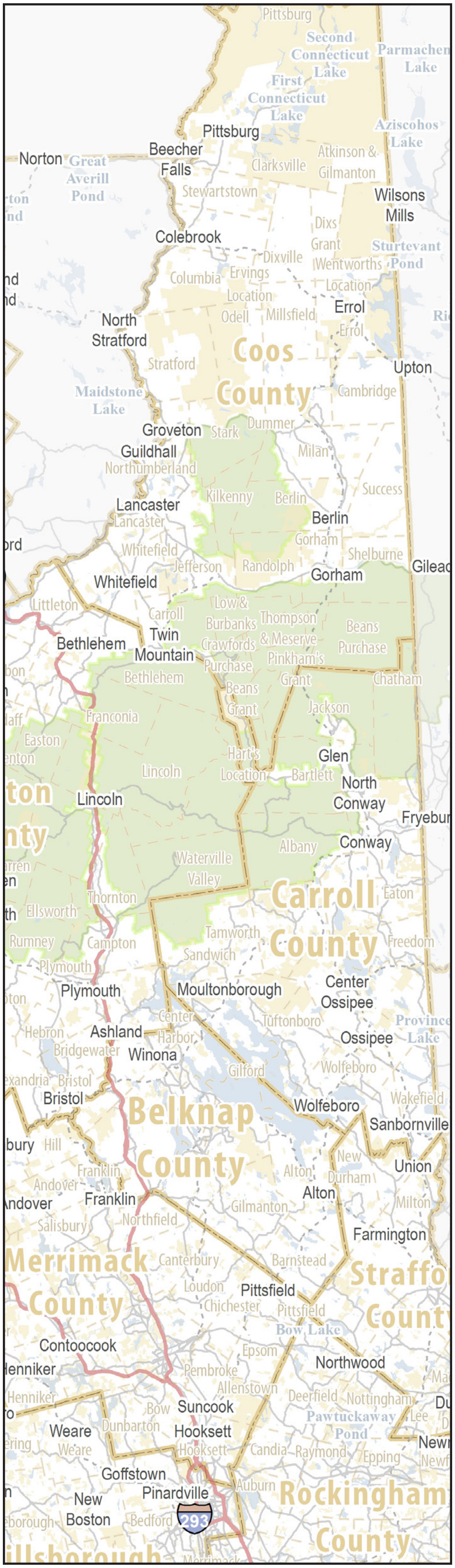

DOE/EIS-0463

FINAL

NORTHERN PASS TRANSMISSION LINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1: IMPACT ANALYSES

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY
WASHINGTON, DC

AUGUST 2017

Department of Energy
Washington, DC 20585
August 2017

Dear Sir/Madam:

Enclosed is the final *Northern Pass Transmission Line Project Environmental Impact Statement* (DOE/EIS-0463) prepared by the Department of Energy (DOE) pursuant to the National Environmental Policy Act of 1969 (NEPA) and its implementing regulations.

The United States Forest Service (USFS) – White Mountain National Forest, United States Environmental Protection Agency (EPA) – Region 1, United States Army Corps of Engineers (USACE) – New England District, and the New Hampshire Office of Energy and Planning (NHOEP) are cooperating agencies in the preparation of the EIS.

The proposed DOE action in the final EIS is to issue a Presidential permit to the Applicant, Northern Pass LLC, to construct, operate, maintain, and connect a new electric transmission line across the U.S./Canada border in northern New Hampshire (NH).

DOE has prepared this final EIS to evaluate the potential environmental impacts in the United States of the proposed action and the range of reasonable alternatives, including the No Action alternative. Under the No Action alternative, the Presidential permit would not be granted, and the proposed transmission line would not cross the U.S./Canada border.

In addition to its Presidential permit application to DOE, Northern Pass LLC applied to the USFS for a special use permit that would authorize Northern Pass LCC to construct, own, operate and maintain an electric transmission line to cross portions of the White Mountain National Forest under its jurisdiction. The final EIS will be used by the Forest Supervisor of the White Mountain National Forest to inform the Record of Decision in regard to this requested use.

DOE will use the EIS to ensure that it has the information it needs for informed decision-making.

The final EIS will also be posted on the project EIS website, http://www.northernpasseis.us/ and DOE's NEPA website at https://energy.gov/nepa/listings/environmental-impact-statements-eis.

Sincerely,

Brian Mills
Transmission Permitting and Technical Assistance,
Office of Electricity Delivery and Energy Reliability
U.S. Department of Energy

FINAL

NORTHERN PASS TRANSMISSION LINE PROJECT ENVIRONMENTAL IMPACT STATEMENT DOE/EIS-0463

Volume 1: Impact Analyses

U.S. DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY
AND ENERGY RELIABILITY

COOPERATING AGENCIES

United States Forest Service – White Mountain National Forest
United States Environmental Protection Agency– Region 1
United States Army Corps of Engineers – New England District
New Hampshire Office of Energy and Planning

August 2017

COVER SHEET

RESPONSIBLE FEDERAL AGENCY: U.S. Department of Energy (DOE), Office of Electricity Delivery and Energy Reliability

COOPERATING AGENCIES: United States Forest Service (USFS) – White Mountain National Forest (WMNF); United States Environmental Protection Agency (EPA) – Region 1; United States Army Corps of Engineers (USACE) – New England District; and New Hampshire Office of Energy and Planning (NHOEP)

TITLE: Northern Pass Transmission Line Project Environmental Impact Statement (DOE/EIS-0463)

LOCATION: Coös, Grafton, Belknap, Merrimack, and Rockingham counties in New Hampshire

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ABSTRACT: Northern Pass Transmission, LLC (Northern Pass) has applied to the DOE for a Presidential permit to construct, operate, maintain, and connect a 192-mile (309-km) electric transmission line across the United States (U.S.)/Canada border in northern New Hampshire (NH). This final EIS addresses the potential environmental impacts of the Project (Proposed Action), the No Action Alternative, and ten additional action alternatives (Alternatives 2 through 6, with variations). The NH portion of the Project would be a single circuit ±320 kilovolt (kV) high voltage direct current (HVDC) transmission line running approximately 158 miles (254 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new direct current-to-alternating current (DC-to-AC) converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at the Public Service of New Hampshire's existing Deerfield Substation located in Deerfield, NH, the Project would consist of 34 miles (55 km) of 345 kV AC electric transmission line. The total length of the Project would be approximately 192 miles (309 km).

PUBLIC COMMENTS: In preparing this final EIS, DOE considered comments received during the scoping period, which extended from February 11, 2011 to June 14, 2011, and was reopened from June 15, 2011 to November 5, 2013 (DOE accepted and considered all comments during the scoping period from February 11, 2011 to November 5, 2013), and the public comment period on the draft EIS (July 31, 2015 through April 4, 2016). Comments on the draft EIS were accepted during the 45-day period following publication of EPA's Notice of Availability (NOA) in the *Federal Register* on July 31, 2015; the public comment period was extended until April 4, 2016 following publication of EPA's NOA of the supplement in the *Federal Register* on November 20, 2015. DOE held four public meetings on the draft EIS in Colebrook, NH on March 7, 2016; Waterville Valley, NH on March 9, 2016; Concord, NH on March 10, 2016; and Whitefield, NH on March 11, 2016. All comments were considered during preparation of this final EIS. Appendix L in Volume 3 of this EIS contains the comments received on the draft EIS and DOE's responses to these comments. This final EIS contains revisions and new information based in part on comments received on the draft EIS. Vertical bars in the margins marking changed text indicate the locations of these revisions and new information. Deletions are not indicated. Appendices J and K in Volume 2 and Appendix L in Volume 3 are entirely new parts of this EIS; therefore, they do not contain bars indicating changes from the draft EIS.

The EIS analyzes the potential environmental impacts of DOE issuing a Presidential permit for the proposed Northern Pass Project, which is DOE's proposed federal action. DOE will use the EIS to inform its decision on whether to issue a Presidential permit. Additionally, Northern Pass has applied to the USFS for a special use permit (SUP) authorizing Northern Pass to construct, operate, and maintain an electric power transmission line crossing portions of the WMNF. The WMNF Forest Supervisor will use the EIS to inform its decision regarding: 1) whether to issue a SUP under the Federal Land Policy and Management Act; 2) the selection of an alternative; 3) any need to amend the Forest Plan; and 4) what specific terms and conditions should apply if a SUP is issued.

Copies of the final EIS are available for public review at 30 local libraries and town halls, or a copy can be requested from Mr. Brian Mills. The EIS is also available on the Northern Pass EIS website (http://www.northernpasseis.us/). DOE will announce its decision on the Proposed Action in a Record of Decision (ROD) in the *Federal Register* no sooner than 30 days after the EPA publishes the NOA of the final EIS. The USFS will announce its draft decision on the Proposed Action in a draft ROD in the *Federal Register* shortly after the EPA publishes the NOA of the final EIS.

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ACRONYMS AND ABBREVIATIONS

AADT	Average Annual Daily Traffic
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ANST	Appalachian National Scenic Trail
APE	area of potential effects
APM	applicant proposed measure
AQI	Air Quality Index
AQRV	Air Quality Related Value
ATC	Appalachian Trail Conservancy
ATV	all-terrain vehicle
BBS	breeding bird survey
BLS	Bureau of Labor Statistics
BMP	best management practice(s)
CAA	Clean Air Act
CAD	computer-aided design
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
dBA	A-weighted decibels
DBH	diameter at breast height
DC	direct current
DNH	Determination of No Hazard
DOE	(United States) Department of Energy
EDR	Environmental Data Resources
EIA	(United States) Energy Information Administration
EIS	environmental impact statement
EHC	Environmental Health Criteria
ELF	extremely low frequency
ELT	Ecological Land Types
EMF	electric and magnetic field
EO	Executive Order
EPA	(United States) Environmental Protection Agency
EPRI	Electric Power Research Institute
EPSC	Erosion Prevention and Sedimentation Control
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
Forest Plan	White Mountain National Forest Land and Resource Management Plan
FPA	Federal Power Act
FR	Federal Register
FSM	Forest Service Manual
FTE	Full-time equivalent
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
GWh	gigawatt-hours
HDD	horizontal directional drilling
HMU	Habitat Management Unit
HVAC	high-voltage alternating current
HVDC	high-voltage direct current
Hz	Hertz
I-	Interstate
IBA	Important Bird Area
ICES	International Committee for Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ID Team	Inter-Disciplinary Team
IEEE	Institute of Electrical and Electronics Engineers
INHS	Institute for New Hampshire Studies
IRA	Inventoried Roadless Area
ISO-NE	New England Independent Systems Operator
ITS	Institute for Tourism Studies
KOP	Key Observation Point
kV	kilovolt
kWh	kilowatt hour
LAU	Lynx Analysis Unit
LCA	Life Cycle Assessment
L_{dn}	Day-night Average Sound Level
LEO	Law Enforcement Officer
MA	Management Area
MBTA	Migratory Bird Treaty Act
ME	Maine
mG	milliGauss
MIS	Management Indicator Species
MOA	Memorandum of Agreement
MP	mile post
MW	megawatt
MWh	megawatt hour
Maine ITS	Maine Interconnected Trail System
NAAQS	National Ambient Air Quality Standards
NB	Northbound
NEPA	National Environmental Policy Act

NESC	National Electric Safety Code
NCED	National Conservation Easement Database
NFMA	National Forest Management Act
NFS	National Forest System
NH	New Hampshire
NHB	(New Hampshire) National Heritage Bureau
NHDES	New Hampshire Department of Environmental Services
NHDFL	New Hampshire Division of Forests and Lands
NHDHR	New Hampshire Division of Historic Resources
NHDOT	New Hampshire Department of Transportation
NHDPR	New Hampshire Division of Parks and Recreation
NHDRA	New Hampshire Department of Revenue Administration
NHDRED	New Hampshire Department of Resources and Economic Development
NHFG	New Hampshire Fish and Game
NHOEP	New Hampshire Office of Energy and Planning
NHPA	National Historic Preservation Act
NHWAP	New Hampshire Wildlife Action Plan
NLCD	National Land Cover Dataset
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NOA	Notice of Availability
NOI	Notice of Intent
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWI	National Wetland Inventory
O_3	ozone
OHV	off-highway vehicle
ORW	Outstanding Resource Waters
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PA	Programmatic Agreement
Pb	lead
PEM	palustrine emergent wetland
PFO	palustrine forested wetland
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
PSNH	Public Service of New Hampshire
PSS	palustrine scrub-shrub wetland
Puc	Public Utility Code
RACR	Roadless Area Conservation Rule
RCRA	Resource Conservation and Recovery Act
RFFS	Regional Forester Sensitive Species
RGGI	Regional Greenhouse Gas Initiative
RMO	Road Management Objectives
RMPP	(New Hampshire) River Management and Protection Program
RMZ	Riparian Management Zone
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RPI	Renewable Properties, Inc.
RPS	Renewable Portfolio Standard
RSA	Revised Statutes Annotated
ROW	right-of-way
SAV	submerged aquatic vegetation
SB	Southbound
SEC	Site Evaluation Committee
SHPO	State Historic Preservation Office
SIO	Scenic Integrity Objective
SIP	State Implementation Plan
SMS	Scenery Management System
SO_2	sulfur dioxide
SO_X	sulfur oxide
SPCC	Spill Prevention, Control, and Countermeasure Rule
SPNHF	Society for the Protection of New Hampshire Forests
SUP	special use permit
SWPPP	Stormwater Pollution Prevention Plan
T&E	threatened and endangered
TDI	Transmission Developers, Inc. – TDI New England
TES	Threatened, endangered, and sensitive (species)
THPO	Tribal Historic Preservation Officer
TPY	tons per year
TSA	Transmission Services Agreement
TSI	timber stand improvement
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compound

WFU	wildland fire use
WHO	World Health Organization
WMNF	White Mountain National Forest
VT	Vermont
ZVI	zone of visual influence

CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

1 PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

On October 14, 2010, Northern Pass Transmission, LLC[1] (Northern Pass or Applicant) applied to the Department of Energy (DOE) for a Presidential permit pursuant to Executive Order (EO) 10485, as amended by EO 12038, and the regulations codified at 10 Code of Federal Regulations (CFR) § 205.320 *et seq*. (2000), "Application for Presidential Permit Authorizing the Construction, Connection, Operation, and Maintenance of Facilities for Transmission of Electric Energy at International Boundaries."[2] The Presidential permit for the Applicant (OE Docket Number PP-362), if issued, would authorize Northern Pass to construct, operate, maintain, and connect facilities at the international border of the United States (U.S.) for the transmission of electric energy across the U.S./Canada border in northern New Hampshire (NH). DOE does not have siting or project alignment authority for projects proposed in applications for Presidential permits.

The DOE's Office of Electricity Delivery and Energy Reliability is responsible for reviewing Presidential permit applications and determining whether to grant a permit for electric transmission facilities that cross the U.S. international border. The DOE has determined that the issuance of a Presidential permit would constitute a major federal action and that an environmental impact statement (EIS) is the appropriate level of environmental review under National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] § 4321 *et seq*.).

The DOE has prepared this EIS in compliance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500–1508), DOE implementing procedures for NEPA (10 CFR Part 1021), DOE floodplain and wetlands environmental review requirements (10 CFR Part 1022), and other applicable federal laws. The DOE invited several federal and state agencies to participate in the preparation of this EIS as cooperating agencies because of their special expertise or jurisdiction by law. The cooperating agencies are the United States Forest Service (USFS) – White Mountain National Forest (WMNF), the United States Environmental Protection Agency (EPA) – Region 1, the United States Army Corps of Engineers (USACE) – New England District, and the New Hampshire Office of Energy and Planning (NHOEP).

After its initial application, on July 1, 2013, the Applicant submitted an amended application for a Presidential permit that reflected proposed changes to the route of the Project, and in July 2015, the DOE issued the draft *Northern Pass Transmission Line Project Environmental Impact Statement* (draft EIS) (80 *Federal Register* [FR] 45652 [July 31, 2015]). The draft EIS analyzed potential environmental impacts from the proposed project (as described in the amended Presidential permit application filed by Northern Pass on July 1, 2013) and the range of reasonable alternatives (collectively referred to as "the Project").

[1] Northern Pass Transmission, LLC is owned by Eversource Energy Transmission Ventures, Inc. (formerly NU Transmission Ventures, Inc.), a wholly-owned subsidiary of Eversource Energy (formerly Northeast Utilities), which is a publicly-held public utility holding company. Public Service of New Hampshire (PSNH) is also a wholly-owned subsidiary of Eversource Energy, and does business as Eversource Energy.

[2] Full text of the federal laws can be accessed at the following website: http://uscode.house.gov/browse.xhtml. EOs can be accessed at the following website: http://www.archives.gov/federal-register/executive-orders/disposition.html. Full text of the state laws can be access at the following website: http://www.nh.gov/government/laws.html.

Subsequent to the publication of the draft EIS, Northern Pass submitted a "Further Amendment to Presidential Permit Application" in August 2015 (Northern Pass 2015) that made changes to the Applicant's proposed project. Specifically, the August 2015 amendment proposed to bury an additional 52 miles of the transmission line in roadway corridors between Bethlehem and Bridgewater, NH.[3] Approximately 49 miles of this additional burial is the same as was analyzed as part of Alternatives 4c and 5c in the draft EIS (each alternative is described in detail in **Section 1.2**). Approximately 3 miles of additional burial in Bethlehem, NH, was not analyzed in the draft EIS, as it would extend immediately to the north of the alignment analyzed as Alternative 5c. Northern Pass also proposed a minor shift (less than 100 feet [30 m]) in the international border crossing location, two new transition stations (one in Bridgewater, NH, and one in Bethlehem, NH, to transition the line between overhead and underground), a change of the project size from 1,200 megawatts (MW) to 1,000 MW with a potential transfer capacity of up to 1,090 MW, and other design changes (e.g., change in converter technology and type of cable).

Although Northern Pass' revised proposal (referred to as Alternative 7) was principally evaluated within the draft EIS under a combination of several of the action alternatives, DOE determined that providing a supplement to the draft EIS would allow the potential environmental impacts of Alternative 7 to be more clearly displayed as an additional singular alternative and facilitate a comparison among the alternatives. DOE regulations provide that DOE may supplement a draft EIS at any time, to further the purposes of NEPA (10 CFR § 1021.314(b)).

Thus, DOE issued a notice of intent (NOI) to prepare a supplement to the draft EIS (80 FR 58725 [September 30, 2015]) and, in November 2015, issued a *Supplement to the Draft Northern Pass Transmission Line Project Environmental Impact Statement* (DOE/EIS-0463-S1). The supplement to the draft EIS contains an analysis of the potential environmental impacts of Alternative 7 and supplemented the analysis contained in the July 2015 draft EIS.

In addition to its Presidential permit application to DOE, Northern Pass applied to the USFS on June 28, 2011, for a special use permit (SUP) that would authorize Northern Pass to construct, own, operate, and maintain an electric transmission line crossing portions of the WMNF. On September 5, 2013, Northern Pass submitted an amended SUP application to the USFS which also reflected proposed changes to the route of the Project. The USFS is a cooperating agency in the preparation of this EIS.

This EIS, *Northern Pass Transmission Line Project Environmental Impact Statement* (DOE/EIS-0463), analyzes potential environmental impacts from the Proposed Action (as described in the further amended Presidential permit application filed by Northern Pass on August 31, 2015 and analyzed as Alternative 7 in the supplement to the draft EIS) and the range of reasonable alternatives (collectively referred to as "the Project").

This EIS presents a summary of detailed information contained in Technical Resource Reports, which were prepared for each resource area evaluated. These reports were prepared by independent experts at the direction of DOE, and are available for review on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports).

Vertical bars in the margins of the final EIS mark text that has changed since the issuance of the draft EIS or the supplement to the draft EIS, including revisions and new information based in part on comments received on the draft EIS (see **Appendix L** – Comment Response Document). The term "draft EIS" in this document refers to material included in the July 2015 draft EIS and the November 2015 supplement. Text

[3] The original Proposed Action (Alternative 2 in the draft EIS) included approximately 8 miles of underground cable. The revised Proposed Action (Alternative 7) includes an additional 52 miles of underground cable, for a total of approximately 60 miles of underground cable.

that was included in the supplement to the draft EIS is not marked as a change, as this text is considered part of the draft EIS and the two documents were combined. Deletions are not indicated.

This EIS was prepared to meet the following key objectives:

- Identify baseline conditions within the study area (see **Section 3.1** for a definition of the study area for each resource)
- Identify and assess potential impacts on the natural and human environment that may result in the U.S. from issuing the Presidential permit and the SUP for the Project
- Describe and evaluate the range of reasonable alternatives to the Proposed Action in the U.S., including the No Action Alternative[4]
- Identify specific mitigation measures, as appropriate, to minimize potential environmental impacts
- Inform decision-making by the DOE, USFS, and other applicable federal and New Hampshire regulatory agencies responsible for the issuance of associated permits and approvals

A summary of the Proposed Action (as described in the Applicant's further amended Presidential permit application [August 2015]) is provided in **Section 1.1.3**. Additional project information including alternatives to the proposal is provided in **Chapter 2**. Maps of the Project are contained in **Appendix A**.

Information regarding Northern Pass' Presidential permit application and the NEPA process is available on the DOE website for the EIS, found at http://www.northernpasseis.us/. Additional project information is available on the Applicant's website at http://www.northernpass.us/.

1.1.1 OVERVIEW OF THE PRESIDENTIAL PERMIT PROCESS

Anyone seeking to construct, operate, maintain, or connect an electric transmission facility crossing the borders of the U.S. must first obtain a Presidential permit issued by DOE under Executive Order (EO) 10485, as amended by EO 12038. EO 10485, as amended by EO 12038, authorizes the Secretary of Energy "upon finding the issuance of the permit to be consistent with the public interest, and, after obtaining the favorable recommendations of the Secretary of State and the Secretary of Defense thereon, to issue to the applicant, as appropriate, a permit for [the] construction, operation, maintenance, or connection" of "facilities for the transmission of electric energy between the United States and a foreign country." In deciding whether to issue a permit, DOE must determine whether doing so would be "consistent with the public interest." In addition, the Departments of State and Defense must both make "favorable recommendations" on the issuance of the permit.

In deciding whether the issuance of a Presidential permit would be consistent with the public interest, DOE assesses the environmental impacts of the Project and reasonable alternatives, the impact of the Proposed Action on electric reliability, and any other factors that DOE may also consider relevant to the public interest. In this EIS, DOE is analyzing the potential environmental impacts that may result from the implementation of any of the action alternatives.

[4] **Chapter 2** of this EIS describes all alternatives considered in this analysis. **Chapter 2** also provides a description of the No Action Alternative, the Proposed Action, and the range of reasonable alternatives.

1.1.2 OVERVIEW OF THE U.S. FOREST SERVICE SPECIAL USE PERMIT PROCESS

Northern Pass has also applied to the USFS for a SUP authorizing Northern Pass to construct, operate, and maintain an electric power transmission line crossing portions of the WMNF.[5] The USFS is considering this application for use of National Forest System (NFS) lands and will determine if the Project is "in the public interest" and is appropriate, based on the WMNF Land and Resource Management Plan, as amended (Forest Plan) (USDA Forest Service 2005a). The WMNF Forest Supervisor will use the EIS to inform the decision regarding: 1) whether to issue a SUP under the Federal Land Policy and Management Act; 2) the selection of an alternative; 3) any need to amend the Forest Plan; and 4) what specific terms and conditions should apply if a SUP is issued.

1.1.3 DESCRIPTION OF THE PROPOSED ACTION

DOE's Proposed Action (Agency Preferred Alternative) is to issue a Presidential permit for a proposed high-voltage direct current (HVDC) transmission line that, as currently designed, would be capable of transmitting up to 1,090 megawatts (MW) of power in either direction (Canada to the U.S. and U.S. to Canada). The northern HVDC converter station is proposed to be constructed at the Des Cantons Substation in Québec, Canada, and would be connected to an HVDC line that would run southward in Québec for approximately 45 miles (72 km) where it would cross the U.S./Canada border into Pittsburg, NH.

The New Hampshire portion of the Proposed Action would be a single circuit ±320 kilovolt (kV) HVDC transmission line running approximately 158 miles (254 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new direct current (DC)-to-alternating current (AC) converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at the Public Service of New Hampshire's (PSNH's) existing Deerfield Substation located in Deerfield, NH, the Proposed Action would consist of 34 miles (55 km) of 345 kV AC electric transmission line. The total length of the Proposed Action would be approximately 192 miles (309 km).[6]

Chapter 2 provides a description of the No Action Alternative, the Proposed Action, and the range of reasonable alternatives considered.

1.2 DEPARTMENT OF ENERGY'S PURPOSE OF AND NEED FOR ACTION

Northern Pass has applied to the DOE for a Presidential permit to construct, operate, maintain, and connect an approximately 192-mile (309-km), 1,090 MW, high-voltage electric transmission line across the U.S./Canada border in New Hampshire.

[5] Northern Pass has not submitted an amended SUP application to the USFS reflecting their revised Project, as described in their further amended application for a Presidential permit (August 2015). However, any of the action alternatives would require a SUP from the USFS and the analysis contained in this EIS will inform the USFS decision.

[6] As described above, the Proposed Action has been modified since the publication of the draft EIS. Alternative 2 in the draft EIS was identified as the Proposed Action consistent with the application then before DOE. In light of the August 2015 amendment to the application, the final EIS identifies the revised proposal (referred to as Alternative 7), rather than Alternative 2, as the Proposed Action. As in the draft EIS, DOE's Proposed Action remains to issue a Presidential permit for the Project as proposed by the Applicant, and the No Action Alternative remains that DOE would not issue a Presidential permit.

The purpose of, and need for, the DOE's action is to determine whether or not to grant the requested Presidential permit for the Project at the international border crossing proposed in the further amended Presidential permit application (Northern Pass 2015).[7]

1.3 U.S. FOREST SERVICE'S PURPOSE OF AND NEED FOR ACTION

Northern Pass has also applied to the USFS for a SUP authorizing Northern Pass to construct, operate, and maintain an electric power transmission line crossing portions of the WMNF.

The purpose of, and need for, the USFS's action is to decide whether to grant a SUP for the Project. The USFS will consider the application for use of NFS lands and determine if the Project is in the public interest and is appropriate, based on the WMNF Forest Plan (USDA Forest Service 2005a). The Forest Supervisor will use the EIS to inform the decision regarding: 1) whether to issue a Special Use Authorization under the Federal Land Policy and Management Act; 2) the selection of a preferred alternative; 3) any need to amend the Forest Plan; and 4) what specific terms and conditions should apply if a SUP is issued.

1.4 PROJECT OBJECTIVES

Northern Pass set forth a detailed range of project objectives and benefits in its permit applications to the DOE and USFS. The DOE and the cooperating agencies reviewed this documentation and determined the following general project objectives.

Purpose: The purpose of the Project is to build and operate a participant-funded electric transmission line to deliver 1,090 MW of low-carbon, non-intermittent power (approximately 98 percent hydropower) from Québec to southern New Hampshire to serve the New England region.

Needs: The Project would address three primary needs concerning New England's electricity supply:

- Diverse electricity supply
- Low-carbon electricity supply
- Non-intermittent electricity supply

Each of these needs is described in greater detail below.

[7] In accordance with its authority under EO 12038, DOE is considering whether to issue a Presidential permit for Northern Pass' proposed transmission line crossing of the international border with Canada into the State of New Hampshire. Although DOE has no siting or project alignment authority, DOE's decision to issue a Presidential permit (along with permits and approvals required from other federal and state agencies) would enable the Applicant to construct and operate a transmission line that crosses the U.S. border into New Hampshire. The construction and operation of the transmission line beyond the border crossing into the U.S. is an action "connected" to the border crossing. See 40 CFR § 1508.25(a)(1). For that reason, DOE has analyzed the potential environmental impacts of the proposed transmission line from the border crossing to the terminus (i.e., first connection to the electrical grid) in accordance with NEPA and the CEQ regulations.

1.4.1 ELECTRICITY DIVERSITY

ISO-NE reported in their 2014 Regional System Plan that "New England is increasingly dependent on natural gas as a primary fuel for generating electric energy…" (ISO-NE 2014a). Subsequent ISO-NE studies and reports have confirmed this trend (ISO-NE 2015a and 2017a). In 2016 natural gas plants provided approximately 49 percent of the system's electric energy production, as compared to approximately 15 percent in 2000 and 45 percent in 2013 (ISO-NE 2013a, 2014a, and 2017a). The ISO-NE 2015 Regional System Plan notes that "New England increasingly relies on natural gas as a primary fuel for generating electric energy" due to the addition of new natural-gas-fired units; the generally low price of natural gas; the displacement of older, less efficient oil- and coal-fired units; and the recent retirements of non-natural-gas-fired generation (ISO-NE 2015a). ISO-NE predicts that natural-gas-fired generation's proportion of the system capacity mix will grow to approximately 56.7 percent by 2024 (ISO-NE 2015a). Currently natural-gas-fired generation represents almost half of proposed new generation projects in the region (ISO-NE 2017a). Approximately 4,200 MW of non-natural-gas-fired generation (primarily oil, coal, and nuclear units) will have shut down between 2012 and 2020, and over 5,500 MW of additional oil and coal capacity are at risk for retirement in the coming years (ISO-NE 2017a). The May 2017 retirement of the coal-fired Brayton Point Power Station in Somerset, Massachusetts, and the upcoming May 2019 retirement of the Pilgrim Nuclear Power Station in Plymouth, Massachusetts, represent a loss of over 2,200 MW of nameplate generating capacity within two years, and "uncertainty surrounds the future of 3,300 MW from the region's remaining nuclear plants" (ISO-NE 2017a). This heavy reliance on natural gas-fired capacity "can expose the region to significant energy supply, reliability, and price issues" (ISO-NE 2015a).

Because New England does not have indigenous supplies of natural gas, it depends on natural gas importation. ISO-NE's 2015 Regional System Plan states that New England's increasing dependence on natural gas "continuously exposes the regional electric power system to potential reliability problems and an associated increased cost of electricity when natural gas prices are high" (ISO-NE 2015a). A 2013 report commissioned by the New England States Committee on Electricity similarly concludes that "in the absence of infrastructure or other solutions to increase supply or reduce demand, New England will experience significant natural gas infrastructure constraints" (Black & Veatch Corporation 2013a). On cold days, natural gas supply pipelines run at or near maximum capacity solely to meet heating demand, leaving a severely limited supply to be used for electricity generation (ISO-NE 2017a). The limitations to natural gas supply threaten the reliable supply of electricity and drive up wholesale electricity prices and air emissions (ISO-NE 2017a). ISO-NE notes that during periods of extreme demand on the natural gas supply, ISO system operators could be forced to order controlled power outages if there were not enough supply to meet both heating and electricity generation demand (ISO-NE 2017a).

While some pipeline capacity was added in 2016 and more is expected in 2017 to serve increased demand from retail gas customers, it is not anticipated that the increased capacity will be sufficient to meet growing heating and electricity generation needs (ISO-NE 2017a). ISO-NE warns that "without timely investment to expand natural gas or LNG infrastructure, the region should expect significant energy market price volatility when the gas pipelines are constrained" (ISO-NE 2017a).

ISO-NE, regional stakeholders, and industry are taking actions to mitigate the regional risks due to its reliance on natural gas (ISO-NE 2013a, 2017a, NHOEP 2014a). A variety of generation alternatives are being considered by ISO-NE and New England states to increase the diversity of the electricity supply, including renewables (wind, solar, etc.), energy efficiency, imports of Canadian hydropower, and others (ISO-NE 2015a, 2017a, NHOEP 2014a).

The Federal Energy Regulatory Commission (FERC) has found that the Project would "diversify New England's power supply mix" (FERC 2011a).

1.4.2 LOW CARBON ELECTRICITY SUPPLY

In addition to diversifying the electricity supply, the utilization of low-carbon hydropower can help meet public policy goals to reduce greenhouse gas (GHG) emissions. In 2012 Hydro-Québec's generation capacity was 35,829 MW, 98 percent of which was hydroelectric power (NESCOE 2013a). Hydroelectric power is documented as a low-carbon energy source.[8]

Low-carbon hydropower can help achieve objectives and/or statutory requirements to reduce carbon emissions such as those presented in the New Hampshire Climate Action Plan, Regional Greenhouse Gas Initiative (RGGI), and the New England Governors' Regional Cooperation on Energy Infrastructure (NESCOE 2013a).[9] The New Hampshire Climate Action Plan includes a number of recommendations designed to "achieve a long-term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050," including the importation of Canadian hydropower (NHDES 2009). In February 2013 the RGGI released revised GHG emissions standards for participating states that include a reduction of the 2014 regional carbon dioxide budget of 45 percent (RGGI 2013a).[10] Additionally, the Hydropower Regulatory Efficiency Act of 2013 promotes the use of hydropower resources (Public Law 113-23 [2013]).

These national and regional policies are mirrored and enhanced in many individual New England state GHG emission mandates. Connecticut legislation mandates a reduction in GHG emissions of 80 percent below their 2001 level by January 2050, and Massachusetts has committed to a reduction of GHG emissions between 10 and 25 percent below 1990 levels by 2020 and 80 percent below 1990 levels by 2050 (Conn. Gen. Stat. § 22a-200a; Mass. Gen. Laws ch. 21N, §§ 3-4). Additionally, several New England state legislatures have recognized public benefits associated with reductions in GHG emissions and/or other air pollutants (N.H. Rev. Stat. Ann. § 362-F:1; N.H. Rev. Stat. Ann. § 125-O; Mass. Gen. Laws ch. 23J, § 9[c][ii]; R.I. Gen. Laws § 39-26-1).

New England states have recently demonstrated their commitment to GHG emission reductions through two requests for proposals (RFPs) for renewable energy suppliers to the region. The "New England Clean Energy RFP" was issued on November 12, 2015 by state agencies and electric distribution companies in Connecticut, Massachusetts, and Rhode Island (Commonwealth of Massachusetts, et. al 2015). The RFP provided a mechanism for the states to procure low carbon energy generation along with the transmission infrastructure needed to deliver it. On August 8, 2016, Massachusetts passed bill H. 4568 – An Act to Promote Energy Diversity (the "Omnibus Energy Bill"), to competitively solicit and contract for approximately 1,200 MW of clean energy generation (2016 Mass. Acts 188). On March 31, 2017,

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[8] In 2010 DOE National Renewable Energy Laboratory (NREL) conducted a comprehensive review and analysis of Life Cycle Assessment (LCA) studies to systematically review estimates of life cycle GHG emissions published between 1970 and 2010 from electricity generation technologies. The LCA considered emissions from all stages in the life cycle of an electricity generation technology, from component manufacturing, to operation of the generation facility to its decommissioning, and including acquisition, processing, and transport of any required fuels. The results of this study demonstrate that hydropower was equivalent to other sources of low-carbon power (wind and solar). Results can be found at http://www.nrel.gov/analysis/sustain_lca_hydro.html. Visit the following site to view comparative graphics displaying the lifetime GHG emissions from various energy sources: http://en.openei.org/apps/LCA/.
Additionally, DOE's 2016 Hydropower Vision report notes the potential for GHG emissions avoidance through the development of hydropower resources (DOE 2016a).

[9] The New Hampshire Climate Action Plan can be found at:
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/nh_climate_action_plan.htm
The Regional Greenhouse Gas Initiative website is located at: http://www.rggi.org/
The New England Governors' Regional Cooperation on Energy Infrastructure can be found at:
http://www.nescoe.com/uploads/6_State_Joint_Statement_FINAL_4-22-15_12-3.36pm_w-sealsf.pdf.

[10] For Canadian hydropower to be eligible for credit under RGGI, the generation and transmission facilities would need to be outfitted with tracking and reporting systems to validate the clean energy attributes of the electricity.

Massachusetts electric distribution companies, in coordination with the State of Massachusetts Department of Energy Resources (DOER), issued an RFP for "Long Term Contract for Clean Energy Projects" (MA DOER 2017a). This solicitation seeks to procure an annual amount of electricity equal to approximately 9,450,000 MWh. This solicitation defines "Clean Energy Generation" as either: (i) firm service hydroelectric generation from hydroelectric generation alone; (ii) new Class I Renewable Portfolio Standard ("RPS") eligible resources that are firmed up with firm service hydroelectric generation; or (iii) new Class I RPS eligible resources (2016 Mass. Acts 188). This RFP was issued pursuant to Section 83D of Chapter 169 of the Acts of 2008 (the "Green Communities Act"), as amended by chapter 188 of the Acts of 2016, An Act to Promote Energy Diversity (the "Energy Diversity Act").

1.4.3 NON-INTERMITTENT POWER SUPPLY

Lastly, the Project has the potential to contribute a non-intermittent (i.e., baseload) power supply to the region. The Commonwealth of Massachusetts' Omnibus Energy Bill recognizes the necessity of hydropower generation to provide reliable generation to meet Massachusetts' energy demand and achieve the greenhouse gas emissions goals of the Global Warming Solutions Act (MA Governor's Press Office 2016). In its report titled "Quantifying the Value of Hydropower in the Electric Grid: Final Report" the Electric Power Research Institute (EPRI) noted that hydroelectric resources "contribute significantly to the reliability of the grid in terms of energy, capacity, and ancillary services" (EPRI 2013a). The EPRI report suggests that hydropower has the potential to address other generation and load variability, provide scheduling to optimize energy and ancillary services, provide fast regulation response, and, as noted above, add generation diversity. In its 2017 Regional Electricity Outlook, ISO-NE notes that federal and state efforts to cut carbon emissions are impacting "traditional resource types needed to meet the region's electricity needs, balance intermittent renewable generation, and provide the grid-stability services that renewables don't" (ISO-NE 2017a). Currently, nuclear power provides roughly 30 percent of ISO-NE's baseload generation (ISO-NE 2017a). As these sources retire, as demonstrated by the retirement of non-natural-gas-fired baseload units as described in **Section 1.4.1**, there will be a need in the near-term for non-intermittent, reliable power in New England (U.S. NRC 2015a). A whitepaper published by the New England States Committee on Electricity also states that "it is no longer possible to safely assume that nuclear power will continue to provide the same approximate percentage of the region's base load power for the next decades in the face of low natural gas prices" (NESCOE 2013a). With a decline in baseload power from nuclear sources, and a need to diversify to avoid over-reliance on natural gas, hydroelectric power provides a logical solution to these needs (NESCOE 2013a).

1.5 PUBLIC PARTICIPATION IN THE NEPA PROCESS

1.5.1 OVERVIEW OF PUBLIC INVOLVEMENT

On February 11, 2011, the DOE published a "Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings and Notice of Floodplains and Wetlands Involvement" (the NOI) in the *Federal Register* (76 FR 7828). In the NOI, the DOE announced its intention to prepare an EIS to assess the potential environmental impacts of issuing a Presidential permit for the Northern Pass Project. After the Applicant amended its Presidential permit application and its SUP application, the DOE published an "Amended Notice of Intent to Modify the Scope of the Environmental Impact Statement and to Conduct Public Scoping Meetings and Notice of Floodplains and Wetlands Involvement" (the amended NOI) in the *Federal Register* (78 FR 54876) on September 6, 2013. As described more fully in **Section 1.5.2**, the DOE conducted a total of eleven scoping meetings in New Hampshire during the public scoping period following publication of the NOI and following publication of the amended NOI.

In July 2015 the public review period for the draft EIS was initiated through publication of a Notice of Availability (NOA) in the *Federal Register* by the EPA (80 FR 45652 [July 31, 2015]). Subsequent to the publication of the NOA for the draft EIS, DOE prepared a supplement to the draft EIS in response to

Northern Pass' August 31, 2015 amendment to its Presidential permit application (80 FR 58725 [September 30, 2015]). As a result, DOE extended the public review period. In total, DOE provided a 248-day public review period and held four public hearings for the draft EIS.

DOE notified the public and applicable federal and state agencies of the public review period for the draft EIS through several methods, including distribution of the document to individuals or parties who submitted scoping comments and to other interested parties that requested a copy of the draft EIS. The DOE made the draft EIS available online at the DOE website for the EIS (http://www.northernpasseis.us), on the DOE NEPA website (http://energy.gov/nepa), and in hard copy and CD format at 30 public libraries located in the proposed Project area. The draft EIS was also circulated to federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that requested a copy.

This final EIS includes, in **Appendix L**, comments on the draft EIS and DOE's responses to those comments. All substantive comments on the draft EIS received or postmarked before the end of the comment period were considered in preparing the final EIS. Comments received after the end of the comment period were considered to the extent practicable. The EPA will issue a NOA for the final EIS that will be published in the *Federal Register* to announce that the final EIS is available. The final EIS will be distributed to all individuals and parties that received a copy of the draft EIS, submitted comments on the draft EIS, or requested a copy of the final EIS.

The DOE will issue its Record of Decision (ROD) no sooner than 30 days following publication of EPA's NOA for the final EIS. The USFS will issue its draft ROD shortly after the publication of EPA's NOA for the final EIS. The publication of the USFS draft ROD will initiate the USFS pre-decisional objection period during which eligible individuals may file objections to the proposed decision (36 CFR Part 218).

A chronology of the Presidential permit application process and EIS public notices to data for the proposed Northern Pass Project is provided in **Table 1-1**.

Table 1-1. Proposed Northern Pass Project Presidential Permit Application Milestones

Date	Action	Summary
October 14, 2010	Initial Presidential permit application submitted	Initial Project consisted of 140 miles (225km) of overhead HVDC transmission lines and 34 miles (55 km) of overhead HVAC transmission lines delivering 1,200 MW of electricity to Deerfield, NH.
November 16, 2010	Notice of Application published in the Federal Register	DOE issued a Notice of Application announcing that the Applicant had applied for a Presidential permit.
February 11, 2011	DOE issued NOI to prepare an EIS and initiate public scoping	DOE announced its intention to prepare an EIS and conduct public scoping meetings.
March 14–20, 2011	Public scoping meetings held	DOE held public scoping meetings to collect comments from the public for consideration in preparation of the EIS.
July 1, 2013	Amendment to the Presidential permit application submitted	The Applicant amended its application to change the route of the proposed Project and include approximately 8 miles (13 km) of underground cable.
September 6, 2013	DOE issued Amended NOI	DOE announced its intent to modify the scope of the EIS and conduct additional public scoping meetings.
September 23–26, 2013	Public scoping meetings held	DOE held public scoping meetings to collect comments from the public for consideration in preparation of the EIS.
July 31, 2015	EPA issued NOA for draft EIS	EPA issued a NOA announcing that the draft EIS was available for public review.

Table 1-1. Proposed Northern Pass Project Presidential Permit Application Milestones

Date	Action	Summary
August 31, 2015	Amendment to the Presidential permit application submitted	The Applicant amended its application to change the route of the proposed Project and include approximately 52 miles (84 km) of additional underground cable.
September 30, 2015	DOE issued NOI to prepare a supplement to the draft EIS	DOE announced its intention to prepare a supplement to the draft EIS to incorporate changes to the proposed Project, and announced a postponement of draft EIS public hearings.
November 20, 2015	EPA issued NOA for supplement to draft EIS	EPA issued a NOA announcing that the supplement to the draft EIS was available for public review.
March 7, 9–11, 2016	Draft EIS public hearings	DOE held public hearings to collect comments from the public on the draft EIS and supplement.

1.5.2 PUBLIC SCOPING PROCESS

The NEPA public scoping period began on February 11, 2011, following the DOE's publication of the NOI (76 FR 7828). Through a notice in the *Federal Register* published on April 15, 2011 (76 FR 21338), DOE extended the scoping period to June 14, 2011. On June 15, 2011, the DOE announced a reopening of the public scoping period, in anticipation of additional route information to be provided by Northern Pass, and stated that the scoping period would remain open until the DOE provided further notice of its closing (76 FR 34969). Following publication of the amended NOI on September 6, 2013 (78 FR 54876), the public scoping period closed 60 days later, on November 5, 2013.[11]

Seven public scoping meetings were held in March 2011. The locations, dates, and times of the meetings were:

- Pembroke, NH, Pembroke Academy cafeteria, 209 Academy Road, Monday, March 14, 2011, 6–9 p.m.
- Franklin, NH, Franklin Opera House, 316 Central Street, Tuesday, March 15, 2011, 6–9 p.m.
- Lincoln, NH, The Mountain Club on Loon, Hancock Room, 90 Loon Mountain Road, Wednesday, March 16, 2011, 6–9 p.m.
- Whitefield, NH, Mountain View Grand Resort & Spa, Presidential Room, 101 Mountain View Road, Thursday, March 17, 2011, 6–9 p.m.
- Plymouth, NH, Plymouth State University, Silver Center for the Arts, Hanaway Theatre, 114 Main St., Friday, March 18, 2011, 6–9 p.m.
- Colebrook, NH, Colebrook Elementary School, Gymnasium, 27 Dumont Street, Saturday, March 19, 2011, 1–4 p.m.
- Haverhill, NH, Haverhill Cooperative Middle School, 175 Morrill Drive, Sunday March 20, 2011, 1–4 p.m.

[11] DOE accepted and considered all comments received during the scoping period from February 11, 2011 to November 5, 2013, while developing the draft EIS.

Following the publication of the amended NOI, four additional public scoping meetings were held in September 2013. The locations, dates, and times of the meetings were:

- Concord, NH, Grappone Conference Center, 70 Constitution Avenue, Monday, September 23, 2013, 6–9 p.m.
- Plymouth, NH, Plymouth State University, Silver Center for the Arts, Hanaway Theater, 17 High Street, Tuesday, September 24, 2013, 5–8 p.m.
- Whitefield, NH, Mountain View Grand Resort & Spa, Presidential Room, 101 Mountain View Road, Wednesday, September 25, 2013, 5–8 p.m.
- Colebrook, NH, Colebrook Elementary School, Gymnasium, 27 Dumont Street, Thursday, September 26, 2013, 5–8 p.m.

The scoping meetings were structured in two parts: first, an open house portion for the initial thirty minutes of each meeting which was not recorded; and second, a formal commenting session for the remainder of each meeting, during which oral comments were transcribed by a stenographer. The meetings provided interested parties the opportunity to view exhibits and information regarding the Project and to provide both oral and written comments. Additionally, the Applicant was in attendance to answer questions and provide information to attendees.

During the entire public scoping period, the DOE received 7,560 comments from over 6,400 individuals, businesses, municipalities, government agencies, and other organizations. Written and oral comments were given equal weight, and the DOE considered all comments emailed, postmarked, or submitted on the EIS website by November 5, 2013, in defining the scope of the draft EIS. Comments submitted after the close of the comment period were considered to the extent practicable. A Scoping Report was posted to the EIS website on March 12, 2014, providing a summary of all scoping comments received.

On May 1, 2014, a Scoping Report Alternatives Addendum was posted to the EIS website. This document summarized the alternatives that the DOE had identified to date for analysis in the draft EIS. The alternatives described in that document included the proposal presented by Northern Pass in its amended application to the DOE, as well as alternatives identified by the DOE, the cooperating agencies, and from public scoping comments. The Scoping Report Alternatives Addendum was prepared in response to NH's Congressional delegation requests that the DOE provide an update on the status of the consideration of alternatives between the scoping period and issuance of the draft EIS. The alternatives considered in this EIS are described in detail in **Chapter 2**.

1.5.3 DRAFT EIS PUBLIC REVIEW PERIOD

In July 2015 DOE issued the draft EIS. The public review period was initiated through publication of a NOA in the *Federal Register* by EPA (80 FR 45652 [July 31, 2015]). Methods similar to those used during the scoping period were used to notify the public and applicable federal and state agencies of the public review period for the draft EIS, including distributing the document to individuals or parties who submitted scoping comments, and to other interested parties that requested a copy of the EIS. A legal notice was published in the Union Leader, the newspaper of record for the WMNF, on November 5, 2015.

DOE made the draft EIS available online at the Northern Pass EIS website (http://www.northernpasseis.us) and on the DOE NEPA website (http://energy.gov/nepa), and in hard copy and CD format at 30 public libraries located in the proposed Project area. The draft EIS was also circulated to federal, state, and local agencies with jurisdiction by law or special subject matter expertise and to any person, stakeholder organization, or agency that requested a copy (40 CFR § 1502.19). **Appendix L** includes additional information about public participation in this process.

Public hearings to receive comments on the draft EIS were scheduled for October 2015. As a result of Northern Pass' August 2015 revision to its proposal, DOE issued a NOI to prepare a supplement to the draft EIS (80 FR 58725 [September 30, 2015]). This notice extended the comment period until December 31, 2015, and postponed the public hearings (but did not identify new dates). On November 20, 2015, DOE issued the supplement to the draft EIS; EPA's Notice of Availability was published on November 20, 2015 (80 FR 72719 [2015]). Public hearings on the draft EIS and supplement were scheduled for December 2015 (80 FR 72716 [2015]). On December 4, 2015, the public hearings were postponed (new dates were not scheduled at this time) and the comment period was extended until April 4, 2016. On February 4, 2016, the public hearings were scheduled for March 2016 (81 FR 5995 [2016]). Four public hearings were held in March 2016. For the convenience of the public, DOE and the cooperating agencies conducted two of these hearings in conjunction with the New Hampshire SEC. The locations, dates, and times of the joint hearings were:

- Colebrook, NH, Colebrook Elementary School, Gymnasium, 27 Dumont Street, Monday, March 7, 2016, 5–8 p.m.
- Concord, NH, Grappone Conference Center, Granite Ballroom, 70 Constitution Avenue, Thursday March 10, 2016, 5–8 p.m.

The structure of the joint hearings included an opening presentation by the Applicant, a question and answer session during which the Applicant and SEC answered written questions submitted by the public, and a formal commenting session. The question and answer and commenting sessions were transcribed by a stenographer.

Additional public hearings were also conducted by the DOE and the cooperating agencies (without the New Hampshire SEC) to receive oral and written comments on the draft EIS at the following locations commencing at the times identified:

- Waterville Valley, NH, Waterville Valley Conference and Event Center, Waterville Room, 56 Packards Road, Wednesday, March 9, 2016, 5–8 p.m.
- Whitefield, NH, Mountain View Grand Resort & Spa, Presidential Room, 101 Mountain View Road, Friday, March 11, 2016, 5–8 p.m.

The structure of these hearings included a formal commenting session which was transcribed by a stenographer. All four public hearings allowed the public to provide both written and oral comments on the draft EIS.

The public comment period on the draft EIS and supplement to the draft EIS closed on April 4, 2016; in total, the comment period was open for 248 days. During the draft EIS comment period, the DOE received 1,037 comments. The final EIS includes, in **Appendix L**, a summary of the draft EIS public review period, all comments received on the draft EIS, and DOE's responses to those comments. All substantive comments submitted on the draft EIS were considered in preparing the final EIS, including those received after the close of the public comment period (approximately 15 comments).

1.5.4 ISSUES ANALYZED IN THIS ENVIRONMENTAL IMPACT STATEMENT

Through the public scoping process, commenters expressed concerns over a broad range of topics, including, but not limited to, the NEPA process, the federal agencies' purpose and need, the range of alternatives to be considered in the draft EIS, potential socioeconomic impacts in the region, potential visual impacts, potential impacts to wildlife, and potential impacts to tourism. Substantive comments submitted on the draft EIS have been considered in preparing the final EIS.

Appendix B contains a list of issues considered in the EIS analysis. The issue statements were developed through information received from the public during the scoping period, through scoping discussions with cooperating agencies, and from internal agency scoping. The issue statements guided the analysis for this EIS. Some issues raised by the public were determined to be outside the scope of this EIS or otherwise did not warrant detailed analysis. Issues considered but dismissed, including the rationale for not addressing them, are discussed in **Appendix B**.

1.5.4.1 Issues Raised During Draft EIS Public Review Period

Appendix L includes additional information about comments received on the draft EIS, substantial changes made to the EIS, and DOE's responses to comments. Following are DOE responses to major issues raised by agencies and the public during the draft EIS public comment period and major conclusions made by DOE regarding the Proposed Action, in accordance with CEQ NEPA regulations (40 CFR § 1502.12).

Purpose and Need, Project Objectives, and Additional Alternatives. Several comments noted that **Section 1.4** of the draft EIS referenced electricity system characteristics that were no longer accurate and requested that they be updated. Other comments expressed that DOE's purpose and need statement is too narrow and inappropriately limited the range of alternatives. Commenters expressed support for fully-buried alternatives and requested the analysis of additional alternatives. In particular, commenters expressed a desire for additional analysis of alternative energy generation sources, energy conservation, other transmission projects, an alternative border crossing, additional roadway burial alignments, and alternative converter station and substation locations.

> *DOE Response.* **Section 1.4** of the final EIS includes updated references regarding the conditions of the ISO-NE electricity system. The purpose and need for DOE's action and decision is described in **Section 1.2**, and is consistent with the authority defined in EO 10485, as amended by EO 12038. While DOE's authority is limited to the approval or denial of the amended Presidential permit application (August 2015) as requested by the Applicant, DOE's policy is to analyze not only the proposed border crossing, but also the alignment of new infrastructure required between the proposed border crossing and connection to the existing U.S. electricity system as a "connected action" under NEPA. In keeping with this policy, DOE analyzed the potential environmental impacts of the alignment proposed by the Applicant. In addition, in response to input from Cooperating Agencies, other agencies, and extensive public comment, DOE analyzed a range of other alignments and underground and overhead configurations between the proposed border crossing and connection with the existing electricity system. The EIS analyzes in detail the No Action Alternative and eleven action alternatives. Additionally, seventeen alternatives were considered but eliminated from detailed analysis, including alternative border crossings, generation sources, other projects, energy conservation, and others. **Section 2.4** has been updated with additional information on alternatives considered but eliminated from detailed analysis.

Visual Resources. Commenters requested analysis of potential visual impacts in Vermont and questioned some assumptions of the landscape assessment in the EIS, particularly the determination of scenic sensitivity and the usefulness of the average scenic impact index.

> *DOE Response.* Potential visual impacts in Vermont are discussed in the final EIS. DOE considered the comments regarding the methods of the landscape assessment. An additional index, the "aggregate scenic impact," is presented in the final EIS to address concerns about the average scenic impact index. Eight additional visual simulations, including seven new Key Observation Points, were prepared and analyzed in the final EIS.

Socioeconomics. Commenters requested that the economic modeling be updated to incorporate the most recent market conditions, particularly natural gas forecasts. Additionally, comments questioned the methods of the property value analysis and requested that potential impacts to tourism be quantified.

> *DOE Response*. In response to comments received, all economic modeling has been updated to incorporate current market conditions. The analysis of potential impacts to property values has also

been updated in response to comments. No changes have been made to the analysis of impacts to tourism; as discussed in **Section 4.1.2**, no authoritative peer-reviewed studies were identified that address impacts to tourism as a result of the construction of transmission lines, and DOE did not attempt to develop such a study. No other resources were identified to allow for quantification of potential impacts.

Historic and Cultural Resources and the Section 106 Process. Comments were received about the coordination of the NEPA and National Historic Preservation Act (NHPA) Section 106 review processes and highlighting specific historic properties of concern to commenters.

DOE Response. NEPA review and the Section 106 process are separate, independent processes, each with its own schedule. DOE is coordinating its compliance with Section 106 and the applicable NEPA requirements in a manner consistent with 36 C.F.R. § 800.8 and, to the extent practicable, NEPA and NHPA: A Handbook for Integrating NEPA and Section 106. DOE's final EIS contains the appropriate level of information on cultural and historic resources, informed by DOE's Section 106 process to the extent possible, for the proposed Northern Pass project. DOE is addressing potential adverse effects to historic properties in accordance with Section 106 of the National Historic Preservation Act and its implementing regulations. **Section 3.1.8** of the EIS provides additional information about the Section 106 process.

Water Resources. Comments expressed concern about potential impacts to water resources, particularly wetlands and public water supplies.

DOE Response. Potential impacts to water resources are analyzed in **Chapter 4**, and an analysis of potential impacts to public water supplies has been added to the final EIS in response to comments. **Appendix H** includes measures to avoid and minimize impacts to wetlands and other water resources. Additional measures could be developed through site-specific permitting processes; DOE's and USFS's decisions would be conditioned on the implementation of the measures in **Appendix H**, as well as any other requirements identified by other permitting processes (including the New Hampshire Site Evaluation Committee review, consultation with the U.S. Fish and Wildlife Service, etc.).

NEPA Process. Commenters requested that the public hearings be rescheduled and the comment period extended to allow adequate opportunity to comment, requested additional public hearing locations, and noted that documents were not made sufficiently available to the public. Several comments noted the need to prepare a supplement to the draft EIS to analyze the changes to the Project noted in the Applicant's August 2015 further amendment to their application for Presidential permit. Comments also requested that DOE prepare a programmatic EIS analyzing multiple transmission projects in the ISO-NE region.

DOE Response. Following the receipt of the further amendment to Presidential permit application from Northern Pass on August 31, 2015, DOE prepared a supplement to the draft EIS analyzing the impacts of Alternative 7 – Proposed Action. A NOA of the supplement to the draft EIS was published by EPA in the Federal Register on November 20, 2015 (80 FR 72719). As a result of the production of the supplement to the draft EIS, the public hearings originally scheduled for October 2015 were rescheduled for December 2015, and were postponed again until March 2016. In response to comments an additional public hearing was held in Colebrook, NH. The comment period was extended until April 4, 2016. **Section 1.5.3** provides a summary of the draft EIS public review period.

A variety of methods were employed to publicize project information and public meetings, including the Federal Register, local newspapers, postal mailing addresses, email addresses, and the project EIS website. Extensive information about the EIS process has been made available through the project EIS website (http://www.northernpasseis.us/). Project documents, including the draft EIS, supplement to the draft EIS, and Technical Resource Reports were available in several formats, including digitally via the project EIS website, and hard copy by request and at public libraries. Printed hard copies and CD copies of the draft EIS and supplement to the draft EIS were sent to those who requested to receive documents in those formats. Printed hard copies and CD copies were made available for public review at 30 public libraries (see **Appendix L**).

There is not before DOE a proposed regional plan for the importation of Canadian hydropower that would serve as the subject of a programmatic EIS. Further, DOE does not have the authority to determine underlying regional energy needs and goals within the New England regional transmission system or to establish a master plan for regional importation of Canadian hydropower. Regional energy needs and a plan for meeting those needs within the New England region would be determined by ISO-NE in coordination with the New England states.

Other comments on the draft EIS, including those related to recreation, health and safety, traffic and transportation, land use, noise, environmental justice, air quality, wildlife, vegetation, geology and soils, cumulative effects, and other content in the EIS are summarized in **Appendix L**.

Issues Outside the Scope of this EIS – Impacts in Canada

During the public comment period on the draft EIS, a number of comments requested that this EIS address potential impacts to environmental, cultural, and human resources in Canada, not just in the United States (U.S.). DOE has determined that such an analysis is outside the scope of this EIS because Canada has and will continue to apply its own sovereign laws to analyze potential impacts resulting from Canadian activities occurring in Canada, and because projects by Hydro-Québec raised by commenters will occur regardless of whether DOE issues a Presidential permit for the proposed Northern Pass Project international border crossing.

Hydro-Québec[12] is proposing to develop a Québec-New Hampshire interconnection on the Canadian side of the international border. This proposed interconnection project in Québec is an approximately 49.2-mile (79.2 kilometer) long, 320-kV direct-current (DC), overhead electric transmission line running from Hydro-Québec's existing Des Cantons substation in Val-Joli, Québec to the Québec-New Hampshire border. The existing Des Cantons substation is currently connected to the Hydro-Québec transmission system by three 735-kV lines and the existing transformer capacity is sufficient to support a new interconnection. To support interconnection with the U.S. grid for the Northern Pass Project, the Des Cantons substation would be modified, within the existing footprint of the substation facility, to incorporate equipment that converts alternating current to direct current. Approximately 39.6 miles (63.8 kilometers) of the proposed Québec transmission line would be routed within the right-of-way of an existing 450-kV DC line that is part of Hydro-Québec's transmission system, thus pairing the new line with an existing line over about 80 percent of its route. Lattice tower structures ranging from 115–130 feet (35–40 meters) tall would be constructed to accommodate the proposed line in Québec.

Canada has its own well-established environmental impact assessment laws and review procedures at both the federal and provincial level (e.g., the Canadian Environmental Assessment Act (CEAA), the National Energy Board Act (NEBA), and the Québec Environment Quality Act (EQA)). If DOE issues a Presidential Permit for the Northern Pass Project, Canadian approvals still must be obtained for the Québec-New Hampshire interconnection. In order to obtain both the provincial and federal approvals required for the construction and operation of the Québec-New Hampshire interconnection, Hydro-Québec must provide an environmental impact study to the appropriate Canadian provincial and federal authorities. Specifically, Hydro-Québec may not undertake any construction of the proposed Québec-New Hampshire interconnection without following the environmental impact assessment and review procedure and obtaining a certificate of authorization from the provincial Québec government in accordance with Section

[12] Hydro Québec is a public utility and its sole shareholder is the Québec government (Hydro- Québec n.d. [e]).

31.1 of the Québec Environmental Quality Act (EQA).[13] Hydro-Québec filed an environmental impact study with the Government of Québec, through the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) in December 2015 (Hydro-Québec TransÉnergie 2016, MDDELCC n.d.). Pursuant to the EQA, the Québec-New Hampshire project is also subject to a public participation process managed by a neutral and independent organization, the Bureau d' audiences publiques sur l'environnement's (BAPE), that reports to the Minister of the MDDELCC. The BAPE led public participation process includes dissemination of information to the public and a public participation process to ensure that public concerns are taken into consideration in the provincial review of the proposed interconnection in Québec (BAPE n.d.).

In addition to approval from the Government of Québec, Hydro-Québec must also receive approval of the interconnection from the Canadian Federal Government, through the National Energy Board (NEB), which will also consider environmental impacts in its assessment of the Québec-New Hampshire interconnection.[14] Hydro-Québec filed an environmental impact study, along with responses to comments, as part of its permit application with the NEB in accordance with the National Energy Board Act in December, 2016 (Hydro-Québec TransÉnergie 2016).

The provincial and federal governments of Canada are completing independent reviews, consistent with the sovereign laws of Canada, of the potential impacts of the Québec-New Hampshire interconnection. In light of these reviews and procedures, the potential environmental impacts that may occur within another sovereign nation are properly being assessed by the sovereign nation with approval authority for those actions. This approach is consistent with Section 2-3[b] of Executive Order (EO) 12114, Environmental Effects Abroad of Major Federal Actions (January 4, 1979), which does not require federal agencies to evaluate impacts outside the U.S. when the foreign nation is participating with the U.S. or is otherwise involved in the action.

Hydro-Québec was formally created by the Government of Québec in 1944 through the expropriation of private firms, and many parts of the Hydro-Québec system have operated for decades (Hydro-Québec n.d.[a]). As it currently exists and operates, the Hydro-Québec system is developed on 75 rivers and the system includes, but is not limited to, 62 hydroelectric generating stations and 24 thermal generating stations that produce 36,908 MW of installed capacity, as well as 536 substations, 27 large reservoirs, 668 dams, 99 control structures, and a transmission system that is 34,292 km long (Hydro-Québec 2016, Hydro-Québec n.d.[b]). Although much of Hydro-Québec's generation is used in Québec, Hydro-Québec also sells electricity to neighboring provinces and U.S. states, including New York, Ontario, and New Brunswick (Hydro-Québec 2016). The source of electrons sold to neighboring jurisdictions can be from any generating station interconnected to the Hydro-Québec system. Similarly, the sources of power that could be

[13] Environment Quality Act, S.Q. 1978, c 64, s 10, § 31.1 (Can.). Canadian regulations regarding implementation of the Environment Quality Act specifically require that projects involving, "the construction or relocation of an electric power transmission line of 315 kV or more over a distance of more than 2 km and the construction or relocation of a control and transformer station of 315 kV or more" are subject to the environmental impact assessment and review procedure and must be the subject of a certificate of authorization issued by the government of Quebec. Regulation Respecting Environmental Impact Assessment and Review, R.R.Q. 1981, c. Q-2, r. 9, s. 2(k) (Can).

[14] The Government of Canada's National Energy Board regulates energy development and factors in economic, environmental and social considerations into its decision-making (NEB n.d.). The National Energy Board Act has specific provisions regarding the approval of international power lines, stating "No person shall construct or operate a section or part of an international power line except under and in accordance with a permit issued under [provisions of this Act]. Canadian National Energy Board Act (R.S.C., 1985, c. N-7), Section 58.1.

transmitted on the proposed Northern Pass Project are expected to be from the bulk electric Hydro-Québec transmission system.[15]

During the public comment period and public hearings on the draft EIS for the proposed Northern Pass Project, public comments were received regarding the potential impacts of Hydro-Québec constructing new hydroelectric facilities, such as the Romaine Complex. As a large public utility, Hydro-Québec regularly undertakes power generation projects, such as rehabilitating generating units to extend the service life of existing generating stations, as well as electricity transmission line projects such as replacing or upgrading aged substations or transmission lines (Hydro-Québec n.d.[c]). For example, in 2009, Hydro-Québec began constructing the Romaine Complex, a 1,550MW hydroelectric complex that will consist of four hydropower generating stations. Two of the hydropower generating stations, Romaine-1 and Romaine-2 are already commissioned. Construction is still underway on the Romaine-3 and Romaine-4 hydropower generating stations, with operations expected in 2017 and 2020, respectively (Hydro-Québec n.d.[d], Hydro-Québec 2016).

As is the case for the Québec-New Hampshire interconnection, Hydro-Québec must comply with applicable Canadian impact assessment laws and review procedures at both the federal and provincial level in order to proceed with power generation and transmission line projects. In the case of the Romaine Complex[16], for example, Hydro-Québec submitted an environmental impact study to the MDDELCC under section 31.1. of the EQA and to the Canadian Environmental Assessment Agency in accordance with the CEAA in August 2008 (BAPE 2009, Hydro-Québec Production 2008).[17] The Canadian environmental impact study assesses potential impacts to natural, cultural and human resources, including those to Aboriginal communities, as well as providing for mitigation, monitoring, compensation and enhancement measures responding to identified impacts from the construction and operation of the Romaine Complex (Hydro-Québec Production 2008). DOE does not analyze the impacts in Canada of Hydro-Québec power generation and transmission line projects because these impacts are analyzed in accordance with the sovereign laws of Canada and because DOE (nor any other U.S. federal agency) has no authority over development of the Hydro-Québec system. The construction and operation of the Romaine Complex, for example, will occur regardless of whether DOE issues a Presidential permit for the proposed Northern Pass Project international border crossing. Hydro-Québec's hydropower is being developed independently from the Northern Pass transmission line project. For this additional reason, potential environmental impacts in Canada from projects such as the Romaine Complex are not addressed in this EIS.

1.6 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. § 306108) requires federal agencies to take into account the effects of their undertakings that require federal funding, approvals or permits on historic properties and to develop measures to avoid, minimize, or mitigate any adverse effects through consultation. Compliance with Section 106 requires consultation with the state historic preservation officer (SHPO) and other consulting parties (which may include federally-recognized Indian Tribes, representatives of local governments, the applicant, certain individuals and organizations with a demonstrated interest in the proposed undertaking due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties),

[15] In 2012 Hydro-Québec's generation capacity was 35,829 MW, 98 percent of which was hydroelectric power (NESCOE 2013a).

[16] DOE received several scoping and public comments about the potential impacts of this particular hydroelectric facility.

[17] The Environmental Impact Statement Summary for the Romaine Complex (Hydro-Québec Production 2008) includes discussion of impacts from greenhouse gases (5.2.7) and mercury in fish (5.3.1).

and the public (36 CFR § 800.2). DOE is coordinating its compliance with Section 106 of the NHPA with its environmental review. The Section 106 review considers potential adverse effects to archaeological (underground) resources as well as architectural (aboveground) historic properties. The information gathered during the Section 106 process is being used to inform the EIS, as NEPA also requires consideration of potential impacts to historic and cultural resources (e.g., 40 CFR § 1502.16(g)). DOE sought public comment on historic properties through its environmental review to fulfill the agency's public involvement responsibilities under Section 106 (36 CFR §§ 800.6(a)(4), 800.14(b)), and continues to provide updates and information to the public regarding the Section 106 process through DOE's Section 106 Consultation Page for the Project at http://www.northernpasseis.us/consultations/section106/.In considering whether the issuance of a Presidential permit to NPT would be consistent with the public interest, DOE determined that the issuance of a Presidential permit for the proposed Project's international border crossing is an undertaking, as defined in 36 C.F.R. § 800.16(y), requiring compliance with Section 106 (36 CFR § 800.3(a)). DOE initiated Section 106 consultation with the NH SHPO in February 2011 in response to Northern Pass's 2010 Presidential permit application. DOE then suspended its Section 106 consultation following notification from Northern Pass that it would be submitting an amended Presidential permit application. DOE re-engaged the NH SHPO in March 2013 to continue Section 106 consultation on Northern Pass's amended Presidential permit application submission. Acting as lead federal agency for Section 106, DOE determined the area of potential effects (APE) (36 CFR § 800.16(d)) (see **Section 3.1.8.2**) through consultation with the NH SHPO, USFS, and USACE, and identified potential additional consulting parties (36 CFR § 800.2(c)(5)).[18] The Advisory Council on Historic Preservation (ACHP) was invited to participate in DOE's Section 106 consultation in January 2014; ACHP formally joined DOE's Section 106 consultation in February 2015. Additional consulting parties were invited to participate in DOE's Section 106 consultation in January 2014. DOE initiated consultation with the VT SHPO in June 2016 to address the portion of the APE within Vermont. DOE is satisfying its Section 106 obligations through a programmatic agreement (PA) developed pursuant to 36 CFR § 800.14(b) and in consultation with ACHP, NH SHPO, VT SHPO, USFS, and USACE and other consulting parties (see **Appendix K**) to ensure that stipulations developed to identify cultural resources and historic properties, determine adverse effects of the Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on historic properties are implemented. Section 106 consultation is on-going in accordance with the terms of the PA. Information about historic properties identified through the Section 106 process available at the time this EIS was prepared is incorporated into the EIS analysis. For more information about the Section 106 consultation for the Project, see **Section 3.1.8**.

1.7 INTERAGENCY COORDINATION

Interagency coordination is an integral element of the NEPA process and is intended to promote open communication between the DOE, other federal and state agencies with jurisdiction by law or special expertise, and Native American tribes.

1.7.1 COOPERATING AGENCIES

The DOE invited several federal and state agencies to participate in the preparation of this EIS as cooperating agencies because of their special expertise or jurisdiction by law. The cooperating agencies are

[18] In compliance with 36 CFR § 800.2(c)(2)(ii) DOE also determined that that the proposed Project may affect historic properties to which federally-recognized Indian tribes may attach religious and cultural significance. DOE notified seven (7) federally-recognized Indian tribes of the undertaking. DOE invited these federally-recognized Indian tribes to engage in consultation on a government-to-government basis in accordance with Executive Order 13175 – *Consultation and Coordination with Indian Tribal Governments* (November 6, 2000). No federally-recognized Indian tribes have expressed interest to DOE in consulting on the proposed undertaking in response to DOE's invitation.

the USFS, the USACE, the EPA, and the NHOEP. This section describes the roles and responsibilities of each cooperating agency.

1.7.1.1 U.S. Forest Service – White Mountain National Forest

A portion of the Proposed Action would cross NFS lands on the WMNF following an existing transmission route that is under a SUP currently held by PSNH and through easements held by PSNH. The Applicant has applied for its own SUP for the Project to cross the WMNF. This final EIS, prepared by the DOE, is intended to provide the analysis necessary to support a USFS decision on whether to issue a SUP allowing the Proposed Action (or alternative) to cross the WMNF (including whether any amendment to the Forest Plan would be required). The Responsible Official for the USFS decision is the Forest Supervisor of the WMNF.

The USFS has assembled an Inter-Disciplinary Team (ID Team) comprised of a team leader and USFS specialists in appropriate resource areas to ensure the DOE EIS meets USFS needs.

1.7.1.2 U.S. Environmental Protection Agency – Region 1

The EPA is required under Section 309 of the Clean Air Act (CAA) to review and publicly comment on the environmental impacts of major federal actions for which an EIS is prepared. EPA is also responsible for publishing the NOAs of draft and final EISs in the *Federal Register,* which initiate regulatory timeframes for the environmental review process. Additionally, the EPA would consult with USACE for any permits that would be required under Section 404 of the 1977 Clean Water Act (CWA) (33 U.S.C. § 1344).

1.7.1.3 U.S. Army Corps of Engineers – New England District

The USACE is responsible for ensuring compliance with Section 404 of the CWA. CWA Section 404 requires a permit prior to discharging dredged or fill material into jurisdictional waters of the U.S., including wetlands. The USACE may adopt portions of the information and analysis presented in this EIS in its preparation of a separate environmental analysis for compliance with NEPA and its decision-making for the Section 404 permits needed for the Project. The Project would cross areas of USACE jurisdiction such as wetlands, stream crossings, and vernal pools.

1.7.1.4 New Hampshire Office of Energy and Planning

The NHOEP provides information, data, and guidance to assist decision-makers on issues pertaining to development, land protection, energy use, and community planning. As a cooperating agency, NHOEP is participating in the DOE's NEPA process and providing special expertise regarding issues to be addressed in this EIS.

1.7.2 FEDERAL, STATE, AND LOCAL AUTHORIZATIONS AND APPROVALS

Additional federal agencies that could have permitting, review, or other approval responsibilities related to certain aspects of the Project are discussed in the following paragraphs.

To construct and operate the Project, the Applicant would be required to consult with and obtain permits and approvals from several federal, state, and local government agencies. **Table 1-2** lists the permits, approvals, and consultations that would be associated with the Project. The roles of the agencies shown in **Table 1-2** are more fully addressed in various chapters of this EIS, where relevant to particular environmental resources and conditions. The following paragraphs describe the authorizations and approvals potentially required for the Project by federal agencies.

Table 1-2. Potential Permits, Approvals and Consultations Associated with the Project

Agency	Permit/Approval/Consultation
Federal	
DOE	Review applications for Presidential permits for construction, operation, and maintenance of a cross-border facility for the transmission of electrical energy.
USFS	Review applications for SUPs to use NFS lands for private purposes.
EPA	Consult with USACE on CWA Section 404 permit applications. Issue National Pollutant Discharge Elimination System (NPDES) permit for stormwater impacts.
USACE	Issue CWA Section 404 permits.
FERC	Approve negotiated rates as regulated under the Federal Power Act (FPA).
U.S. Fish and Wildlife Service (USFWS)	Ensure compliance with Section 7 of the Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA), and issue permit to traverse the Silvio O. Conte National Fish and Wildlife Refuge.
Federal Aviation Administration (FAA)	Issue hazard determinations for aboveground structures and vegetation in the vicinity of airports.
Federal Highway Administration (FHWA)	Authorize Use and Occupancy Agreements according to NH Department of Transportation (NHDOT) Utility Accommodation Manual.
Advisory Council on Historic Preservation (ACHP)	Participate in Section 106 consultation.
State of New Hampshire	
NH Site Evaluation Committee (SEC)	Review and act upon application to construct an energy facility in order to issue Certificate of Site and Facility.
NH State Historic Preservation Office (SHPO)	Advise and assist DOE in carrying out its section 106 responsibilities.
NHDOT	Issue Excavation Permits, Encroachment Permits, Driveway Permits, Utility Pole Licenses, and Use and Occupancy Agreements according to NHDOT Utility Accommodation Manual.
NH Department of Environmental Services (DES)	Issue National Pollutant Discharge Elimination System (NPDES) permit from EPA for stormwater impacts, Alteration of Terrain permit for disturbance over 100,000 square feet, and Shoreland Water Quality Protection Act permit, if applicable. Ensure compliance with New Hampshire Rivers Management and Protection Program for Designated Rivers.
Municipal	
Municipalities along the Project corridor	Issue permits and consents for use of municipal lands (including roads) for construction and operation of the transmission line.

1.7.2.1 Federal Energy Regulatory Commission

The FERC's Federal Power Act (FPA) authority includes the review of all issuances of securities under FPA Section 204 (16 U.S.C. § 824(c)) and review of all rate filings under FPA Sections 205 and 206 (16 U.S.C. § 824(d), (e)). Under this authority, the FERC regulates the transmission and wholesale sales of electricity in interstate commerce and has jurisdiction over the negotiated rates an electric transmission provider may charge and, specifically, the return on equity a project can realize through their Transmission Services Agreement (TSA). On December 11, 2013, Northern Pass submitted an amended TSA to the FERC, which was accepted on January 11, 2014. While the submittal was accepted, it has not yet been approved. A FERC order approving a TSA will be required in order for the Applicant to charge negotiated rates for transmission rights on the Project.

1.7.2.2 U.S. Fish and Wildlife Service

The Endangered Species Act (ESA) directs all federal agencies to work to conserve threatened and endangered (T&E) species and to use their authorities to further the purposes of the Act (USFWS 2014a). Section 7 of the Act, called “Interagency Cooperation,” is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species or result in the destruction or adverse modification of their critical habitat. (USFWS 2014a). Under Section 7, federal agencies must consult with the USFWS when any action the agency carries out, funds, or authorizes may affect a listed endangered or threatened species. The DOE intends to use the analysis prepared for this EIS to fulfill the requirements under ESA. The DOE and the USFS are consulting with the New England Ecological Services Field Office in the USFWS Region 5.

The USFWS would also ensure appropriate consideration of the Migratory Bird Treaty Act (MBTA). The MBTA and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (January 10, 2001), provide requirements for all federal agencies to incorporate considerations of migratory birds into their decision-making. These considerations include the conservation of migratory birds; the proper evaluation of them in NEPA documents; and avoidance, minimization and mitigation of migratory birds impacts and “take” (as defined in the MBTA) where appropriate.

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 provides further protection for bald eagles and golden eagles (16 U.S.C. §§ 668−668(d)). The BGEPA prohibits the take, possession, or any acts thereof, of any bald or golden eagle, part, nest, or egg (16 U.S.C. § 668).

1.7.2.3 Federal Aviation Administration

The Federal Aviation Administration (FAA) uses obstruction criteria, defined in 14 CFR Part 77 and in Order 8260-3B, U.S. Standard for Terminal Instrument Procedures, to identify human-made or natural objects that create potential obstructions and evaluate them for hazards to navigable airspace. Northern Pass initiated consultation with the FAA in October 2010 and on July 1, 2011, the FAA issued Determination of No Hazard (DNH) letters for 15 of 36 structures, and Does Not Exceed letters for the remaining structures. These determinations became final on August 10, 2011 and included conditions for lighting some of the structures. While these letters were issued prior to Northern Pass’ submittal of the amended Presidential permit application, the structure heights in this area did not change and these determinations are still applicable.

Northern Pass will initiate consultation with FAA if a Presidential permit is granted and after siting is selected to adhere to the FAA’s formal Notifications process in order to ensure that issuance of a DNH letter for final tower designs coincides with the issuance of the Project’s other permits.

1.7.2.4 Federal Highway Administration

For portions of the Project located underground adjacent to interstate highways, the Applicant would be required to comply with direction outlined in the NHDOT Utility Accommodation Manual and other FHWA guidance. Required permits and authorizations would not be acquired through this EIS process, but rather through a separate, subsequent process.

1.7.2.5 National Park Service

According to the National Trails Act (16 U.S.C. § 1244(a)), the Appalachian National Scenic Trail (ANST) is administered by the Secretary of Interior in consultation with the Secretary of Agriculture. As allowed by the Act, the National Park Service (NPS) transferred management of the ANST in New Hampshire to the USFS, WMNF. As a result, the Forest Supervisor for the WMNF has responsibility for managing the ANST in accordance with the National Trails Act. The Act requires the managing agency to consult with the heads of all other affected agencies. The WMNF Forest Plan acknowledges that the ANST is managed as a partnership with the NPS and several non-governmental groups. Consistent with the National Trails Act and Forest Plan, the USFS has consulted with the NPS regarding issues, alternatives, and potential effects related to the ANST for this analysis, and the USFS has incorporated NPS input into the development of this EIS.

1.7.3 NEW HAMPSHIRE STATE AUTHORIZATIONS AND APPROVALS

1.7.3.1 New Hampshire Site Evaluation Committee

In order to construct the Project, Northern Pass will be required to obtain the approval of the State of New Hampshire. The Site Evaluation Committee (SEC) may use the information contained in this EIS and other information from the Applicant's SEC application submission to determine whether to approve the Project. The SEC is an eleven member committee representing state agencies and the public that review and act upon applications to construct energy facilities. This is a non-federal process in which the DOE has no role. Additional state agencies with a review and/or approval responsibility are discussed in **Table 1-2** above and in the text below.

1.7.3.2 New Hampshire Department of Transportation

For portions of the Project located underground adjacent to or beneath state and federal highways, the Applicant would be required to comply with direction outlined in the NHDOT Utility Accommodation Manual. Required permits and authorizations would not be acquired through this EIS process, but rather through a separate, subsequent process.

1.8 ORGANIZATION OF THIS FINAL EIS

This final EIS is organized into nine chapters followed by appendices. The general contents of each chapter are as follows:

Chapter 1 – Purpose of and Need for Action describes the purpose of and need for agency action, project objectives, public participation in the NEPA process, and interagency coordination.

Chapter 2 – Proposed Action and Alternatives contains a description of the Proposed Action and the range of reasonable alternatives.

Chapter 3 – Affected Environment contains a general description of the physical resources and baseline conditions that could be affected by the Project.

Chapter 4 – Environmental Impacts presents an analysis of the potential environmental impacts anticipated to result with the implementation of the alternatives.

Chapter 5 – Cumulative and Other Impacts includes an analysis of the potential cumulative impacts of the Project when considered with other past, present, and reasonably foreseeable future actions in the region.

Chapter 6 – List of Preparers includes the list of individuals who prepared the document.

Chapter 7 – References includes a complete list of references used in the preparation of the document.

Chapter 8 – Glossary contains definitions of terms used in the document.

Chapter 9 – Index contains an alphabetical list of key terms and subjects found within the document.

Appendix A contains maps referenced in this document.

Appendix B contains a detailed list of the issues analyzed in this document.

Appendix C contains information on the proposed Forest Plan Amendment.

Appendix D contains a list of past, present, and reasonably foreseeable future actions considered in the cumulative effects analysis.

Appendix E contains visual simulations from key observation points.

Appendix F contains a Forest Plan consistency analysis.

Appendix G contains documentation on ESA Section 7 consultation.

Appendix H contains a list of Applicant-proposed impact avoidance and minimization measures.

Appendix I provides NEPA disclosure statements for the preparation of the EIS.

Appendix J presents a hybrid alternative to the Proposed Action.

Appendix K contains documentation related to the Section 106 consultation process

Appendix L contains comments received on the draft EIS and responses to those comments.

This final EIS examines the environmental impacts anticipated to result with the implementation of the Proposed Action or other action alternatives described in **Chapter 2**. The following environmental resource areas are being addressed in detail for the Project:

- Visual Resources
- Socioeconomics
- Recreation
- Health and Safety
- Traffic and Transportation
- Land Use
- Noise
- Historic and Cultural Resources
- Environmental Justice
- Air Quality
- Wildlife
- Vegetation
- Water Resources
- Geology and Soils

Where relevant, the environmental laws, regulations, permits, and EOs that might apply to the Project are described in more detail within the appropriate resource area sections.

1.8.1 READER'S GUIDE

This section is provided to assist the reader in readily locating the information and data of greatest interest. In order to understand the information presented in this EIS, DOE encourages the reader to review **Chapter 1** and **Chapter 2** in their entirety before proceeding to read the remainder of the document. **Chapter 1** and **Chapter 2** provide important background information about the analysis and a detailed description of the Project.

For the purposes of understanding the various environmental settings associated with the Project, and to facilitate the analysis in this EIS, the route of each alternative was divided into three geographic sections and one administrative section defined by the WMNF: Northern Section, Central Section, Southern Section, and WMNF Section (see **Section 2.2**). Information provided in both **Chapter 3** and **Chapter 4** is organized by geographic section, with common and Project-wide information provided in a "General" section at the beginning of each of these chapters (**Section 3.1** and **Section 4.1**). Each resource is analyzed in the "General" section as well as in each geographic section.

Depending on the preference of the reader, there are two distinct methods for reviewing this document: 1) by geographic section, and/or 2) by resource topic. The geographic review method allows the reader to understand the full range of potential environmental impacts in a particular location. In contrast, the resource topic review method allows the reader to understand the details of potential impacts to a particular resource across the entire study area.

The **Table of Contents** provides a clear outline of how this document is organized and how the reader can best navigate the analysis to find the information of interest. The maps included in **Appendix A** depict the geographic sections, as well as Project features. Definitions of terms used in this document are provided in **Chapter 8**.

Vertical bars in the margins of the final EIS mark text that has changed since the issuance of the draft EIS or the supplement to the draft EIS, including revisions and new information based in part on comments received on the draft EIS. Deletions are not indicated, nor are administrative changes (such as correcting typographical errors). Text that was included in the supplement to the draft EIS is not marked as a change, as this text is considered part of the draft EIS and the two documents were combined.

This chapter presents a summary of detailed information contained in Technical Resource Reports, which were prepared for each resource area evaluated. These reports were prepared by independent experts at the direction of DOE, and are available for review on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports).

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

2 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and the range of reasonable alternatives developed for analysis. It provides a description of the No Action Alternative, the Proposed Action (as presented in the "Further Amendment to Presidential Permit Application" submitted in August 2015), the alternatives analyzed in detail, and the alternatives considered but eliminated from further detailed analysis. Also in this chapter is a summary comparison of the potential environmental impacts that could result from the Project under each alternative analyzed in detail.

The Project

A transmission line between the Des Cantons Substation in Québec, Canada and the Deerfield Substation in Deerfield, NH, as presented in the Proposed Action and/or action alternatives.

2.1 PROCESS USED TO DEVELOP ALTERNATIVES

NEPA requires that an EIS evaluate the range of reasonable alternatives. The CEQ explains that "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (CEQ 1981a). The issues raised during the scoping process (detailed in **Appendix B**) formed the basis for developing the alternatives considered in this final EIS. The DOE, in coordination with cooperating agencies, developed an initial list of potential alternatives in response to the issues raised during scoping. On May 1, 2014, the DOE published a Scoping Report Alternatives Addendum summarizing the potential alternatives that DOE had identified to-date for analysis in the EIS.

In reviewing the potential alternatives, DOE considered the issues identified during scoping and in comments (**Chapter 1** and **Appendix B**) and evaluated whether each alternative was practical or feasible, met the purpose and need for the Proposed Action, and met the Project objectives (**Sections 1.2, 1.3**, and **1.4**).

Scoping comments expressed concern with visual impacts from an aboveground transmission line and DOE determined that alternatives with increased use of underground infrastructure and burial of project segments should be analyzed in detail. In consultation with independent transmission engineers, DOE determined that the design capacity included in Alternative 2 (1,200 MW) would not be feasible if applied to a project with substantial underground segments. However, in order to assess the range of reasonable alternatives in the EIS, including an evaluation of options that are fully or partially underground, DOE analyzed several alternatives with reduced transmission capacity (1,000 MW) and determined that extensive burial at this capacity would be practical and technically feasible. As a result of alternative development for the draft EIS, the range of alternatives evaluated in the draft EIS included eight that were wholly or partially buried and would have a transmission capacity of 1,000 MW.[19]

In August 2015, subsequent to the publication of the draft EIS, Northern Pass submitted a "Further Amendment to Presidential Permit Application" (Northern Pass 2015) that made changes to the Applicant's proposed Project. Specifically, the August 2015 amendment proposed to bury an additional 52 miles (84 km) of the transmission line in roadway corridors between Bethlehem and Bridgewater, NH; changed the project size from 1,200 MW to 1,090 MW; adjusted the border crossing location by approximately 100 feet (30 m); and other design changes (e.g., change in converter technology and type of cable). This revised proposal was analyzed in the supplement to the draft EIS and is analyzed in this final EIS as Alternative 7 (the Proposed Action). The additional design details developed by the Applicant for Alternative 7 have

[19] Extensive transmission cable burial requires the use of different cable technology that is not capable of transmitting 1,200 MW. The actual capacity of a project using this technology would be determined by several factors that are outside the scope of DOE's analysis. In the draft EIS, DOE assumed that alternatives using this technology would be capable of transmitting up to 1,000 MW, but in the final EIS it is assumed that they would be capable of transmitting up to 1,090 MW, based on new information provided by the Applicant.

been used to update the descriptions of other action alternatives described in this chapter, as appropriate. Refer to **Table 2-1** for transmission capacity specifications and overhead/burial distances by alternative.

The alternatives considered in detail are summarized in **Table 2-1**, and described in detail in **Section 2.3**. A discussion of alternatives eliminated from further detailed analysis, including rationale for elimination, is provided in **Section 2.4**.[20] **Table 2-1** describes each alternative analyzed, including a description of the converter stations and substations, and also provides the length of the transmission line (overhead, underground, and total) and the operational capacity. For a visual description of the alternatives, refer to Maps 5–19 in **Appendix A**.

Table 2-1. Alternatives Considered in Detail

Alternative	Description	Length Overhead miles (km)	Length Underground miles (km)	Total Length miles (km)[a]	Operational Capacity (MW)
1	No Action	N/A	N/A	N/A	0
2	Primarily overhead in existing Public Service of New Hampshire (PSNH) transmission route, convert from HVDC to HVAC at Franklin Converter Station, overhead HVAC to Deerfield Substation	179 (288)	8 (13)	187 (301)	1,200
3	Underground in Alternative 2 alignment, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	187 (301)	187 (301)	1,090
4	Underground in roadway corridors				
4a	Underground in roadway corridors, I-93 through Franconia Notch, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	175 (282)	175 (282)	1,090
4b	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	190 (306)	190 (306)	1,090
4c	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, US Route 3 from North Woodstock to Ashland, NH, convert from HVDC to HVAC at alternate North Road Converter Station, underground HVAC to Deerfield Substation	0	182 (293)	182 (293)	1,090
5	Alternative 2, except underground in roadway corridors in the vicinity of the WMNF				
5a	Alternative 2 except underground in I-93 corridor through Franconia Notch	156 (251)	28 (45)	184 (296)	1,090
5b	Alternative 2 except underground in NH Routes 112 and 116 through WMNF	170 (274)	21 (34)	190 (306)	1,200
5c	Alternative 2 except underground in NH Routes 18, 112 and 116 through Sugar Hill, Franconia, Easton, NH, and WMNF	157 (253)	33 (53)	191 (307)	1,090

[20] Additionally, **Appendix J** contains an abbreviated analysis of a hybrid alternative utilizing a combination of routes to reduce potential impacts to certain resources.

Table 2-1. Alternatives Considered in Detail

Alternative	Description	Length Overhead miles (km)	Length Underground miles (km)	Total Length miles (km)[a]	Operational Capacity (MW)
6	Underground in roadway corridors until Franklin, NH and co-located HVAC between Franklin and Deerfield, NH				
6a	Underground in roadway corridors, I-93 through Franconia Notch, convert from HVDC to HVAC at Franklin Converter Station, co-located overhead HVAC to Deerfield Substation	34 (55)	139 (224)	173 (278)	1,090
6b	Underground in roadway corridors, NH Routes 112 and 116 through WMNF, convert from HVDC to HVAC at Franklin Converter Station, co-located overhead HVAC to Deerfield Substation	34 (55)	154 (248)	188 (303)	1,090
7	Proposed Action – Alternative 2 except underground in NH Routes 18, 112, 116, and US Routes 3 and 302 from Bethlehem to Bridgewater, NH	132 (212)	60 (97)	192 (309)	1,090

[a] Due to rounding, the total length of the Project may vary slightly from the sum of its parts.

2.2 DESCRIPTION OF GEOGRAPHIC ANALYSIS SECTIONS

For the purposes of understanding the various environmental settings associated with the Project, and to facilitate the analysis in this EIS, the analysis of the Project was divided into three geographic sections and one administrative section defined by the WMNF:

- Northern Section
- Central Section
- Southern Section
- WMNF Section

The Northern Section includes portions of the Project within Coös County, NH as well as a small area of Vermont near the U.S./Canada border which includes Canaan, VT. The Central Section includes portions of the Project within Grafton and Belknap counties, NH. The Southern Section includes portions of the Project within Merrimack and Rockingham counties, NH. The WMNF Section is within the Northern and Central Sections and includes portions of the Project within the borders of the WMNF.

The four sections are shown on Maps 1–4 in **Appendix A**.

2.3 ALTERNATIVES CONSIDERED IN DETAIL

As described in this section, detailed engineering has only been prepared by the Applicant for the Proposed Action (Alternative 7). The development of the planning and engineering for Alternative 7 (Proposed Action) reflects details provided in the Applicant's Further Amendment to Presidential Permit Application (August 2015). The revised design details and assumptions provided by the Applicant for Alternative 7 are assumed to apply to the other action alternatives (e.g., construction methods) and have been used to update and refine the descriptions of other action alternatives, as appropriate. DOE developed design details for other action alternatives to a level sufficient for comparable environmental analysis of all alternatives considered in detail. To implement any of the action alternatives, additional site-specific design and engineering would need to be completed by the Applicant and could vary from the initial planning and design presented within the description of alternatives below. DOE would prepare supplemental NEPA documentation as necessary.

Many of the action alternatives are described here in terms of their similarities and differences with Alternative 2. Alternative 2 was used as the basis for comparison because it was the Proposed Action at the time the draft EIS was prepared and published. Even though Alternative 7 is now the Proposed Action (DOE's Preferred Alternative), for continuity and to avoid confusion, some of the alternative descriptions still refer to Alternative 2 as the basis for comparison.

Change in Proposed Action

Alternative 2 was characterized as the Proposed Action in the draft EIS. Alternative 2 is the project as described in Northern Pass' July 2013 amended Presidential permit application. Following the publication of the draft EIS, in August 2015 Northern Pass submitted a further amendment to its Presidential permit application that made changes to the Applicant's proposed project. The Applicant's revised project is analyzed in the supplement to the draft EIS and the final EIS as Alternative 7 – Proposed Action. To avoid confusion, DOE retained the alternative numbering between the draft and final EISs. DOE recommends that readers start by reviewing Alternative 7 – Proposed Action.

2.3.1 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action Alternative, DOE would not issue a Presidential permit and the USFS would not issue a SUP for the Project, the proposed transmission system would not be constructed, and the potential impacts from the Project would not occur. The CEQ and DOE regulations require consideration of the No Action Alternative. **Chapter 3** describes the existing conditions within the study area that are anticipated to continue under the No Action Alternative. The No Action Alternative serves as a baseline against which the potential environmental impacts of the Proposed Action and alternatives are evaluated.

Refer to Map 5 in **Appendix A**.

2.3.2 ALTERNATIVE 2

Alternative 2 includes a proposed HVDC transmission line that, as currently designed, would be capable of transmitting up to 1,200 MW of power in either direction (Canada to the U.S. or U.S. to Canada). The northern HVDC converter station is proposed to be constructed at the Des Cantons Substation in Québec, Canada, and would be connected to an HVDC line that would run southward in Québec for approximately 45 miles (72 km) where it would cross the U.S./Canada border into Pittsburg, NH.

Alternative 2 would be a single circuit ±300 kV HVDC transmission line running approximately 153 miles (246 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new DC-to-AC converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at PSNH's existing Deerfield Substation located in Deerfield, NH, Alternative 2 would consist of 34 miles (55 km) of 345 kV AC electric transmission line. The total length of Alternative 2 would be approximately 187 miles (301 km).

Approximately 8 miles (13 km) of HVDC transmission cable would be constructed underground, underneath public roads in Clarksville and Stewartstown, NH. Approximately 32 miles (51 km) of new overhead HVDC transmission line would be constructed on land owned, leased, or otherwise controlled by Northern Pass in a new transmission route. Approximately 147 miles (237 km) of new overhead HVDC and HVAC transmission lines would be located within the existing PSNH transmission route.

Refer to Map 6 in **Appendix A**.

2.3.2.1 Northern Section

Alternative 2 in the Northern Section would extend from Mile Post (MP) 0 (the U.S./Canada border) to approximately MP 76.[21] The Project within the Northern Section would be entirely HVDC. Following the proposed route from north to south, the Project would begin at the U.S./Canada border crossing in Pittsburg, NH. From the border crossing, the Project would be routed overhead in a new transmission route into Clarksville, NH. At approximately MP 2, in the vicinity of the US Route 3 bridge crossing of the Connecticut River in Pittsburg and Clarksville, NH, the Project would be routed underground for approximately 2,300 feet (701 m). Transition stations would be constructed at each end of this segment to allow the transition from overhead line to underground cable and vice versa. After this segment, the Project would transition back to an overhead transmission line and would continue east through Clarksville, NH in the new transmission route. At approximately MP 5 in Clarksville, NH, the Project would transition underground again and continue for approximately 8 miles (12 km) beneath public roads into Stewartstown, NH. Transition stations would be constructed at each end of this segment. This underground segment would begin on property owned by the Applicant in Clarksville, NH, continue along NH Route 145 and Old County Road into Stewartstown, NH, where it would continue along North Hill Road and Bear Rock Road to property owned by the Applicant on Heath Road where it would transition back to an overhead line. The Project would continue as an overhead line in the new transmission route through the municipalities of Dixville, Millsfield, and Dummer, NH.

At approximately MP 40 in Dummer, NH, the Project would intersect with an existing PSNH transmission route. The Project would continue as an overhead transmission line within the existing PSNH transmission route through the municipalities of Stark, Northumberland, Lancaster, Whitefield, and Dalton, NH, parallel to an existing PSNH AC transmission line(s). Between approximately MP 50–52 in Stark, NH, the Project would be located on the WMNF within a transmission route authorized under existing PSNH easements or SUPs. The Northern Section of the Project is bounded on the south by the Coös/Grafton County boundary at approximately MP 76.

2.3.2.2 Central Section

Alternative 2 in the Central Section would extend approximately from MP 76 to MP 141. Within the Central Section, the Project would be constructed as an overhead HVDC transmission line parallel to an existing PSNH AC transmission line(s) within the existing PSNH transmission route. From MP 76 at the Grafton County boundary in Bethlehem, NH, the Project would continue through the municipalities of Sugar Hill and Easton, NH. At approximately MP 92 in Easton, NH, the Project would enter the WMNF once again, and would traverse the WMNF on lands authorized under existing PSNH easements and SUPs through the towns of Lincoln and Woodstock, NH, until approximately MP 106 where the Project would exit the WMNF. From approximately MP 106, the Project would continue south through the municipalities of Thornton, Campton, Holderness, Ashland, Bridgewater, New Hampton, and Bristol, NH. The Central Section of the Project is bounded on the south by the border between Belknap and Merrimack counties at approximately MP 140.

2.3.2.3 Southern Section

Alternative 2 in the Southern Section would extend approximately from MP 141 to the terminus of the Project at the Deerfield Substation (MP 187). Within the Southern Section, the Project would be constructed as an overhead transmission line within the existing PSNH transmission route. From MP 141 at the Merrimack County boundary in Hill, NH, the Project would continue to approximately MP 153 in Franklin, NH, where a converter station would be constructed to convert the Project from HVDC to HVAC. From the Franklin Converter Station, the Project would continue as an overhead HVAC transmission line through

[21] MPs are used to measure distance along the Project route. MP 0 is located at the U.S./Canada border, and MP reference numbers increase as the Project moves south towards the Project terminus.

the municipalities of Northfield, Canterbury, Concord, Pembroke, Allenstown, and Deerfield, NH. The Project would terminate at the Deerfield Substation in Deerfield, NH at approximately MP 187.

2.3.2.4 White Mountain National Forest Section

Alternative 2 would be located on the WMNF in two locations: approximately MP 50–52 in Stark, NH, and MP 92–106 in Easton, Lincoln, and Woodstock, NH. In total, Alternative 2 would be within the WMNF for approximately 11 miles (18 km). All portions of Alternative 2 on the WMNF would be located in the existing PSNH transmission route. As mentioned above, the crossing from MP 50–52 would be on land authorized through an existing transmission route easement, and the remaining portion within the WMNF (MP 92–106) would be on land authorized under either existing transmission route easements or existing SUPs. The Project would cross the ANST at approximately MP 97 in the existing PSNH transmission route.

Alternative 2 would require Forest Plan Amendments to four standards: 1) Forest-wide Recreation General Standard S-2, 2) Management Area (MA) 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2, 3) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1, and 4) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2. Forest-wide Recreation General Standard S-2 states: "Current development levels in the backcountry will be maintained or lowered where appropriate" (USDA Forest Service 2005a). MA 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2 states: "Management of the AT experience must be compatible with the prescribed recreation experience opportunity class. Lands within this management area should be managed under the semi-primitive non-motorized (SPNM) Recreation Opportunity Spectrum (ROS) class. There are situations where the AT crosses or follows public roads and snowmobile trails, and where developed facilities are present. Current inconsistencies in this ROS Class, such as Appalachian Mountain Club huts, are acceptable but are managed to minimize impacts on the SPNM experience" (USDA Forest Service 2005a). MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1 states: "The AT is a Concern Level 1 Travelway, and middleground and background areas on National Forest lands seen from the AT must be managed for scenery in accordance with Scenic Integrity Objectives identified through the Scenery Management System" (USDA Forest Service 2005a). MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2 states: "All management activities will meet a Scenic Integrity Objective of High or Very High" (USDA Forest Service 2005a). Under Alternative 2, the USFS would amend the Forest Plan to indicate that this Project does not need to meet these management standards.

2.3.2.5 Design and Construction Details

Overhead Transmission Line

Overhead Support Structures

The HVDC and HVAC overhead portions of Alternative 2 would utilize a range of lattice steel, tubular steel monopole, and tubular steel H-Frame structures. Towers would range in height from approximately 50 feet (15 m) to a maximum of approximately 155 feet (47 m). The majority of towers would be between approximately 75 feet and 105 feet (23 m to 32 m) tall. The arms of the structures would support insulator strings, bundled conductors, a dedicated metallic return conductor, and overhead shield wire(s).

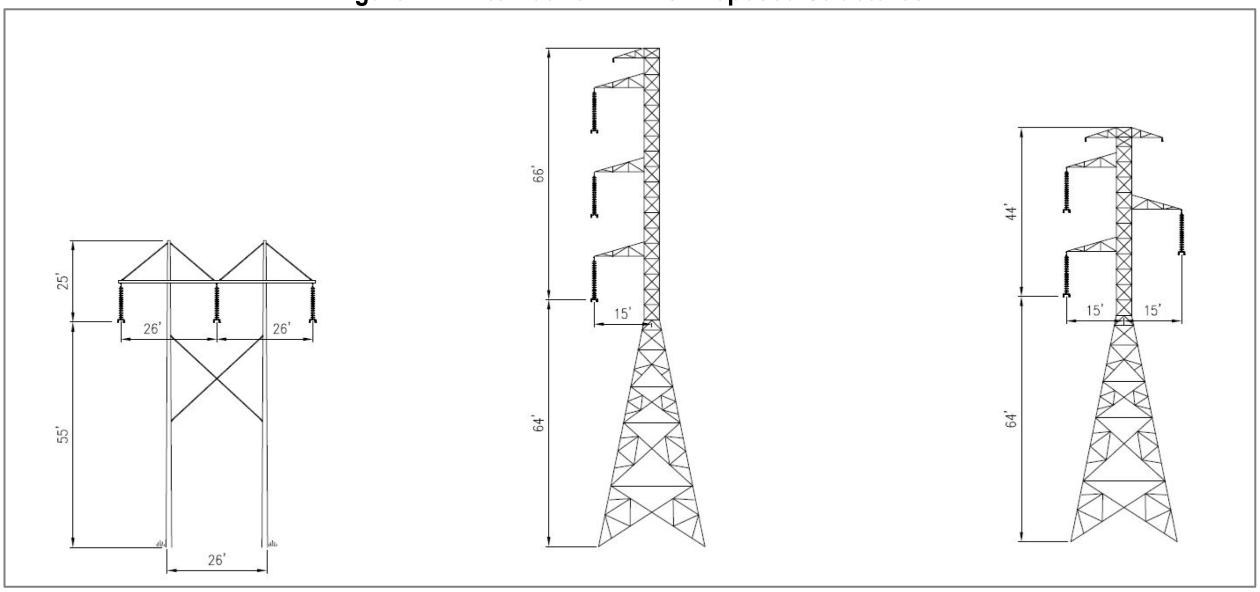
The lattice tower configuration would have an approximate base dimension of 30 feet by 30 feet (9 m by 9 m) and taper to a 6-foot by 5-foot (2 m by 2 m) column halfway up the structure. Lattice structures would be anchored to four concrete foundations (approximately 3 to 5 feet [1 to 2 m] in diameter) at the corners of the base.

Monopole configurations would be approximately 4 to 10 feet (1 to 3 m) in diameter at the base, tapering to approximately 1 to 2 feet (0.3 to 0.6 m) in diameter at the top. These structures would be anchored to concrete foundations approximately 7 to 12 feet (2 to 4 m) in diameter.

The tubular steel H-Frame structures would consist of two smaller vertical poles connected near the top of the structure with a crossarm. The vertical poles in the H-Frame structures would have an approximate base diameter of 2 to 3 feet (0.6 to 1 m), tapering to approximately 1 foot (0.3 m) at the top. The two vertical poles would be separated horizontally by 26 feet (8 m). The crossarm would be approximately 52 feet (16 m) wide. The H-Frame structures would have a combination of direct embed and concrete foundations. Concrete foundations for the H-Frame structures would be approximately 3 to 4 feet (1 to 1 m) in diameter. For direct embed foundations, a portion of the pole would be placed into a hole approximately 3- to 4-foot (1 to 1 m) diameter and backfilled with either native material, crushed rock or a mixture of the two, which would be compressed to provide a rigid support system.

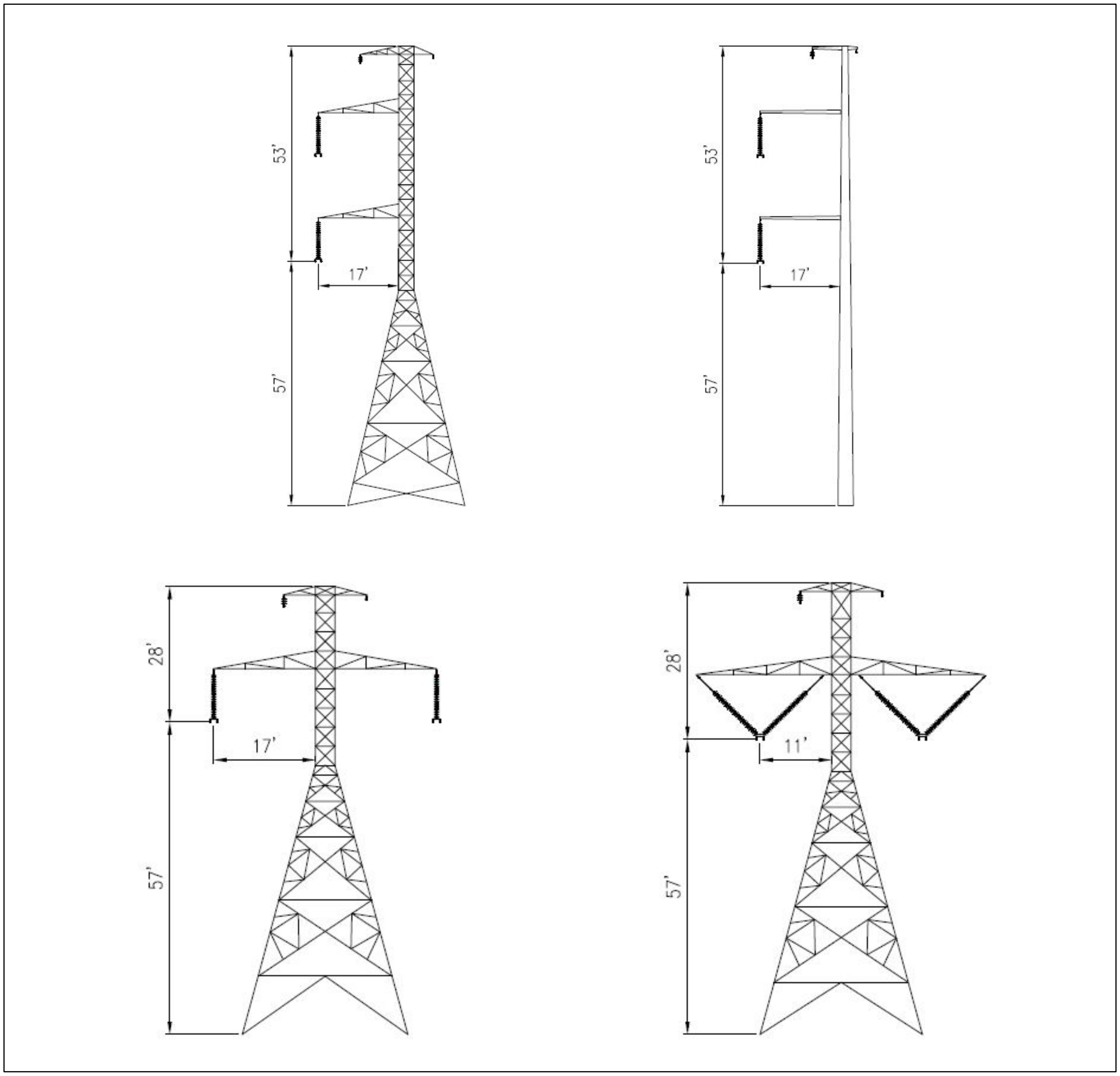
During the detailed design process, other foundation designs could be considered where constructability could be improved in order to reduce environmental impacts or achieve other benefits. **Figure 2-1** and **Figure 2-2** represent typical structure configurations for the overhead portions of Alternative 2.

Figure 2-1. Alternative 2 HVAC Proposed Structures



Source: Northern Pass 2013a
Note: Structures depicted in figure are (from left to right): AC Horizontal I String Tubular Steel H-Frame Tower, AC Vertical I String Lattice Steel Tower, and AC Delta I String Lattice Steel Tower.

Figure 2-2. Alternative 2 HVDC Proposed Structures



Source: Northern Pass 2013a
Note: Structures depicted in figure are (from top left clockwise): HVDC Vertical I String Lattice Steel Tower, HVDC Vertical I String Tubular Steel Tower, HVDC Horizontal I String Lattice Steel Tower, and HVDC V String Lattice Steel Tower.

Structure Spacing

The majority of structures would be spaced approximately 600 to 650 feet (183 to 198 m) apart; maximum spacing would be approximately 1,000 feet (305 m). The distance between structures would depend on the terrain, the height of the structures, and proximity to adjacent structures within the transmission route. Larger spans between structures generally require taller structures.

Line Clearances

For HVDC clearances, the horizontal distance between each energized conductor and the support structure would be 12 to 17 feet (4 to 5 m). Minimum clearance to ground from the conductors would be 30 feet (9 m).

For the 345 kV AC circuit, the horizontal distance between an energized phase and the support structure would be 13 to 15 feet (4 to 5 m). Minimum clearance to ground from the conductors would be 29 feet (9 m).

Construction

In the Northern Section, where there is no preexisting transmission route, a new corridor 120 feet (37 m) wide would be cleared of vegetation. This width would accommodate not only the operation of the transmission line, but also construction, maintenance, and repair activities.

For the Central and Southern Sections, the Project would use an existing transmission route under a written agreement with PSNH.[22] As necessary to accommodate construction activities (e.g., access and laydown areas) along portions of the proposed route, Northern Pass would acquire short-term easements and/or land use agreements. Construction of the overhead portions of the Project (HVDC and HVAC) within the existing PSNH transmission route would require relocating portions of the existing AC transmission lines and additional vegetation clearing.

Additional detail regarding the construction of overhead transmission line infrastructure is provided in **Section 2.3.12.5**.

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct burial of the cable, installation of the cable in a buried duct bank, or the use of trenchless technology. Trenchless technology would be used in areas where crossing of rivers, streams, and culverts is required.

The trenchless technology would include "jack & bore" and horizontal directional drilling (HDD; see **Figure 2-3** and **Figure 2-4**). Alternative 2 would include eight trenchless segments, including the proposed crossing of the Connecticut River in the towns of Pittsburg and Clarksville, NH. The trenchless segments would require installation areas near the beginning and end for equipment and materials storage. Previously disturbed areas would be utilized to the maximum extent possible. A trenchless excavation pit approximately 20 feet wide, 20 feet deep, and 60 feet long (6 m wide, 6 m deep, and 18 m long) would be required paralleling the alignment at the start and end of each trenchless segment.

Underground Transmission Cable Construction Terms

direct burial: refers to burial conventionally trenched from the surface and subsequently backfilled.

buried duct bank: Duct banks are groups of conduits designed to protect and consolidate cabling. Duct banks are buried, allowing cables to be centralized within an underground path.

trenchless technology: is a general reference to various types of horizontal/directional boring or drilling not requiring surface trenching.

jack & bore: a method of trenchless cable installation that involves digging a pit at each end of an underground segment and using a bore machine to dig a tunnel between the pits. The pipe or cable is then pulled through this tunnel.

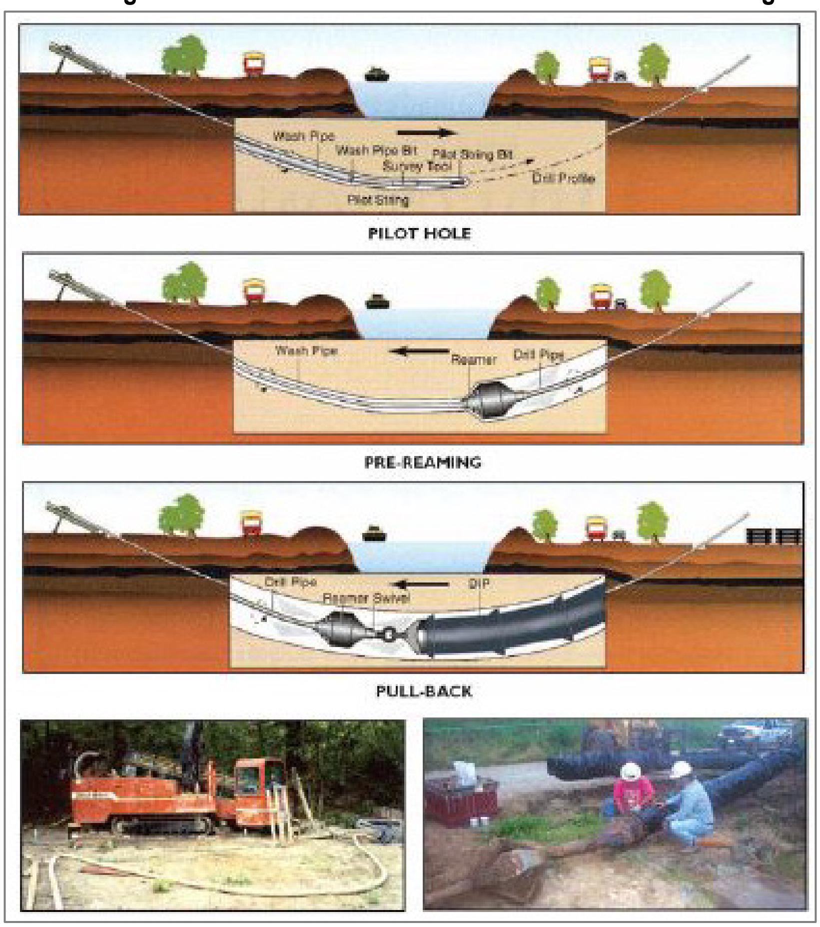
Horizontal directional drilling (HDD): A steerable trenchless method of installing underground pipes, conduits, and cables in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. This method allows pipes and conduits to be installed under water bodies, parks, roadways, and other features with minimal impact on the resource or surrounding area.

[22] Northern Pass Transmission, LLC. and PSNH are wholly owned subsidiaries of Eversource Energy. A written agreement would be entered into and approved by the NH PUC.

Figure 2-3. Underground Cable Installation – Horizontal Directional Drilling Equipment

Source: Northern Pass 2013a

Figure 2-4. Underground Cable Installation – Horizontal Directional Drilling Diagram



Source: Northern Pass 2013a

Portions of Alternative 2 that are proposed to be buried along roadways in a trench (direct burial) are assumed to be buried beneath the road surface or shoulder. Short-term disturbance for the trench and construction activities is assumed to be 10 feet (3 m) wide, with the majority of disturbance limited to the road surface (approximately 30 feet [9 m] wide) and adjacent, previously disturbed areas. One lane of the road would be temporarily closed to traffic to accommodate construction activities. Construction and installation of the underground cables associated with the Project would be scheduled to meet local requirements regarding noise limitations, construction work hours, etc. and to minimize the impact on local traffic, residents, and businesses. Lane closures would be in effect for days to weeks and for short segments of road along the route.

The depth of the direct buried cable would be approximately 4 feet (1 m) below grade; the depth of the duct bank would vary based upon its configuration and a minimum of 3 feet (1 m) of cover would exist over the duct bank; the depth of the HDD sections would be approximately 65 feet (20 m) below grade at its maximum depth; and the depth of the jack & bore would be approximately 10 to 15 feet (3 to 5 m) below grade. Burial depths would be determined based on site-specific factors.

For portions of Alternative 2 that are planned to be buried in a new transmission route (rather than within an existing roadway), it is assumed that an area approximately 40 feet (12 m) wide would be cleared of vegetation to accommodate this construction. Future vegetation growth would need to be limited in this 40-foot-wide corridor to prevent disturbance of the cables by roots. The area of direct, short-term disturbance for installation of the trench would be 10 feet (3 m) wide.

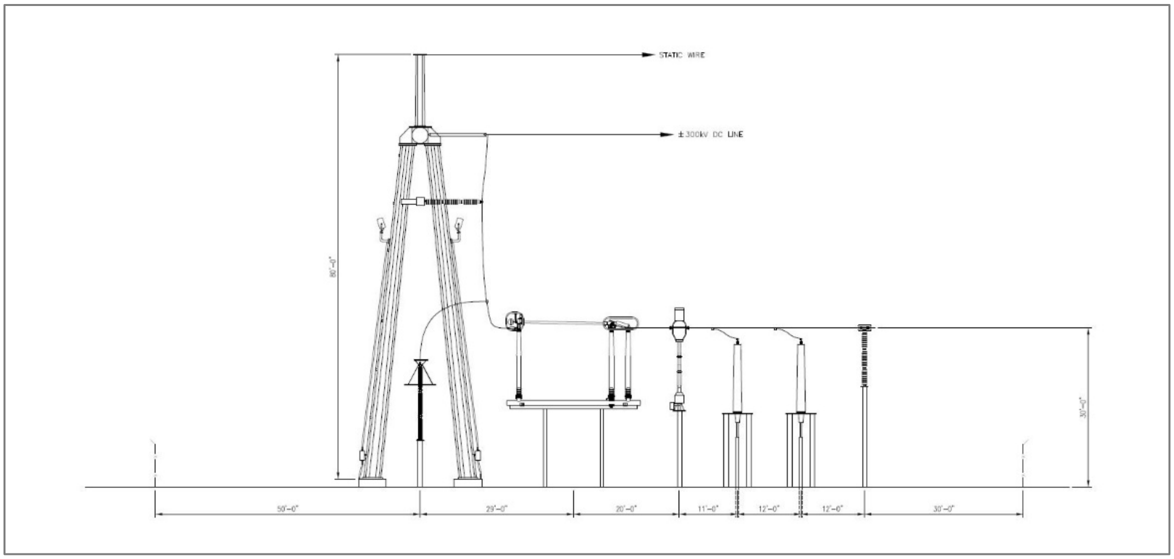
Cable splice pits would be utilized for the installation and joining of underground cable segments. The cable splice pits would be temporary areas within which splicing would be conducted. Upon completion of a necessary splice, the area would be backfilled and no longer present. The splice pit areas would be necessary approximately every 1,800 feet (549 m). The distance between splice pits is dependent on many factors, including: (i) local conditions, including site conditions and local road load and other limits; (ii) the maximum size of cable reels that can be transported to a particular location; and (iii) the bending radius of the cable. Each splice pit would be approximately 8 by 40 feet (2 by 12 m) aligned parallel to the roadway.

Additional detail regarding the construction of underground transmission line infrastructure is provided in **Section 2.3.12.5**.

Transition Stations

Four aboveground transition stations (see **Figure 2-5**) would be required, one at each location where the overhead transmission line would transition from aboveground to underground (or vice versa). One transition station would be located in Pittsburg, NH, two in Clarksville, NH, and one in Stewartstown, NH. Each transition station would resemble a small switching station, would have an area of approximately 160 feet by 180 feet (49 m by 55 m), and would be secured by an enclosed fence. The equipment at each transition station would include a line terminal structure, surge arresters, instrument transformers, disconnect switches, cable terminators, communications equipment, and a small control building. An area of approximately 4 acres (2 ha) would be cleared of vegetation surrounding each transition station. Additional detail regarding transition stations is provided in **Section 2.3.12.5**.

Figure 2-5. Typical Transition Station – Elevation View



Source: Northern Pass 2013a

Franklin Converter Station

The HVDC transmission lines would terminate approximately 153 miles (246 km) south of the U.S./Canada border at a proposed HVDC converter station (see **Figure 2-6**) in Franklin, NH. The Franklin Converter Station would convert the electrical power from HVDC to HVAC. An overhead HVAC line would leave the converter station and run approximately 34 miles (55 km) to the Deerfield Substation, where the Project would terminate.

Figure 2-6. Typical Converter Station Layout

Source: Northern Pass 2013a

The site of the proposed Franklin Converter Station is a 118-acre (48-ha) parcel, which was formerly a campground. The proposed converter station would disturb approximately 16 acres (6 ha) of the site. The converter station would be designed for a continuous HVDC to HVAC transfer rating of 1,200 MW. Additional detail regarding the Franklin Converter Station is provided in **Section 2.3.12.5**.

Deerfield Substation

Alternative 2's interconnection to the New England electrical system would be at the existing PSNH Deerfield Substation located in Deerfield, NH. In order to establish the new line position for the 345 kV line from the converter station, an existing 345 kV line connection in the Deerfield Substation would be relocated. This would require the installation of additional terminal structures, 345 kV switches, breakers, bus work, instrument transformers, and associated protection and control devices inside the existing Deerfield Substation. The Deerfield Substation would be expanded by approximately 9 acres (4 ha) to accommodate additional equipment. Additional detail regarding the Deerfield Substation is provided in **Section 2.3.12.5**.

AC System Support Projects

ISO-NE requires the preparation of a system impacts study for any transmission project (ISO-NE n.d.). The ISO-NE evaluation of Alternative 2 indicates that system reliability upgrades to existing PSNH AC transmission facilities would be required, including upgrades to the Deerfield Substation, Scobie Pond Substation (Londonderry, NH), and existing 345 kV transmission lines between the Deerfield Substation, Scobie Pond Substation, and Lawrence Road Substation (Hudson, NH). The necessary upgrades to these lines could require the replacement of multiple transmission towers to accommodate the new infrastructure.

In particular, the ISO-NE evaluation of Alternative 2 completed in 2014 indicates that the following upgrades to existing AC transmission facilities would be required (ISO-NE 2014f):

- Deerfield Substation – The 345 kV AC line from Buxton, Maine (ME) to Londonderry, NH, presently runs adjacent to the Deerfield Substation with no electrical connection. This line would be split into two segments: Buxton, ME to Deerfield, NH, and Deerfield, NH to Londonderry, NH with a connection at the Deerfield Substation. This would require the construction of an additional 345 kV bay position at the Deerfield Substation, which would be located within the existing substation yard. Additionally, 345 kV capacitor banks to provide voltage support would be constructed in the expanded substation yard.
- Scobie Pond 345 kV Substation – 345 kV capacitor banks to provide voltage support would be constructed in an area abutting the existing substation yard, requiring an expansion of approximately 5 acres (2 ha).
- 345 kV Transmission Line Upgrades – The two existing 345 kV AC transmission lines between the Deerfield Substation and the Scobie Pond Substation would be reconductored to provide additional power flow capabilities. These upgrades may require the alteration or replacement of a limited number of existing transmission support structures. One existing 345 kV AC transmission line from the Scobie Pond Substation to the Lawrence Road Substation would be reconductored to provide additional power flow capabilities.[23]

[23] Since Northern Pass submitted its amended Presidential permit application in July 2013 indicating that reconductoring would be necessary between Scobie Pond and the Lawrence Road Substation, PSNH undertook a thermal upgrade of this line section as part of its normal activities to address system reliability needs—independent of the Northern Pass Project. No further upgrades between Scobie Pond and Lawrence Road are needed to accommodate the Project. Thus, there would be no ground disturbance along this part of the line.

Rebuilding Existing Facilities

Alternative 2 would use an existing, occupied PSNH transmission route to a large extent. In order to accommodate the installation of the Project in the existing PSNH transmission route, the existing PSNH electric lines would need to be relocated within the transmission route in some areas. In these areas, the existing 115 kV transmission lines and 34.5 kV distribution lines would be relocated within the transmission route to create sufficient width for the Project facilities. During construction, the removal of existing lines would be carefully coordinated with the installation of new lines to allow workers to safely perform construction while customers continue to receive electrical power with no loss of service.

The National Electric Safety Code (NESC) governs the separation distance required between electric transmission lines within the same transmission route to assure safe and reliable operation of the lines. The need to relocate existing lines along the proposed route would be determined by the space available within the existing PSNH transmission route. Where line relocation is necessary, Northern Pass would relocate the existing transmission line within the existing transmission route. Line relocation would require some vegetation clearing within the existing PSNH transmission route. Under Alternative 2, approximately 92 miles (148 km) of existing lines would be relocated. Tangent structures along the relocated 115 kV and 34.5 kV lines would be direct-embedded, meaning that part of the structure itself would be buried in the ground to provide structural support.[24] These direct-embedded structures would have ground openings approximately 3 to 5 feet (1 to 2 m) in diameter. Once the structure was placed in the hole, it would be back-filled with either native material, crushed rock, or a mixture of the two, and compressed to provide a rigid support system. Angle and dead-end structures would be self-supported using an anchor bolt foundation designed to take the larger loading of these structures. These foundations would have a diameter of approximately 4 to 8 feet (1 to 2 m).

Additional detail regarding the relocation of existing transmission facilities is provided in **Section 2.3.12.5**.

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of portions of the route where transmission lines presently exist would not change substantially from what currently occurs. Along the entire route, Northern Pass and PSNH would perform maintenance of the existing lines, maintenance of rebuilt lines, and implementation of Alternative 2 in accordance with Eversource Energy's system maintenance policies and procedures. Specific requirements for high voltage transmission lines include periodic patrols of infrastructure and vegetation management (including vegetation maintenance every three years within cleared areas, and side trimming and tree removal every ten years, or as required).

Maintenance activities in the transmission route, depending on the natural features and accessibility of the corridor, would be carried out on foot, by line truck, by track mounted vehicle, by all-terrain vehicle, or by snowmobile, as authorized. All vegetation management and line maintenance activities associated with Alternative 2's new lines and upgrades to existing 345 kV lines would be performed in accordance with the New Hampshire Division of Forest and Lands Best Management Practice for Utility Maintenance (NHDRED 2010a). This Best Management Practice publication provides guidance for identifying appropriate means and methods for vegetation management and maintenance in or within the vicinity of jurisdictional wetlands. Northern Pass would be required to provide a field manual summarizing the Best Management Practice to all contractors performing maintenance work in the transmission route.

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[24] Tangent structures are the type most commonly used on a transmission line and are used on relatively straight portions of the transmission line. Because the conductors are in a relatively straight line passing through them, tangent structures are designed only to handle small line angles (changes in direction) of 0 to 2 degrees. Tangent structures are usually characterized by suspension (vertical) insulators, which support and insulate the conductors and transfer wind and weight loads to the structure.

Maintenance associated with transition stations, the HVDC converter station, the underground cables, and the Deerfield and Scobie Pond Substation upgrades would also be performed in accordance with Eversource Energy's system maintenance policies and procedures.

2.3.3 ALTERNATIVE 3 – UNDERGROUND TRANSMISSION CABLE IN ALTERNATIVE 2 ALIGNMENT

Under Alternative 3, the Project would be constructed as an underground transmission cable for its entire length, and would be located within the same alignment as Alternative 2, with a slight deviation to accommodate an alternate to the proposed converter station to be located at the intersection of the existing PSNH transmission route and North Road in Deerfield, NH (North Road Converter Station). Alternative 3 includes the alternate North Road Converter Station because it is technically difficult to bury extended lengths of HVAC cable, as discussed in **Section 2.4.16**. The North Road Converter Station would be approximately 3 miles (5 km) from the Deerfield Substation, and burial of HVAC cable between these two stations would be feasible. Refer to **Section 2.3.2** for a discussion of the Alternative 2 alignment. The Project under Alternative 3 would be approximately 187 miles (301 km) in length, requiring approximately 184 miles (296 km) of HVDC burial between the U.S./Canada border crossing and the North Road Converter Station, and approximately 3 miles (5 km) of HVAC burial to the Deerfield Substation. Due to the total length of the buried section(s) included under Alternative 3, the transmission system for this alternative would be developed with a capacity of 1,090 MW (see **Section 2.1**). The portion of the Alternative 3 Project corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner. This aspect of Alternative 3 may be challenging to implement. The analysis of Alternative 3, within this final EIS, ensures that the potential environmental impacts from any combination of above and below ground placement of the Project within the Alternative 2 route is bounded by the analysis.

Refer to Map 7 in **Appendix A**.

2.3.3.1 Northern Section

The alignment would be identical to Alternative 2, but the Project would be constructed as an underground transmission cable. The Project would transition from overhead lines to underground cables at a transition station in Pittsburg, NH immediately on the U.S. side of the border with Canada.

2.3.3.2 Central Section

The alignment would be identical to Alternative 2, but the Project would be constructed as an underground transmission cable.

2.3.3.3 Southern Section

The alignment would be identical to Alternative 2, but the Project would be constructed as an underground transmission cable. The Project would convert from HVDC to HVAC at the alternate North Road Converter Station at approximately MP 184.

2.3.3.4 White Mountain National Forest Section

The alignment would be identical to Alternative 2, but the Project would be constructed as an underground transmission cable. Appropriate authorization from the USFS would be required.

Alternative 3 would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.3.5 Design and Construction Details

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct burial of the cable, installation of the cable in a duct bank, or the use of trenchless technology. These techniques are discussed in **Section 2.3.12.5**.

Portions of the Project that would be buried along roadways would be constructed in the manner discussed above for Alternative 2 (see **Section 2.3.12.5**).

For portions of the Project that would be buried in the new transmission route, it is assumed that a corridor approximately 40 feet (12 m) wide would be cleared of vegetation to accommodate construction. Future vegetation growth would need to be limited in this corridor to prevent disturbance of the cables by roots. The area of direct, short-term disturbance for the trench would be 10 feet (3 m) wide.

For portions of the Project that would be buried in the existing PSNH transmission route, it is assumed that a corridor approximately 40 feet (12 m) wide would be temporarily disturbed for construction activities associated with installation of the cable. It is assumed that the trench would be located within the existing cleared portion of the transmission route and no new overstory vegetation removal would be required. Future vegetation growth would need to be limited in this corridor to prevent disturbance of the cables by roots. The area of direct, short-term disturbance for the trench would be 10 feet (3 m) wide.

Alternative 3 would include all trenchless segments in Alternative 2, and would likely include other trenchless segments along the route where appropriate to avoid and minimize impacts to sensitive resources. Because this alternative has not undergone technical design, the exact number and location of trenchless segments has not been determined (see **Section 2.3**).

Underground cable splice pits would be required for the installation of underground cable segments (see **Section 2.3.12.5**).

Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. Refer to **Section 2.3.12.5** for more information on transition stations. The transition station in Alternative 3 would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

North Road Converter Station

Under Alternative 3, the HVDC transmission cables would terminate approximately 184 miles (296 km) south of the U.S./Canada border at an alternate HVDC converter station in Deerfield, NH. This converter station would be located approximately at the intersection of the existing PSNH transmission route and North Road. The North Road Converter Station would convert the electrical power from HVDC to HVAC. An underground HVAC cable would run approximately 3 miles (5 km) to the Deerfield Substation, where the Project would terminate. The North Road Converter Station would occupy a site approximately 33 acres (13 ha) in size. The converter station would be designed for a continuous HVDC to HVAC transfer rating of 1,000 MW, with the potential transfer capability of 1,090 MW. Additional detail regarding converter stations is provided in **Section 2.3.12.5**.

Deerfield Substation

Alternative 3 would include the same upgrades to the Deerfield Substation as described in the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 3 would include the same AC System Support Projects as described in the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Additional Construction Details

Access and Maintenance Roads

Alternative 3 would include the same access and maintenance roads as described in the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Stream and Road Crossings

Trenchless technology would be used as appropriate in situations such as stream and road crossings to avoid or minimize impacts to sensitive resources. Additionally, the cable could be installed underneath bridges or underpasses as warranted.

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for underground portions of the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.4 ALTERNATIVE 4A – UNDERGROUND TRANSMISSION CABLE IN ROADWAY CORRIDORS, I-93 THROUGH FRANCONIA NOTCH

Under Alternative 4a, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a portion of the line totaling just over 2 miles (3 km) from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH that would be buried in a new transmission route. The three variations of Alternative 4 would follow different alignments of roadway corridors, primarily in the vicinity of the WMNF (refer to Map 17 in **Appendix A**). The Project under Alternative 4a would be approximately 175 miles (282 km) in length, requiring the burial of approximately 172 miles (277 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Alternative 4a includes the alternate North Road Converter Station because it is technically difficult to bury extended lengths of HVAC cable, as discussed in **Section 2.4.16**. Due to the total length of the buried section(s) included in Alternative 4a, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 8 in **Appendix A**.

2.3.4.1 Northern Section

The Project would transition from overhead lines to underground cables at a transition station in Pittsburg, NH immediately on the U.S. side of the border with Canada. The Project would follow (from north to south): the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH and US Route 3 south to the border between Coös and Grafton counties at approximately MP 70.

2.3.4.2 Central Section

The Project would follow (from north to south): US Route 3 south from MP 70 to Franconia, NH at approximately MP 78, I-93 south from approximately MP 78 to MP 134 at the border between Belknap and

Merrimack counties. The Project would cross Franconia Notch State Park approximately between MP 80 and MP 86.

2.3.4.3 Southern Section

The Project would follow (from north to south): I-93 south from MP 134 to MP 152 in Concord, NH, I-393/NH Route 9/US Route 202 east to approximately MP 165 in Epsom, NH, NH Route 107 south to the alternate North Road Converter Station in Deerfield, NH, and would continue as underground HVAC beneath Nottingham Road to the destination substation in Deerfield, NH.

2.3.4.4 White Mountain National Forest Section

Alternative 4a would be located in the vicinity of the WMNF from approximately MP 71–80 within the US Route 3 and I-93 corridors. Additionally, I-93 crosses the WMNF near MP 91. In total, the Project under Alternative 4a would be located on the WMNF for approximately 10 miles (16 km). Appropriate authorization from the USFS would be required. The Project would cross beneath the ANST at approximately MP 85 buried in an existing roadway corridor (I-93) in Franconia Notch State Park (the ANST in this location is managed by the Franconia Notch State Park).

Alternative 4a would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.4.5 Design and Construction Details

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct burial of the cable, installation of the cable in a duct bank, or the use of trenchless technology. These techniques are discussed above in **Section 2.3.12.5**.

Portions of the route that would be buried along state or local roadways in a trench are assumed to be buried primarily beneath the road surface, with the majority of disturbance limited to the road surface (approximately 30 feet [9 m] wide) and adjacent, previously disturbed areas. For portions buried along I-93, installation of the cable underneath the pavement or in the median is prohibited in NHDOT's Utility Accommodation Manual, thus the cable could either be buried on the east side of the northbound lane or the west side of the southbound lane (NHDOT 2010a). Short-term disturbance associated with installation of underground cable in roadways is discussed in **Section 2.3.12.5**.

Short-term disturbance associated with the burial of underground cable in areas of new transmission route is discussed in **Section 2.3.3.5**.

Cable splice pits would be required for the installation of underground cable segments (see **Section 2.3.12.5**).

Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. Refer to **Section 2.3.12.5** for more information on transition stations. The transition station in Alternative 4a would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

North Road Converter Station

The North Road Converter Station included in Alternative 4a would be identical to that described in Alternative 3 (see **Section 2.3.3.5**). Additional detail regarding converter stations is provided in **Section 2.3.12.5**.

Deerfield Substation

Alternative 4a would include the same upgrades to the Deerfield Substation as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 4a would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Additional Construction Details

Access and Maintenance Roads

A total of approximately 1 mile (1.6 km) of new roads, and improvements to existing roads, would be required to reach the transmission route for construction of the Project (exclusively the portion between the U.S./Canada border and US Route 3 in Clarksville, NH). Refer to **Section 2.3.12.5** for more information.

Stream and Road Crossings

Assumptions for construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for underground portions of the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.5 ALTERNATIVE 4B – UNDERGROUND TRANSMISSION CABLE IN ROADWAY CORRIDORS, NH ROUTES 112 AND 116 THROUGH WMNF

Under Alternative 4b, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a small portion from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH. Alternative 4b would follow the same alignment as Alternative 4a except for the portion in the vicinity of WMNF where it would follow NH Routes 112 and 116 (refer to Map 17 in **Appendix A**). The Project under Alternative 4b would be approximately 190 miles (306 km) in length, requiring the burial of approximately 187 miles (301 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Alternative 4b includes the alternate North Road Converter Station because it is technically difficult to bury extended lengths of HVAC cable, as discussed in **Section 2.4.16**. Due to the total length of the buried section(s) included in Alternative 4b, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 9 in **Appendix A**.

2.3.5.1 Northern Section

The alignment would be identical to Alternative 4a (see **Section 2.3.4.1**).

2.3.5.2 Central Section

The Project would follow (from north to south): US Route 3 south from MP 70 to Franconia, NH at approximately MP 78, I-93 north to the junction of I-93 and NH Route 116 at approximately MP 83, NH Route 116 south to the junction with NH Route 112 at approximately MP 94, NH Route 112 east to the junction with I-93 in Woodstock, NH at approximately MP 105, I-93 south to approximately MP 149 at the border between Grafton and Merrimack counties.

2.3.5.3 Southern Section

The alignment would be identical to Alternative 4a (see **Section 2.3.4.3**).

2.3.5.4 White Mountain National Forest Section

Alternative 4b would be located in the vicinity of the WMNF from approximately MP 71–79 and 90–106 within US Route 3, I-93, and NH Routes 112 and 116. In total, the Project under Alternative 4b would be located on the WMNF for approximately 19 miles (31 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 98 in an existing roadway corridor (NH Route 112).

Alternative 4b would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.5.5 Design and Construction Details

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct burial of the cable, installation of the cable in a duct bank, or the use of trenchless technology. These techniques are discussed in **Section 2.3.12.5**.

Installation assumptions are identical to those described above for Alternative 4a (see **Section 2.3.4.5**).

Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. Refer to **Section 2.3.12.5** for more information on transition stations. The transition station in Alternative 4b would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

North Road Converter Station

The North Road Converter Station included in Alternative 4b would be identical to that described for Alternative 3 (see **Section 2.3.3.5**). Additional detail regarding converter stations is provided in **Section 2.3.12.5**.

Deerfield Substation

Alternative 4b would include the same upgrades to the Deerfield Substation as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 4b would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Additional Construction Details

Access and Maintenance Roads

Access and maintenance roads under Alternative 4b would be identical to those discussed for Alternative 4a (see **Section 2.3.4.5**).

Stream and Road Crossings

Assumptions for construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for underground portions of the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.6 ALTERNATIVE 4C – UNDERGROUND TRANSMISSION CABLE IN ROADWAY CORRIDORS, NH ROUTES 112 AND 116 THROUGH WMNF AND US ROUTE 3 FROM NORTH WOODSTOCK TO ASHLAND

Under Alternative 4c, the Project would be constructed as an underground transmission cable for its entire length, and would be buried under or adjacent to existing roadways (state and federal) except for a small portion from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH. Alternative 4c would differ from Alternatives 4a and 4b between Whitefield and Franconia, NH, and North Woodstock and Ashland, NH where it would follow NH Routes 142, 112, and 116 and US Route 3 (refer to Map 17 in **Appendix A**). The Project under Alternative 4c would be approximately 182 miles (293 km) in length, requiring the burial of approximately 179 miles (288 km) of HVDC transmission cable from the U.S./Canada border crossing to the North Road Converter Station and 3 miles (5 km) of HVAC transmission cable to the Deerfield Substation. Alternative 4c includes the alternate North Road Converter Station because it is technically difficult to bury extended lengths of HVAC cable, as discussed in **Section 2.4.16**. Due to the total length of the buried section(s) included in Alternative 4c, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 10 in **Appendix A**.

2.3.6.1 Northern Section

The Project would transition from overhead lines to underground cables at a transition station in Pittsburg, NH, immediately on the U.S. side of the border with Canada. The Project would follow (from north to south): the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH, US Route 3 south to Whitefield, NH, at approximately MP 60, NH Route 116 south to the junction with NH Route 142 at approximately MP 63, and NH Route 142 south to the border between Coös and Grafton counties at approximately MP 64.

2.3.6.2 Central Section

The Project would follow (from north to south): NH Route 142 south from MP 64 to the junction with NH Route 18 in Franconia, NH, at approximately MP 74, NH Route 18 north in Franconia, NH to the junction with NH Route 116 at approximately MP 74, NH Route 116 south to the junction with NH Route 112 at approximately MP 85, NH Route 112 east to North Woodstock, NH and the junction with US Route 3 at approximately MP 96, US Route 3 south to the junction with I-93 in Ashland, NH (exit 24) at approximately MP 122, I-93 south to the border between Belknap and Merrimack counties at approximately MP 141.

2.3.6.3 Southern Section

The alignment would be identical to Alternative 4a (see **Section 2.3.4.3**).

2.3.6.4 White Mountain National Forest Section

Alternative 4c would be located in the vicinity of the WMNF from approximately MP 82–95 within NH Routes 112 and 116, and US Route 3. In total, the Project under Alternative 4c would be located on the WMNF for approximately 10 miles (16 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 90 in an existing roadway corridor (NH Route 112).

Alternative 4c would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.6.5 Design and Construction Details

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct bury of the cable, installation of the cable in a duct bank or the use of trenchless technology. These techniques are discussed above in **Section 2.3.12.5**.

Installation assumptions are identical to those described above for Alternative 4a (see **Section 2.3.4.5**).

Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. Refer to **Section 2.3.12.5** for more information on transition stations. The transition station in Alternative 4c would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

North Road Converter Station

The North Road Converter Station included in Alternative 4c would be identical to that described for Alternative 3 (see **Section 2.3.3.5**). Additional detail regarding converter stations is provided in **Section 2.3.12.5**.

Deerfield Substation

Alternative 4c would include the same upgrades to the Deerfield Substation as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 4c would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Additional Construction Details

Access and Maintenance Roads

Access and maintenance roads under Alternative 4c would be identical to those discussed for Alternative 4a (see **Section 2.3.4.5**).

Stream and Road Crossings

Assumptions for construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for underground portions of the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.7 ALTERNATIVE 5A – ALTERNATIVE 2 EXCEPT UNDERGROUND TRANSMISSION CABLE ALONG I-93 THROUGH FRANCONIA NOTCH

Under Alternative 5a, the Project would be identical to Alternative 2 for the entire length of the transmission line except for the portion in the vicinity of the WMNF where the Project would be buried for an additional 20 miles (32 km) in the I-93 corridor. The three variations of Alternative 5 include sections of underground cable in different roadway corridors in the vicinity of the WMNF (refer to Map 18 in **Appendix A**). Construction within the WMNF would be similar to what is described above in Alternative 4a, and the rest of the Project would be identical to Alternative 2. The Project under Alternative 5a would be approximately 184 miles (296 km) in length, with approximately 28 miles (45 km) of HVDC burial. Due to the total length of the buried section(s) included under Alternative 5a, the Project would use technology capable of delivering 1,090 MW of power to Deerfield.

Refer to Map 11 in **Appendix A**.

2.3.7.1 Northern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.1**).

2.3.7.2 Central Section

The Project would follow (from north to south): the Alternative 2 alignment (as an overhead HVDC line) until the intersection with I-93 at approximately MP 83 where the line would transition from overhead to underground at a transition station. The Project would continue as an underground HVDC cable following I-93 south to the intersection with the Alternative 2 alignment at approximately MP 103 where the line would transition from underground to overhead at a transition station. The Project would continue as an overhead HVDC line in the Alternative 2 alignment to the border between Grafton and Merrimack counties at approximately MP 139.

2.3.7.3 Southern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.3**).

2.3.7.4 White Mountain National Forest Section

Alternative 5a would be located aboveground on the WMNF from approximately MP 50–52 as an overhead HVDC transmission line within land authorized under an existing transmission easement. Additionally, the Project would be located in the vicinity of the WMNF underground in the I-93 roadway corridor between MP 89–91 and near MP 102 and 104. In total, the Project under Alternative 5a would be located on the WMNF for approximately 3 miles (5 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 96 underground in an existing roadway corridor in Franconia Notch State Park (the ANST in this location is managed by the Franconia Notch State Park).

Alternative 5a would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.7.5 Design and Construction Details

Overhead Transmission Line

Under Alternative 5a, construction of overhead portions of the Project would be similar to the Proposed Action – Alternative 7. Refer to **Section 2.3.12.5** for more information.

Underground Transmission Cable

Alternative 5a would include three sections of underground cable: two in the Northern Section which are identical to Alternative 2, and one in the Central Section in the I-93 corridor. Refer to **Section 2.3.2.5** for information regarding the Alternative 2 burial portions. Refer to **Section 2.3.4.5** for information regarding burial in I-93. Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Stations

Transition stations would be constructed at each end of an underground segment to allow transition to the overhead line. There would be six transition stations in Alternative 5a. Refer to **Section 2.3.12.5** for more information on transition stations. The transition stations in Alternative 5a would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

Franklin Converter Station

The Franklin Converter Station included in Alternative 5a would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**). The Franklin Converter Station in Alternative 5a would disturb approximately 16 acres (6 ha) and would permanently occupy approximately 8 acres (3.2 ha) of the site. It would be smaller than that described in **Section 2.3.2.5** for Alternative 2 due to the reduced power capacity and different cable technology.

Deerfield Substation

The Deerfield Substation included in Alternative 5a would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 5a would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Rebuilding Existing Facilities

Alternative 5a would require the relocation of fewer existing transmission structures than Alternative 2. No existing lines would need to be relocated in areas where the Project would be buried in roadway corridors. Under Alternative 5a, approximately 78 miles (126 km) of existing lines would be relocated. Existing transmission structures within the WMNF would not need to be relocated. Refer to **Section 2.3.12.5** for more information about rebuilding existing facilities.

Additional Construction Details

Laydown Areas

Laydown areas would be required for overhead portions of the Project under Alternative 5a. Refer to **Section 2.3.12.5** for more information.

Access and Maintenance Roads

Access and maintenance roads under Alternative 5a would be required for overhead portions of the Project (see **Section 2.3.12.5** for more information). For portions of the Project that would be buried in roadway corridors, no access or maintenance roads would be required.

Stream and Road Crossings

Assumptions for underground cable construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.8 ALTERNATIVE 5B – ALTERNATIVE 2 EXCEPT UNDERGROUND TRANSMISSION ALONG NH ROUTES 112 AND 116 THROUGH WMNF

Under Alternative 5b, the Project would be identical to Alternative 2 for the entire length of the route except for the portion in the vicinity of the WMNF where an additional 13 miles (21 km) of the Project would be buried in the NH Route 116 and 112 corridors (refer to Map 18 in **Appendix A**). Construction within the WMNF Section would be similar to what is described above in Alternative 4b, and the rest of the Project would be identical to Alternative 2. The Project under Alternative 5b would be approximately 190 miles (306 km) in length, with approximately 21 miles (34 km) of underground HVDC transmission cable. The Project under Alternative 5b would be designed using technology capable of delivering 1,200 MW of power to Deerfield, NH.[25]

Refer to Map 12 in **Appendix A**.

2.3.8.1 Northern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.1**).

2.3.8.2 Central Section

The Project would follow (from north to south): the Alternative 2 alignment (as an overhead HVDC line) until the intersection with NH Route 116 at approximately MP 94 where the line would transition from overhead to underground at a transition station. The Project would continue as an underground HVDC cable following NH Route 116 south to the intersection with NH Route 112 at approximately MP 97 and NH Route 112 east to the intersection with the Alternative 2 alignment at approximately MP 107, where the line would transition from underground to overhead at a transition station. The Project would continue as an overhead HVDC line in the Alternative 2 alignment to the border between Grafton and Merrimack counties at approximately MP 145.

2.3.8.3 Southern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.3**).

2.3.8.4 White Mountain National Forest Section

Alternative 5b would be located on the WMNF from approximately MP 50–52 aboveground on land authorized under an existing transmission easement, MP 92–107 buried within the NH Route 112 and 116 corridors, MP 107–108 aboveground on land authorized under an SUP, and near MP 110 on land authorized

[25] The Applicant has indicated that buried segments of less than 24 miles (39 km) at a capacity of 1,200 MW would be economically reasonable.

under an existing transmission easement. In total, the Project under Alternative 5b would be located on the WMNF for approximately 13 miles (21 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 102 underground in an existing roadway corridor (NH Route 112).

Alternative 5b would require a Forest Plan Amendment to one standard: MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1, which states: "The AT is a Concern Level 1 Travelway, and middleground and background areas on National Forest lands seen from the AT must be managed for scenery in accordance with Scenic Integrity Objectives identified through the Scenery Management System" (USDA Forest Service 2005a). Under the Alternative 5b, the USFS would amend the Forest Plan to indicate that this Project does not need to meet this management standard.

2.3.8.5 Design and Construction Details

Overhead Transmission Line

Under Alternative 5b, sections of overhead transmission line would be identical to Alternative 2 (see **Section 2.3.2.5**). Additional detail regarding the construction of overhead infrastructure is provided in **Section 2.3.12.5**.

Underground Transmission Cable

Alternative 5b would include three sections of underground cable: two in the Northern Section which are identical to Alternative 2, and one in the Central Section along NH Routes 112 and 116. Refer to **Section 2.3.2.5** for information regarding the Alternative 2 burial portions. Refer to **Section 2.3.4.5** for information regarding burial in state highways. Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Stations

Transition stations would be constructed at each end of an underground segment to allow transition to the overhead line. There would be six transition stations in Alternative 5b. The size of the transition stations in Alternative 5b would be similar to those in Alternative 2 (see **Section 2.3.2.5**). Refer to **Section 2.3.12.5** for more information on transition stations.

Franklin Converter Station

The Franklin Converter Station included in Alternative 5b would be identical to that described for Alternative 2 (see **Section 2.3.2.5**). Additional detail regarding the Franklin Converter Station is provided in **Section 2.3.12.5**.

Deerfield Substation

The Deerfield Substation included in Alternative 5b would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 5b would include the same AC System Support Projects as described for Alternative 2 (see **Section 2.3.2.5**).

Rebuilding Existing Facilities

Alternative 5b would require the relocation of fewer existing structures than Alternative 2. No existing lines would need to be relocated in areas where the Project would be buried in roadway corridors. Under Alternative 5b, approximately 82 miles (132 km) of existing lines would be relocated. Refer to **Section 2.3.12.5** for more information about rebuilding existing facilities.

Additional Construction Details

Laydown Areas

Laydown areas would be required for overhead portions of the Project under Alternative 5b. Refer to **Section 2.3.12.5** for more information.

Access and Maintenance Roads

Access and maintenance roads under Alternative 5b would be required for overhead portions of the Project (see **Section 2.3.12.5** for more information). For portions of the Project that would be buried in existing roadway corridors, no access or maintenance roads would be required.

Stream and Road Crossings

Assumptions for underground cable construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.9 ALTERNATIVE 5C – ALTERNATIVE 2 EXCEPT UNDERGROUND TRANSMISSION CABLE ALONG NH ROUTES 18, 112 AND 116 THROUGH SUGAR HILL, FRANCONIA, EASTON AND WMNF

Under Alternative 5c, the Project would be identical to Alternative 2 for the entire length of the route except for the portion from Sugar Hill, NH to North Woodstock, NH where an additional 25 miles (40 km) of the Project would be buried in the NH Route 18, 112, and 116 corridors (refer to Map 18 in **Appendix A**). Alternative 5c is identical to Alternative 5b except that it includes an additional portion of underground transmission cable through Sugar Hill, Franconia, and Easton, NH, and rejoins the existing PSNH transmission route at a different location in North Woodstock, NH. Construction within this WMNF Section would be similar to what is described above in Alternative 4b, and the rest of the Project would be identical to Alternative 2. The Project under Alternative 5c would be approximately 191 miles (307 km) in length, with approximately 33 miles (53 km) of underground HVDC cable. Due to the total length of the buried section(s) included under Alternative 5c, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 13 in **Appendix A**.

2.3.9.1 Northern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.1**).

2.3.9.2 Central Section

The Project would follow (from north to south): the Alternative 2 alignment (as an overhead HVDC line) until the intersection with NH Route 18 in Sugar Hill, NH at approximately MP 83 where the line would transition from overhead to underground at a transition station. The Project would continue as an underground HVDC cable following NH Route 18 south to the intersection with NH Route 116 in Franconia, NH at approximately MP 86, NH Route 116 south to the intersection with NH Route 112 at approximately MP 97, NH Route 112 east to the intersection with US Route 3 in North Woodstock, NH at approximately MP 108, and US Route 3 south to the intersection with the Alternative 2 alignment at approximately MP 109 where the line would transition from underground to overhead at a transition station.

The Project would continue as an overhead HVDC line following the Alternative 2 alignment to the Grafton/Merrimack county boundary at approximately MP 145.

2.3.9.3 Southern Section

The alignment would be identical to Alternative 2 (see **Section 2.3.2.3**).

2.3.9.4 White Mountain National Forest Section

Alternative 5c would be located on the WMNF from approximately MP 50–52 aboveground on land authorized under an existing transmission easement and in the vicinity of the WMNF between MP 93–109, buried within the NH Route 112, NH Route 116, and US Route 3 corridors. In total, the Project under Alternative 5c would be located on the WMNF for approximately 11 miles (18 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 102 underground in an existing roadway corridor (NH Route 112).

Alternative 5c would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.9.5 Design and Construction Details

Overhead Transmission Line

Under Alternative 5c, construction of overhead portions of the Project would be similar to the Proposed Action – Alternative 7. Refer to **Section 2.3.12.5** for more information.

Underground Transmission Cable

Alternative 5c would include three sections of underground cable: two in the Northern Section which are identical to Alternative 2, and one in the Central Section along NH Routes 18, 112, and 116. Refer to **Section 2.3.2.5** for information regarding Alternative 2 burial portions. Refer to **Section 2.3.4.5** for information regarding burial along the state highways. Additional detail regarding the construction of underground transmission cable is provided in **Section 2.3.12.5**.

Transition Stations

Transition stations would be constructed at each end of an underground segment to allow transition to the overhead line. There would be six transition stations in Alternative 5c. Refer to **Section 2.3.12.5** for more information on transition stations. The transition stations in Alternative 5c would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

Franklin Converter Station

The Franklin Converter Station included in Alternative 5c would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**). The Franklin Converter Station in Alternative 5c would disturb approximately 16 acres (6 ha) and would permanently occupy approximately 8 acres (3.2 ha) of the site. It would be smaller than that described in **Section 2.3.2.5** for Alternative 2 due to the reduced power capacity and different cable technology.

Deerfield Substation

The Deerfield Substation included in Alternative 5c would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 5c would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Rebuilding Existing Facilities

Alternative 5c would require the relocation of fewer structures than Alternative 2. No existing lines would need to be relocated in areas where the Project would be buried in roadway corridors. Under Alternative 5c, approximately 79 miles (127 km) of existing lines would be relocated. Refer to **Section 2.3.12.5** for more information about rebuilding existing facilities.

Additional Construction Details

Laydown Areas

Laydown areas would be required for overhead portions of the Project under Alternative 5c. Refer to **Section 2.3.12.5** for more information.

Access and Maintenance Roads

Access and maintenance roads under Alternative 5c would be required for overhead portions of the Project (see **Section 2.3.12.5** for more information). For portions of the Project that would be buried in roadway corridors, no access or maintenance roads would be required.

Stream and Road Crossings

Assumptions for underground cable construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.10 ALTERNATIVE 6A – UNDERGROUND TRANSMISSION CABLE IN ROADWAY CORRIDORS AND CO-LOCATE OVERHEAD HVAC WITH EXISTING TRANSMISSION LINE ON THE SAME SET OF NEW TOWERS, I-93 THROUGH FRANCONIA NOTCH

Under Alternative 6a, the HVDC transmission cable would be buried under or adjacent to existing roadways for approximately 139 miles (224 km) between the U.S./Canada border crossing and the proposed Franklin Converter Station. For approximately 34 miles (55 km) from the Franklin Converter Station to the destination substation in Deerfield, NH, the Project would be constructed as an overhead HVAC transmission line along the Alternative 2 alignment, but would be co-located with the existing PSNH AC lines on a new single set of towers. Alternatives 6a and 6b differ only in the route of the transmission cable through the WMNF (similar to Alternatives 4a and 4b) (refer to Map 17 in **Appendix A**). The Project under Alternative 6a would be approximately 173 miles (278 km) in length, with approximately 139 miles (224 km) of underground HVDC cable. Due to the total length of the buried section included under Alternative 6a, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 14 in **Appendix A**.

2.3.10.1 Northern Section

The alignment would be identical to Alternative 4a (see **Section 2.3.4.1**).

2.3.10.2 Central Section

The alignment would be identical to Alternative 4a until exit 22 of I-93 at approximately MP 130. From MP 130, the Project would follow (from north to south): NH Route 127 (New Hampton Road) south to the border between Grafton and Merrimack counties at approximately MP 132.

2.3.10.3 Southern Section

The Project would follow (from north to south): NH Route 127 (New Hampton Road) south from MP 132 to the intersection with US Route 3 in Franklin, NH at approximately MP 135, US Route 3 to the proposed Franklin Converter Station at approximately MP 139. From the Franklin Converter Station, the Project would continue as co-located, overhead HVAC in the Alternative 2 alignment to the Deerfield Substation.

2.3.10.4 White Mountain National Forest Section

The alignment would be identical to Alternative 4a (see **Section 2.3.4.4**).

Alternative 6a would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.10.5 Design and Construction Details

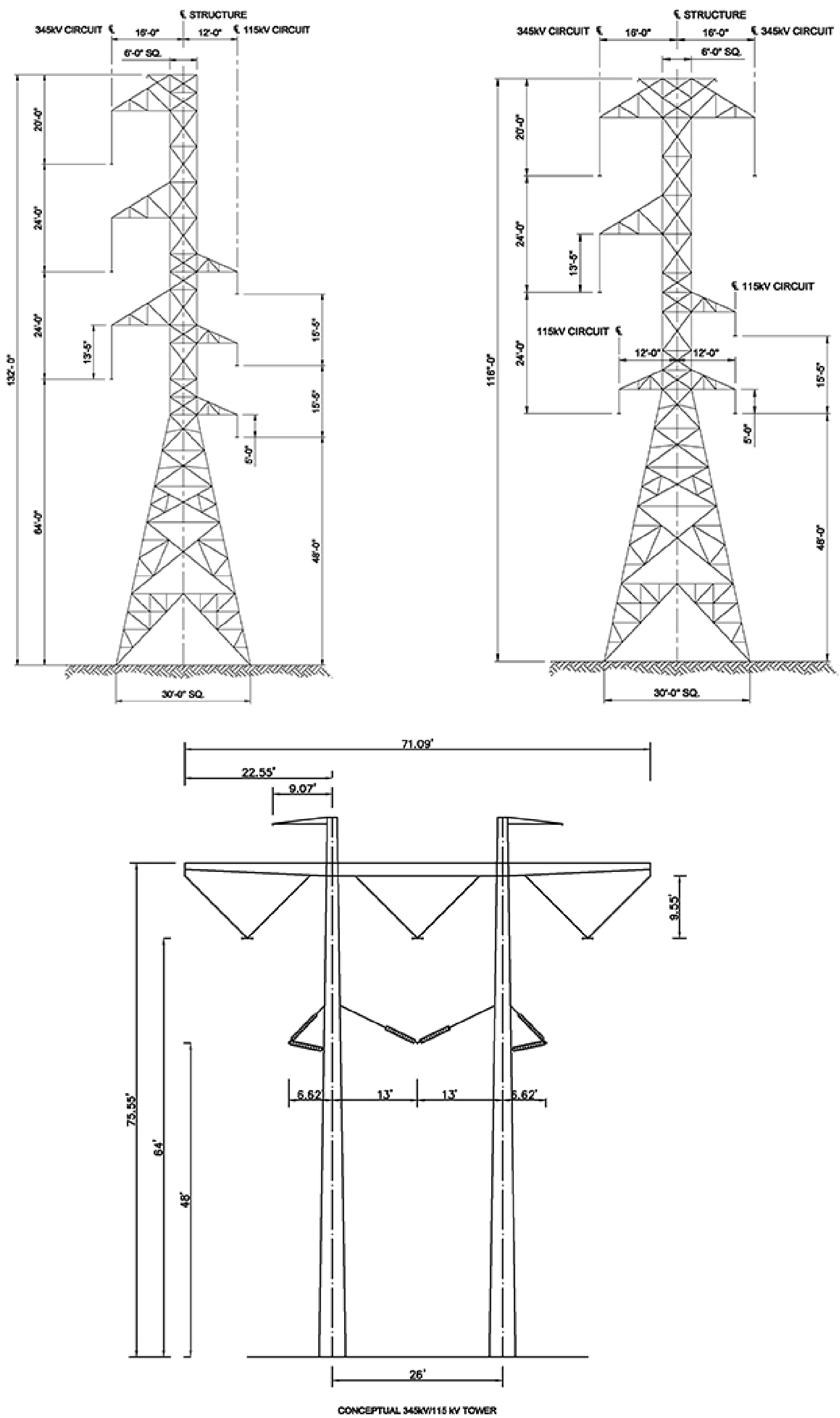
Overhead Transmission Line

Overhead Support Structures

A single set of new towers between the Franklin Converter Station and Deerfield Substation would accommodate both the existing PSNH 115 kV AC line as well as the new 345 kV AC line. While this alternative has not undergone technical design, it is assumed that the structures supporting the co-located lines would generally resemble the structures in Alternative 2, and would be of a comparable height. The height of co-located H-frame structures were assumed to be 80 feet (24 m), vertical lattice structures were assumed to be 132 feet (40 m), and delta lattice structures were assumed to be 116 feet (35 m) (see **Figure 2-7**).

For the purposes of this analysis, these new structures were assumed to be located on the centerline of the transmission route and spaced at the same interval as the structures in Alternative 2 (see **Section 2.3.2.5**). Height restrictions for structures near the Concord Airport (approximately MP 155) would be considered when the engineering design details are finalized.

Figure 2-7. Conceptual Structure Designs for Co-Located HVAC Lines



Source: Teshmont Consultants, LP.

Note: Structures depicted in figure are (from top left clockwise): HVAC I String Vertical Configuration Tower, HVAC I String Delta Configuration Tower, HVAC H Frame V String Tower.

Construction

The use of co-located lines would reduce the need for additional overstory vegetation clearing in the transmission route due to the ability to reduce the overall width necessary to accommodate both lines. For the purposes of this analysis, it was assumed that an area 40 feet (12 m) on each side of the centerline of the Project would need to be cleared of vegetation. During construction, portions of the existing AC line(s) present in the PSNH transmission route would need to be taken out of service for some length of time.

Additional detail regarding the construction of overhead infrastructure is provided in **Section 2.3.12.5**.

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct burial of the cable, installation of the cable in a duct bank, or the use of trenchless technology. These techniques are discussed above in **Section 2.3.12.5**.

Installation assumptions are identical to those described above under Alternative 4a (see **Section 2.3.4.5**).

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. The Project would transition to overhead at the proposed Franklin Converter Station. Refer to **Section 2.3.12.5** for more information on transition stations. The transition stations in Alternative 6a would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

Franklin Converter Station

The Franklin Converter Station included in Alternative 6a would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**). The Franklin Converter Station in Alternative 6a would disturb approximately 16 acres (6 ha) and would permanently occupy approximately 8 acres (3.2 ha) of the site. It would be smaller than that described in **Section 2.3.2.5** for Alternative 2 due to the reduced power capacity and different cable technology.

Deerfield Substation

The Deerfield Substation included in Alternative 6a would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 6a would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Rebuilding Existing Facilities

The towers currently supporting the existing AC transmission line between the Franklin Converter Station and the Deerfield Substation would be removed, and the existing transmission line would be supported along with the Project by a single set of new towers. In areas of the existing PSNH transmission route where multiple lines currently exist, portions of these lines may require relocation to accommodate the Project under this alternative. Refer to **Section 2.3.12.5** for more information about rebuilding existing facilities.

Additional Construction Details

Laydown Areas

Laydown areas would be required for overhead portions of the Project under Alternative 6a. Refer to **Section 2.3.12.5** for more information.

Access and Maintenance Roads

A total of approximately 1 mile (1.6 km) of new roads, and improvements to existing roads, would be required to reach the transmission route for construction of the Project (exclusively the portion between the U.S./Canada border and US Route 3 in Clarksville, NH). For construction of the overhead portion of the Project, new access and maintenance roads would be constructed within the existing transmission route (see **Section 2.3.12.5** for more information).

Stream and Road Crossings

Assumptions for underground cable construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.11 ALTERNATIVE 6B – UNDERGROUND TRANSMISSION CABLE IN ROADWAY CORRIDORS AND CO-LOCATE OVERHEAD HVAC WITH EXISTING TRANSMISSION LINE ON THE SAME SET OF NEW TOWERS, NH ROUTES 112 AND 116 THROUGH WMNF

Under Alternative 6b, the HVDC transmission cable would be buried under or adjacent to existing roadways for approximately 154 miles (248 km) between the U.S./Canada border crossing and the proposed Franklin Converter Station. For approximately 34 miles (55 km) from Franklin, NH to the destination substation in Deerfield, NH, the Project would be constructed as overhead HVAC transmission line along the Alternative 2 alignment, co-located with the existing PSNH AC lines on a new set of towers. Alternatives 6a and 6b differ only in the route of the transmission cable through the WMNF (similar to Alternatives 4a and 4b) (refer to Map 17 in **Appendix A**). The Project under Alternative 6b would be approximately 188 miles (303 km) in length. Due to the total length of the buried section included under Alternative 6b, the Project would use technology capable of delivering 1,090 MW of power to Deerfield, NH.

Refer to Map 15 in **Appendix A**.

2.3.11.1 Northern Section

The alignment would be identical to Alternative 4b (see **Section 2.3.5.1**).

2.3.11.2 Central Section

The alignment would be identical to Alternative 4b until exit 22 of I-93 at approximately MP 144. From MP 144, the Project would follow (from north to south): NH Route 127 (New Hampton Road) south to the border between Belknap and Merrimack counties at approximately MP 147.

2.3.11.3 Southern Section

The alignment would be identical to Alternative 6a (see **Section 2.3.10.3**).

2.3.11.4 White Mountain National Forest Section

The alignment would be identical to Alternative 4b (see **Section 2.3.5.4**).

Alternative 6b would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.11.5 Design and Construction Details

Overhead Transmission Line

Overhead Support Structures

Under Alternative 6b, overhead support structures would be identical to Alternative 6a (see **Section 2.3.10.5**).

Construction

Under Alternative 6b, construction assumptions would be identical to Alternative 6a (see **Section 2.3.10.5**).

Underground Transmission Cable

Underground cables would be installed using a combination of construction techniques including direct bury of the cable, installation of the cable in a duct bank, or the use of trenchless technology. These techniques are discussed above in **Section 2.3.12.5**.

Installation assumptions are identical to those described above for Alternative 4a (see **Section 2.3.4.5**).

Transition Station

One transition station would be required in Pittsburg, NH, immediately on the U.S. side of the border with Canada, to transition from aboveground to underground. The Project would transition to overhead at the proposed Franklin Converter Station. Refer to **Section 2.3.12.5** for more information on transition stations. The transition stations in Alternative 6b would be approximately 75 feet by 130 feet (23 m by 40 m)—smaller than Alternative 2—due to the reduced power capacity and different cable technology.

Franklin Converter Station

The Franklin Converter Station included in Alternative 6b would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**). The Franklin Converter Station in Alternative 6a would disturb approximately 16 acres (6 ha) and would permanently occupy approximately 8 acres (3.2 ha) of the site. It would be smaller than that described in **Section 2.3.2.5** for Alternative 2 due to the reduced power capacity and different cable technology.

Deerfield Substation

The Deerfield Substation included in Alternative 6b would be identical to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

AC System Support Projects

Alternative 6b would include the same AC System Support Projects as described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

Rebuilding Existing Facilities

Modifications to existing facilities under Alternative 6b would be identical to those described for Alternative 6a (see **Section 2.3.10.5**).

Additional Construction Details

Laydown Areas

Laydown areas would be required for overhead portions of the Project under Alternative 6b. Refer to **Section 2.3.12.5** for more information.

Access and Maintenance Roads

A total of approximately 1 mile (1.6 km) of new roads and improvements to existing roads would be required to reach the transmission route for construction of the Project (exclusively the portion between the U.S./Canada border and US Route 3 in Clarksville, NH). For construction of the overhead portion of the Project, new access and maintenance roads would be constructed within the existing transmission route (see **Section 2.3.12.5** for more information).

Stream and Road Crossings

Assumptions for underground cable construction methods at stream and road crossings would be identical to those discussed for Alternative 3 (see **Section 2.3.3.5**).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of the Project would be similar to that described for the Proposed Action – Alternative 7 (see **Section 2.3.12.5**).

2.3.12 ALTERNATIVE 7 – PROPOSED ACTION

Change in Proposed Action

Alternative 2 was characterized as the Proposed Action in the draft EIS. Alternative 2 is the project as described in Northern Pass' July 2013 amended Presidential permit application. Following the publication of the draft EIS, in August 2015 Northern Pass submitted a further amendment to its Presidential permit application that made changes to the Applicant's proposed project. The Applicant's revised project is analyzed in the supplement to the draft EIS and the final EIS as Alternative 7 – Proposed Action. To avoid confusion, DOE retained the alternative numbering between the draft and final EISs. DOE recommends that readers start by reviewing Alternative 7 – Proposed Action.

DOE's Proposed Action and Agency Preferred Alternative is to issue a Presidential permit for the Project. Northern Pass, as the Applicant for the Presidential permit and SUP, would develop the Proposed Action as a transmission line to deliver electric power from Québec to southern New Hampshire. DOE does not have siting or alignment authority for projects proposed in applications for Presidential permits.

As described in the August 2015 "Further Amendment to Presidential Permit Application," Northern Pass would develop the Project under Alternative 7 as a transmission line to deliver electric power from Québec to southern New Hampshire (Northern Pass 2015). Alternative 7 includes a proposed HVDC transmission line that, as currently designed, would be capable of transmitting up to 1,090 MW of power in either direction (Canada to the U.S. and U.S. to Canada). The northern HVDC converter station is proposed to be constructed at the Des Cantons Substation in Québec, Canada, and would be connected to an HVDC line that would run southward in Québec for approximately 45 miles (72 km) where it would cross the U.S./Canada border into Pittsburg, NH.

The Project would consist of a single circuit ±320 kV HVDC transmission line running approximately 158 miles (254 km) from the U.S. border crossing with Canada in Pittsburg, NH, to a new DC-to-AC converter station to be constructed in Franklin, NH. From Franklin, NH, to the Project terminus at PSNH's existing Deerfield Substation located in Deerfield, NH, the Project would consist of 34 miles (55 km) of 345 kV AC electric transmission line.

The Project would be similar to Alternative 2 but would include approximately 52 additional miles (84 km) of underground cable between Bethlehem, NH and Bridgewater, NH. This section of underground cable would be similar to that included in Alternatives 4c and 5c. Map 19 in **Appendix A** illustrates the differences between Alternatives 4c, 5c, and 7.

The Project under Alternative 7 would be approximately 192 miles (309 km) in length, with approximately 60 miles (97 km) of underground HVDC cable. Refer to Map 16 in **Appendix A**.

2.3.12.1 Northern Section

Alternative 7 in the Northern Section would extend from MP 0 (the U.S./Canada border) to approximately MP 76. The Project within the Northern Section would be entirely HVDC. Following the proposed route from north to south, the Project would begin at the U.S./Canada border crossing in Pittsburg, NH. As the result of siting needs on the Canadian side of the border, the border crossing in Alternative 7 was relocated approximately 100 feet (30 m) from the location in Alternative 2 (Northern Pass 2015). From the border crossing, the Project would be routed overhead in a new transmission route into Clarksville, NH. At approximately MP 2, in the vicinity of the US Route 3 bridge crossing of the Connecticut River in Pittsburg and Clarksville, NH, the Project would be routed underground for approximately 2,300 feet (701 m). Transition stations would be constructed at each end of this segment to allow the transition from overhead line to underground cable and vice versa. After this segment, the Project would transition back to an overhead transmission line and would continue east through Clarksville, NH, in the new transmission corridor. At approximately MP 5 in Clarksville, NH, the Project would transition underground again and continue for approximately 8 miles (12 km) beneath public roads into Stewartstown, NH. Transition stations would be constructed at each end of this segment. This underground segment would begin on property owned by the Applicant in Clarksville, NH, continue along NH Route 145 and Old County Road into Stewartstown, NH where it would continue along North Hill Road and Bear Rock Road to property owned by the Applicant on Heath Road where it would transition back to an overhead line. The Project would continue as an overhead line in the new transmission corridor through the municipalities of Dixville, Millsfield, and Dummer, NH.

At approximately MP 40 in Dummer, NH, the Project would intersect with an existing PSNH transmission route. The Project would continue as an overhead transmission line within the existing PSNH transmission corridor through the municipalities of Stark, Northumberland, Lancaster, Whitefield, and Dalton, NH, parallel to an existing PSNH AC transmission line(s). Between approximately MP 50–52 in Stark, NH, the Project would be located on the WMNF within a transmission route authorized under existing PSNH easements. The Northern Section of the Project is bounded on the south by the Coös/Grafton County boundary at approximately MP 76.

This alignment would be identical to Alternative 2, with the exception of the minor modification in border crossing location (see **Section 2.3.2.1**).

2.3.12.2 Central Section

Alternative 7 in the Central Section would extend approximately from MP 76 to MP 146. The Project would follow (from north to south): the Alternative 2 alignment (as an overhead HVDC line in the existing PSNH transmission corridor) until the intersection with Route 302 in Bethlehem at approximately MP 81 where the line would transition from overhead to underground at a transition station. The Project would continue as an underground HVDC cable following US Route 302 south to the to the intersection with NH Route 18 in Bethlehem at approximately MP 82, along NH Route 18 to the intersection with NH Route 116 in Franconia at approximately MP 86, along NH Route 116 to the intersection with NH Route 112 at approximately MP 97, along NH Route 112 to the intersection with US Route 3 in North Woodstock at approximately MP 108, and along US Route 3 to the intersection with the Alternative 2 alignment in Bridgewater at approximately MP 133 where the line would transition from underground to overhead at a transition station. The Project would continue as an overhead HVDC line in the Alternative 2 alignment through the municipalities of Bristol and New Hampton, NH to the border between Belknap and Merrimack counties at approximately MP 146.

2.3.12.3 Southern Section

Alternative 7 in the Southern Section would extend approximately from MP 146 to the terminus of the Project at the Deerfield Substation (MP 192). Within the Southern Section, the Project would be constructed as an overhead transmission line within the existing PSNH transmission corridor. From MP 146 at the Merrimack County boundary in Hill, NH, the Project would continue to approximately MP 158 in Franklin, NH, where a converter station would be constructed to convert the Project from HVDC to HVAC. From the Franklin Converter Station, the Project would continue as an overhead HVAC transmission line through the municipalities of Northfield, Canterbury, Concord, Pembroke, Allenstown, and Deerfield, NH. The Project would terminate at the Deerfield Substation in Deerfield, NH, at approximately MP 192.

This alignment would be identical to Alternative 2 (see **Section 2.3.2.1**).

2.3.12.4 White Mountain National Forest Section

Alternative 7 would be located on the WMNF between approximately MP 50–52 in Stark, NH, as an overhead HVDC transmission line within land authorized under an existing transmission easement. Additionally, the Project would traverse the WMNF between approximately MP 94–109 underground within the Route 116, Route 112, and US Route 3 roadway corridors. In total, the Project under Alternative 7 would be located on the WMNF for approximately 11 miles (18 km). Appropriate authorization from the USFS would be required. The Project would cross the ANST at approximately MP 102 underground in an existing roadway corridor (Route 116).

Alternative 7 would be consistent with the WMNF Forest Plan and does not require a Forest Plan Amendment (see **Appendix F**).

2.3.12.5 Design and Construction Details

Overhead Transmission Line

Overhead Support Structures

The HVDC and HVAC overhead portions of Alternative 7 would utilize a range of lattice steel, tubular steel monopole, and tubular steel H-Frame structures. Towers would range in height from approximately 48 feet (15 m) to a maximum of approximately 160 feet (49 m). The majority of towers would be between approximately 70 feet and 105 feet (21 m to 32 m) tall. The arms of the structures would support insulator strings, bundled conductors, a dedicated metallic return conductor, and overhead shield wire(s).

The lattice tower configuration would have an approximate base dimension of 30 feet by 30 feet (9 m by 9 m) and taper to a 6-foot by 5-foot (2 m by 2 m) column halfway up the structure. Lattice structures would be anchored to four concrete foundations (approximately 3 to 5 feet [1 to 2 m] in diameter) at the corners of the base. This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

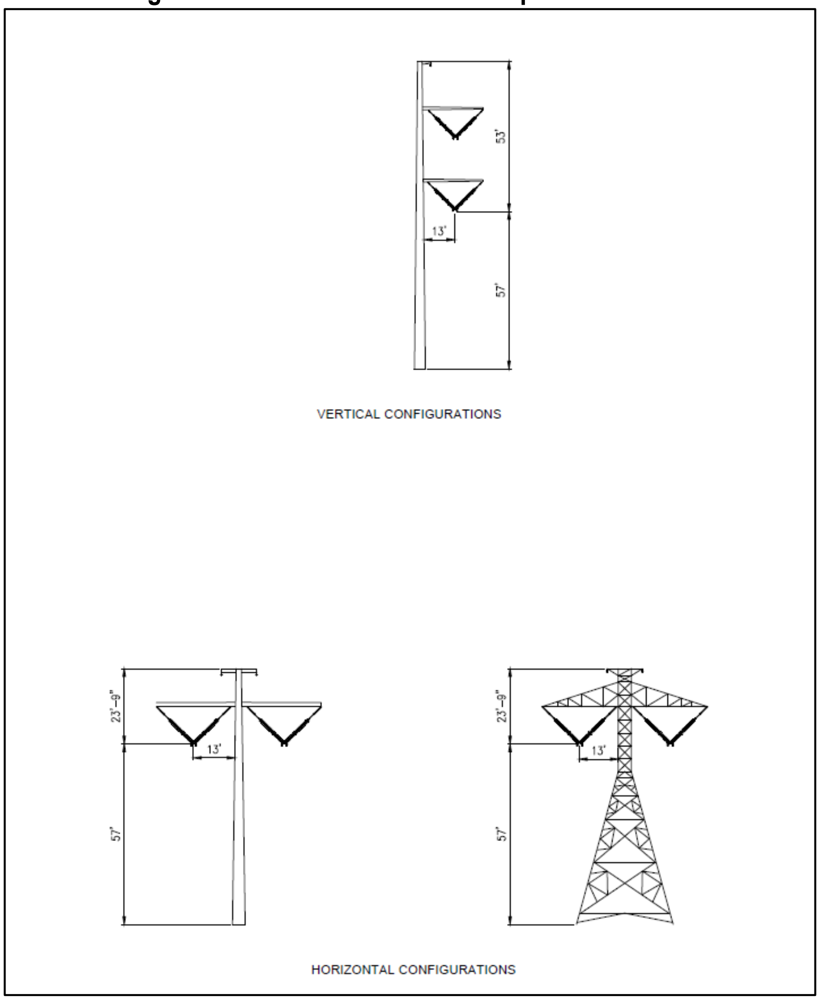
Monopole configurations would be approximately 4 to 10 feet (1 to 3 m) in diameter at the base, tapering to approximately 1 to 2 feet (0.3 to 0.6 m) in diameter at the top. These structures would be anchored to concrete foundations approximately 7 to 12 feet (2 to 4 m) in diameter. This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

The tubular steel H-Frame structures would consist of two smaller vertical poles connected near the top of the structure with a crossarm. The vertical poles in the H-Frame structures would have an approximate base diameter of 2 to 3 feet (0.6 to 1 m), tapering to approximately 1 foot (0.3 m) at the top. The two vertical poles would be separated horizontally by 26 feet (8 m). The crossarm would be approximately 52 feet (16 m) wide. The H-Frame structures would have a combination of direct embed and concrete foundations. Concrete foundations for the H-Frame structures would be approximately 3 to 4 feet (1 to 1 m) in diameter. For direct embed foundations, a portion of the pole would be placed into a hole approximately 3- to 4-foot (1 to 1 m) diameter and backfilled with either native material, crushed rock or a mixture of the two, which would be compressed to provide a rigid support system. This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

During the detailed design process, other foundation designs could be considered where constructability could be improved in order to reduce environmental impacts or achieve other benefits.

Alternative 7 would use the same typical structure configurations for the HVAC portion as Alternative 2, see **Figure 2-1**. However, for the overhead portion of the HVDC line in Alternative 7, Northern Pass proposes to use lattice steel and tubular steel monopole structures, see **Figure 2-8**.

Figure 2-8. Alternative 7 HVDC Proposed Structures



Source: Northern Pass 2015

Structure Spacing

The majority of structures would be spaced approximately 600 to 650 feet (183 to 198 m) apart; maximum spacing would be approximately 1,000 feet (305 m). The distance between structures would depend on the terrain, the height of the structures, and proximity to adjacent structures within the transmission route. Larger spans between structures generally require taller structures. This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

Line Clearances

For HVDC clearances, the horizontal distance between each energized conductor and the support structure would be 12 feet (4 m). Minimum clearance to ground from the conductors would be 30 feet (9 m). Spacing between HVDC energized conductors would be 28 feet (9 m) for V-String insulator configurations on horizontal structures. Spacing between HVDC energized conductors would be 26 feet (8 m) for vertical structures.

For the 345 kV AC circuit, the horizontal distance between an energized phase and the support structure would be 13 to 15 feet (4 to 5 m). Minimum clearance to ground from the conductors would be 29 feet (9 m). This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

Construction

For the Central and Southern Sections, overhead portions of the Project would use an existing transmission route under a written agreement with PSNH.[26] As necessary to accommodate construction activities (e.g., access and laydown areas) along portions of the proposed route, Northern Pass would acquire short-term easements and/or land use agreements.

The overhead transmission lines would be constructed in a progression of activities typically proceeding as follows:

- Development of a compliance plan;
- Establishment of marshaling yard and laydown area locations;
- Removal of vegetation and mowing in advance of construction;
- Installation of soil erosion and sedimentation controls;
- Construction of access improvements, as needed;
- Construction of work pads and pulling sites:
- Removal and disposal of existing transmission line components;
- Installation of foundations and structures;
- Installation of conductor and shield wire; and
- Restoration of the Project corridor.

Compliance Plan

The Applicant would prepare a plan describing erosion control measures, identifying sensitive resources and mitigation measures required, and determining measures contractors would use to ensure compliance with all requirements imposed by any permitting and regulatory authorities.

Laydown Areas

The Applicant would establish areas for material and equipment storage, work force parking, and field offices. These yards would be in previously-disturbed areas; be located away from residential areas; be of sufficient size to accommodate necessary vehicles and equipment; have a means to restrict access; not require tree clearing or extensive grading; not require any disturbance to wetlands or water bodies; and be located on land under the control of Northern Pass or their contractors, by lease agreement or otherwise. Sites typically chosen include parking lots, gravel pits and industrial sites.

[26] Northern Pass Transmission, LLC. and PSNH are wholly owned subsidiaries of Eversource Energy. A written agreement would be entered into and approved by the NH PUC.

Vegetation Removal

The Applicant would clear the transmission corridor of trees and brush to provide access for construction equipment and a safe work area for crews. Where the Project would be constructed in the area of new transmission corridor (in the Northern Section), construction would commence with clearing of all tall-growing woody species within the 120-foot-wide (37 m) corridor. The remainder of the overhead transmission line route would be located in existing transmission line corridors and would require mowing of access roads, selective clearing and side trimming to accommodate the additional transmission line. Generally, trees would be cut close to the ground, leaving the stumps and roots in place to minimize ground disturbance. Stumps would only be removed where required to facilitate structure installations, access, or a safe working environment.

Small trees and shrubs within the transmission corridor would be mowed, as necessary, with the intent of preserving roots and low-growing vegetation to the extent practical. Where the transmission corridor crosses streams and brooks, low-growing vegetation along the stream bank would be selectively cut to preserve a riparian buffer that would minimize the disturbance of stream bank soils and reduce the potential for erosion and sedimentation. In addition, Northern Pass would preserve low-growing vegetation in accordance with regulatory guidance or permit conditions, as necessary, to protect rare, threatened, and endangered species or habitats. This Project would span more than one growing season; therefore, additional mowing of access roads and work pads may be required as vegetation re-generates in these locations.

Tree removal equipment would utilize existing access roads which may be improved as necessary to facilitate a safe and productive working environment while minimizing overall disturbance. The boundaries of wetlands would be clearly marked prior to equipment mobilization to prevent unauthorized vehicular encroachment into wetland areas. Forestry equipment would be operated from upland areas. Trees within wetland areas that are inaccessible by equipment staged in upland areas would be removed manually.

Soil Erosion and Sedimentation Controls

In accordance with the compliance plan, the Applicant would install full erosion control measures in a linear progression along the Project corridor in order to prepare the work areas ahead of construction. This process would be completed along the corridor until each section of the Project was complete. These measures would then be maintained until disturbed areas had been restored and stabilized. At that point a similar progression would occur to remove the erosion control measures and restore the corridor to meet the requirements.

Access Improvements

Construction vehicles must be able to access the location of each structure that would support the transmission lines. Access to the construction sites would be achieved by utilizing existing roads, developing new roads or by using timber mats. Timber mats may be used in or around wetlands to protect these environmentally sensitive areas. Silt fencing and/or other environmental controls would also be used to stabilize the soil and protect wetlands during construction. At the request of property owners, gates may be installed across new access roads where they intersect town or state roads to help deter unauthorized access to the Project corridor or where access roads cross agricultural land containing livestock. Access road improvements would average two to three days on each property.

Work Pads

At each transmission line structure site along the Project corridor, a work area, called a “crane pad,” would be required to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect the structure. The size and configuration of a crane pad at a particular structure location would vary based on site-specific conditions. A typical pad averages about 120 feet by 100 feet (37 m by 30 m). The exact locations and configurations of crane pads would be determined during final Project design based on site-specific conditions (e.g., to avoid or minimize work in wetlands or other environmentally- or culturally-sensitive areas). However, at each structure site, the crane pad would generally be situated within a specifically identified structure location envelope.

A typical (upland) installation of a crane pad involves several steps, beginning with the removal of vegetation, if necessary. The crane pad site then would be graded to create a level work area and, if necessary, the upper 3 to 6 inches (8 to 15 cm) of topsoil (which is typically unsuitable to support the necessary construction activities) would be removed and temporarily stockpiled within the Project corridor. A filter fabric layer would then be installed over the excavated area and a rock base allowing for drainage, then would be layered on top of the filter fabric. Additional layers of rock with dirt/rock fines are typically placed over this rock base. Finally, a roller is used to flatten and compact the pad. Crane pads often can be modified and contoured to the surrounding area to minimize impacts. In areas where crane pads must unavoidably be located in wetlands, layers of removable timber mats are typically used to construct the pads. Alternatively, a large rock base layer may be used to allow water to flow underneath the pad with smaller rock, layered on top of larger rock, followed by the final layer of gravel intermixed with soil.

The wire-stringing operation would require a work pad approximately 100 feet by 200 feet (30 m by 61 m), which would be used for staging material and the puller and tensioner equipment, at each end of the section that was being strung. These pulling sites would be set up at various intervals along the Project corridor and would be placed just before the stringing activity takes place.

Upon completion of construction, the crane pads and wire pulling sites, rock base and fabric materials, and timber mats (where used for crane support in wetlands) would be removed. The topsoil layer would be re-spread over the crane pad site and the area would be returned to pre-construction grade, to the extent practical and consistent with the Eversource ROW maintenance program.

Foundation and Structure Installation

There are three separate foundation types planned for new transmission structures: drilled shaft (utilized for lattice tower structures and steel monopole and H-frame structures), grillage (utilized for lattice tower structures) and direct embedded structures (utilized for steel monopole and H-frame structures).

The installation of drilled shaft foundations would begin by mobilizing the drill equipment and setting up over the foundation locations. The foundation drilling process would involve drilling holes that vary in diameter and depth dependent on the design, structure type and results of the geotechnical report and presence of rock. Once drilling was complete, a steel rebar cage and anchor bolt assembly would be placed in each hole and concrete would be poured to construct a foundation for the new steel structure or lattice tower. Concrete trucks would be used to deliver the concrete mix for the foundations. Drilling operations would typically occur for two to five days at each structure location.

The installation of grillage foundations is accomplished using conventional construction equipment, such as an excavator. The excavation typically covers an area between 6 feet and 15 feet (2 m and 5 m) square and up to 15 feet (5 m) deep. The steel grillage foundations, along with stub angles, would be placed in the hole and then backfilled with either select backfill material or concrete. Installation of grillage foundations would typically require two to three days at each structure location.

Direct embedded foundations would be installed by excavating a hole to the required depth using excavator or drill equipment to dig the hole. The structure would be placed in the hole and then filled with a suitable backfill material. In locations where rock was encountered, the foundation hole would be excavated to the rock depth and the contractor would use other approved methods to remove the rock including ripping, hoe ramming, or blasting, to achieve the required depth.

During construction of the Project, it is likely that occasional shallow-to-bedrock soil depths and subsurface boulders would be encountered. Blasting may be required in order to place transmission line support structures. For transmission line construction, blasting activity would be limited to the small volume of material needed to be removed to fit and plumb the pole structures. Only small charges would be required for the installation of transmission structures. The blasting plan would reflect this limited use of charges.

For work locations adjacent to or crossing gas pipelines, the Applicant would coordinate with the utility owner. Such coordination may include communicating with the utility, locating the pipeline, excavating near pipelines, and constructing access roads to cross the underground pipeline. In addition, to eliminate the risk of damaging the pipeline, the construction contractor would be required to determine the location of the pipeline before installing structure foundations near the pipeline. The contractor would use vacuum trucks and hand tools to safely remove backfill material above the pipe and to confirm the location of the pipeline.

Prior to any construction activity in the proximity of a pipeline, the contractor would be required to provide for approval by the Applicant, a work plan and drawings that accurately located and described the construction activities and that included the following:

- Excavator set up in relation to the pipeline
- Any benching needed for leveling the excavator or drill equipment
- Excavation location including depth and length
- Sloping or shoring
- Ingress and egress locations
- Clearance requirements
- Pipe location
- Spoil pile location

Once the foundations had been installed, transmission structure installation would begin. The Project would use lattice towers and steel pole structures. Steel pole structures would primarily be single pole structures (i.e., monopoles) and also include some H-frame and three-pole angle and dead-end structures. Steel structures would be delivered in sections; the number of sections would be dependent on the overall height of the structure. The bottom section of the steel pole would either be installed on a drilled shaft foundation or directly embedded in the earth. Steel structures would be either bolted flange connections or slip fit connections. On slip fit structures the sections would be installed by using a crane to lift the sections and place them on the previous steel pole section. The sections would be joined together by jacking the sections until the overlap between the sections is within the manufacturer's specifications. The pole sections would be bolted to the previous steel pole section.

Lattice tower structures would be delivered to the Project corridor in bundles of angle iron. The structures would be constructed in place by crews bolting together, or lacing, the towers on site.

Conductor and Shield Wire Installation

With the new structures in place, wire ("conductor"), shield wire and fiber optic ground wire would be installed by utilizing stringing blocks (pulleys), pulling ropes, pullers and tensioners. Once the stringing blocks were in place, the pulling ropes, or lead lines, would typically be installed via helicopter and the pulling ropes would then be attached to stringing equipment (pullers and tensioners) to pull the conductor, shield wire and fiber optic ground wire through the stringing blocks. The conductor would then be sagged to the specified tension and clipped into place.

During the stringing operation, temporary guard structures or boom trucks would be placed at road and highway crossings and at crossings of existing utility lines. These guard structures would be used to ensure public safety and uninterrupted operation of other utility equipment by keeping the conductor off the traveled way and away from other utility conductors at these crossing locations. Shield wires and fiber optic ground wire would be installed on top of the structure in a similar manner.

Project Corridor Restoration

Temporary work areas, including ditches, roads, walls, and fences, and pre-construction drainage patterns would generally be restored to their pre-existing condition. Restoration efforts, including removal of construction debris, minor grading and stabilization of disturbed soil, would be completed following the construction operations. All disturbed areas around structures and other graded locations would be seeded with an appropriate seed mixture or mulched to stabilize the soils in accordance with applicable regulations. Regulated environmental resource areas that are temporarily disturbed by construction would be restored in accordance with applicable permit conditions to pre-existing conditions under the supervision of Project environmental monitors. Temporary sediment control devices would be removed following the stabilization of disturbed areas.

Underground Transmission Cable

Alternative 7 would include three sections of underground cable: two in the Northern Section which are identical to Alternative 2, and one in the Central Section in the US Route 302, NH Route 18, NH Route 16, NH Route 112, and US Route 3 roadway corridors. All three sections would be underground in public roadways, and the installation method for all three sections would be the same.

The underground transmission line would be constructed in a progression of activities typically proceeding as follows:

- Site preparation, similar to overhead construction, including surveying, removal of vegetation in the Project corridor, installation of soil erosion and sedimentation controls, construction of access roads;
- Trench excavation and conduit installation; and
- Cable splicing.

Site Preparation and Development of a Traffic Control Plan

Similar to overhead transmission construction, the HVDC underground transmission line construction would generally progress in a linear manner. Installing an underground transmission line is comparable to that of installing a water or sewer main. It is expected that work at multiple sites would occur simultaneously. Work would begin by first performing survey, staking and protection of any sensitive areas, and contacting Dig Safe for demarcation of existing utilities. The installation of the underground transmission line would follow the existing roadway alignment with small extensions to connect to transition stations adjacent to the roadway (most transition stations would be located within approximately 500 feet [152 m] of the roadway, but the two transition stations in Clarksville, NH would be located approximately 1,500 to 2,500 feet [457 to 762 m] from the nearest roadway). A traffic control plan would be implemented utilizing traffic control devices as necessary to ensure the safe and expeditious movement of the traveling public. The plan would conform to the NHDOT Construction Sign Standards, the State of New Hampshire Flagger Handbook, and standards set forth in the FHWA Manual on Uniform Traffic Control Devices, which is a required condition of the NHDOT's excavation permit. Where the installation would be in a paved road, the pavement would be saw-cut on both sides of the trench to limit damage to the road.

Trench Excavation and Conduit Installation

The Project involves longitudinal installation of conduit and cable in approximately 60 miles of public roadways as well as the installation of cable splice pits (described below). Typical techniques used for the underground construction are open trenching and direct bury duct banks with concrete caps, both described below. In some locations, the use of trenchless technology, including "jack & bore" or HDD, would be required (see **Figure 2-3** and **Figure 2-4**).

Short-term disturbance for the trench and construction activities is assumed to be 10 feet (3 m) wide, with the majority of disturbance limited to the road surface (approximately 30 feet [9 m] wide) and adjacent, previously disturbed areas. In portions where the Project follows the roadway alignment, the cable would be installed in the shoulder or on the very edge of the roadway (Labbe 2016a, 2016b, 2016c). Where extensions would be required to connect the transition stations to the roadway, construction disturbance (including potentially vegetation removal and temporary roads) would occur within an area approximately 40 feet [12 m] wide. A trench would be excavated to the design depth, which generally would have a minimum cover along or across the roadway corridor of 30 inches, except crossing ditches where 48 inches is required. When the trench was deeper than 48 inches, the sidewalls would be shored up for support in order to allow safe worker access. The depth of the duct bank would vary based upon its configuration and a minimum of 2.5 feet (1 m) of cover would exist over the duct bank.

If an underground utility line crossing would be performed within an existing roadway, it would be installed by jacking or boring or by other trenchless technology methods. Minimum cover of trenchless installations would be 5 feet (2 m) on secondary roads and 10 feet (3 m) under primary and freeway roadways.

Underground Transmission Cable Construction Terms

direct burial: refers to burial conventionally trenched from the surface and subsequently backfilled.

buried duct bank: Duct banks are groups of conduits designed to protect and consolidate cabling. Duct banks are buried, allowing cables to be centralized within an underground path.

trenchless technology: is a general reference to various types of horizontal/directional boring or drilling not requiring surface trenching.

jack & bore: a method of trenchless cable installation that involves digging a pit at each end of an underground segment and using a bore machine to dig a tunnel between the pits. The pipe or cable is then pulled through this tunnel.

Horizontal directional drilling (HDD): A steerable trenchless method of installing underground pipes, conduits, and cables in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. This method allows pipes and conduits to be installed under water bodies, parks, roadways, and other features with minimal impact on the resource or surrounding area.

For the longitudinal installation, typically up to 750 feet (229 m) of trench excavation would be open at a time to allow for efficient construction installation methods. Storm water and groundwater issues would be managed in compliance with state and federal law and all permit conditions. Conduits would be installed into spacers to maintain their position in the trench and would be either backfilled with a suitable granular material or a high slump concrete, and then capped with a layer of concrete for protection against accidental dig-ups. Any temporary shoring would be removed as the trench is backfilled. After backfill, public roads would be restored as required and undeveloped areas would be restored.

One lane of the road would be temporarily closed to traffic to accommodate construction activities. Construction and installation of the underground cables associated with the Project would be scheduled to meet local requirements regarding noise limitations, construction work hours, etc. and to minimize the impact on local traffic, residents, and businesses. Lane closures would be in effect for days to weeks and for short segments of road along the route.

If the need arises to conduct blasting during installation of the Project all laws, ordinances and regulations, including the NHDOT Standard Specifications for Road and Bridge Construction, would be followed in the use, handling, loading, transporting and storage of explosives and blasting agents.

Jack & bore and micro-tunneling can be used for short distances when crossing under a railroad or highway, particularly when depths exceed 20 feet (6 m). The maximum depth of the jack & bore would be approximately 25 to 30 feet (8 to 9 m) below grade. For this application, a reinforced jacking pit would be constructed to the depth of the proposed bore and similarly a reinforced receiving pit would be constructed at the termination point of the pipe. A concrete reaction wall would be poured inside the jacking pit opposite the exit point of the bore. In jack & bore, the pipe is pushed along its path, and spoils are removed from the inside of the pipe by auger or by hand. Hydraulic equipment is used to push the pipe string, and it would be set up in the jacking pit. Alignment of the pipe would be monitored, and adjustments made as required until the pipe reached the termination point in the receiving pit. Micro-tunneling is very similar to jack & bore, except a remote controlled boring machine would along the bore path, first excavating ahead of the pipes which would be jacked in behind it as the spoils are removed.

HDD would be used for long-distance trenchless crossings. The maximum depth of the HDD sections would be approximately 65 feet (20 m) below grade. Typical applications are large stream or water body crossings such as the first underground segment in the vicinity of the US Route 3 bridge-crossing of the Connecticut River in Pittsburg and Clarksville, NH. Prior to installation, the process for HDD construction would begin with establishing an electronic positioning sensor system. The crews would set up drill equipment including a drill rig, mud mixer/reclaimer, pumps, miscellaneous support equipment, loaders, boom trucks and control booth. A pilot hole would be drilled using a "steerable" drill bit or mud motor with electronic position sensing equipment attached to a string of steel pipe sections. The pilot hole would be drilled along the pre-determined bore path to the exit point. During the pilot hole drilling the bore would be kept full of bentonite water slurry to provide lubrication and cooling for the drill bit, to help support the hole and to carry cuttings back to the entry hole to be cleaned and reused. The mud motor would be removed when it reaches the exit pit, and replaced with a reamer bit used to enlarge the hole as the drill rig pulls the string back. During the pull back, additional pipe would be attached to the reamer from the exit pit so that there will always be a string of pipe in the bore. After the reamer is pulled back, a series of larger and larger reamers would be pulled through the bore until the size is adequate for pullback of the "casing pipe or conduit." The casing pull back should be completed without stopping, to prevent friction buildup due to collapsed soil, so the entire length of casing is fused together into one long section before the pull back. Once the casing is in place, additional conduits may be attached or it may be terminated in a splice pit near the entry and exit pit.

Trenches would terminate either at splice pits or at a transition station. The conduit systems would be "proofed" or tested by pulling a specified dimensional mandrel through the duct from splice location to splice location. After installation and testing of the duct bank, pits and transition structure system, the conductors would be pulled to the splice locations. Conductors would be spliced in the pits, or terminated at a transition station. When an underground section was complete, there would be a series of electrical tests performed on the cable before it was energized.

The exact depth of the trenchless conduit installation, duct bank or direct buried cable could be adjusted based upon the final design.

Cable Splicing

Cable splice pits would be installed along the underground cable route at intervals corresponding to the greatest length of cable that could be transported on a reel and as determined by the engineer. This distance would vary depending upon the terrain, and the diameter and unit weight of the cable; distances of approximately 1,500 to 2,500 feet (457 to 762 m) between locations is typical. The pits, which are typically precast concrete and 30 by 10 by 6 feet (9 by 3 by 2 m) in dimension, provide a protected location for making cable splices. They also facilitate replacement cable installation when necessary. The cable would be installed in the conduit between the pits using puller/tensioner equipment. A cable reel trailer with a braking system or tensioner would be stationed at one end of the pull and a cable puller would be stationed at the other end. The puller would utilize a wire rope attached to the end of the conductor to pull the conductor through the duct system. Prior to pulling the cable, a jacket integrity test would be performed on the cable while it was on the reel; a second jacket test would be performed after the pull was completed. A pull for one reel of conductor typically takes one to two hours depending upon the set-up time.

Cable splicing would be performed inside a portable enclosure placed on top of the splice pit. The enclosure would provide for temperature, humidity and dust control to ensure optimal conditions for cable splicing. The cables to be spliced would be brought in at each end of the enclosure and the cable ends would then be prepared by exposing the conductors. The conductors would then be joined by either welding or using a mechanical connection and then a pre-molded splice body would be placed over the conductor joint to complete the splice.

This process would be repeated for the second cable. Both splices would then be placed in cradle supports on the pit floor. The splice pit would then be filled with sand to secure in place the cables and splices. The precast concrete lid would then be placed on top to seal the splice pit and the excavation filled back to finish grade.

Transition Stations

Six aboveground transition stations (see **Figure 2-5**) would be required, one at each location where the overhead transmission line would transition from aboveground to underground (and vice versa). One transition station would be located in Pittsburg, NH, two in Clarksville, NH, one in Stewartstown, NH, one in Bethlehem, NH, and one in Bridgewater, NH. Each transition station would resemble a small switching station, would have an area of approximately 75 feet by 130 feet (23 m by 40 m), and would be secured by an enclosed fence. The equipment at each transition station would include a line terminal structure, surge arresters, instrument transformers, disconnect switches, cable terminators, communications equipment, and a small control building. An area of approximately 4 acres (2 ha) would be cleared of vegetation surrounding each transition station.

The work at each transition station would begin with survey, staking and protection of any sensitive areas. Access to the work site would then be established and the required safety measures would be implemented prior to construction. The work site would then be cleared of any trees, shrubs and debris (if needed) and the temporary environmental erosion controls would be installed. Environmental control measures would be monitored throughout the process until the site was restored and stabilized. The work site would be grubbed, stripped and graded to the designed elevations, and then the disturbed areas would be restored. Next steps would include excavating and installing foundations, drainage systems, perimeter security fence, ground grid and underground conduits within the station footprint. Station materials, structures and equipment would begin delivery to the site for installation. The structures and equipment would be installed on the foundations, control building erected and control cable and conductors installed and terminated. When construction was complete, final restoration of any disturbed areas outside of the developed footprint would be completed and environmental controls would be removed, though some controls would remain until the area was completely stabilized.

Franklin Converter Station

The HVDC transmission lines would terminate approximately 158 miles (254 km) south of the U.S./Canada border at a proposed HVDC converter station (see **Figure 2-6**) in Franklin, NH. The Franklin Converter Station would convert the electrical power from HVDC to HVAC. An overhead HVAC line would leave the converter station and run approximately 34 miles (55 km) to the Deerfield Substation, where the Project would terminate.

The site of the proposed Franklin Converter Station is a 118-acre (48-ha) parcel, which was formerly a campground. The proposed converter station would disturb approximately 16 acres (6 ha) and would permanently occupy approximately 8 acres (3.2 ha) of the site. The converter station would be designed for a continuous HVDC to HVAC transfer rating of 1,000 MW, with the potential transfer capability of 1,090 MW. The converter terminal would include buildings with conversion equipment and controls and an open-air substation with filter banks and other equipment similar to a conventional substation. This facility would be somewhat smaller than the facility included in Alternative 2 due to the difference in capacity and technology.

The construction activities for the converter terminal and existing substations modifications would be generally the same. It is expected that work at multiple sites would occur simultaneously. In some cases, existing infrastructure or existing lines could need to be relocated prior to the construction of the station. The relocations would be planned and included as part of the construction sequencing activities.

The work at each station site would begin with the survey, staking and protection of any sensitive areas. Access to the work site would then be established, and the required safety measures would be implemented before construction. The work site would then be cleared of any trees, shrubs and debris (if needed) and the temporary environmental erosion controls would be installed. Environmental control measures would be monitored throughout the process until the site was restored and stabilized. The work site would be grubbed, stripped and graded to the designed elevations; the disturbed areas outside of the footprint of the site stations would be restored. Blasting required for the construction of station sites would be achieved through blast detonation in delayed series that would result in no greater impact or vibration than those charges required for setting transmission line structures.

Next steps would include excavating and installing foundations, drainage systems, perimeter fence ground grid and underground conduits within the station footprint. Station materials, structures and equipment would begin delivery to the site for installation. The steel structures and equipment would be installed on the foundations, buildings would be erected, control cables and conductors would be installed and terminated. When construction was complete, final restoration of any disturbed areas would be performed. Environmental controls would be removed, though some may remain until the area was completely stabilized.

Following installation, and prior to energizing the line, an extensive electrical testing process would confirm that each piece of equipment and each circuit had been installed and was operating in accordance with the specifications. Energization is a sequential process that energizes the equipment and facilities in a logical order to coordinate with the equipment and system requirements to meet the Project milestones. Transmission line outages would be necessary and would require coordination with ISO-NE. The Applicant would implement an outage and schedule process to confirm that all new or modified transmission and station facilities were sequenced into service in accordance with ISO-NE operational procedures with no interruption of service to the distribution customers.

Deerfield Substation

Alternative 7's interconnection to the New England electrical system would be at the existing PSNH Deerfield Substation located in Deerfield, NH. In order to establish the new line position for the 345 kV line from the converter station, an existing 345 kV line connection in the Deerfield Substation would be relocated. This would require the installation of additional terminal structures, 345 kV switches, breakers, bus work, instrument transformers, and associated protection and control devices inside the existing Deerfield Substation. The Deerfield Substation would be expanded by approximately 9 acres (4 ha) to accommodate additional equipment.

This is identical to the design of Alternative 2 (see **Section 2.3.2.5**).

AC System Support Projects

ISO-NE requires the preparation of a system impacts study for any transmission project (ISO-NE n.d.). The ISO-NE evaluation of Alternative 7 indicates that system reliability upgrades to existing PSNH AC transmission facilities would be required, including modifications to two existing lines, both between the Deerfield and Scobie Pond Substations. In particular, the ISO-NE evaluation of Alternative 7 to date indicates that the following upgrades to existing AC transmission facilities would be required (ISO-NE 2016a):

- Deerfield Substation – The 345 kV AC line from Buxton, Maine (ME) to Londonderry, NH, presently runs adjacent to the Deerfield Substation with no electrical connection. This line would be split into two segments: Buxton, ME to Deerfield, NH, and Deerfield, NH to Londonderry, NH with a connection at the Deerfield Substation. This would require the construction of an additional 345 kV bay position at the Deerfield Substation, which would be located within the existing substation yard. Additionally, 345 kV capacitor banks to provide voltage support would be constructed in the expanded substation yard.
- Scobie Pond 345 kV Substation – 345 kV capacitor banks to provide voltage support would be constructed in an area abutting the existing substation yard, requiring an expansion of approximately 5 acres (2 ha).
- 345 kV Transmission Line Upgrades – The two existing 345 kV AC transmission lines between the Deerfield Substation and the Scobie Pond Substation would be reconductored to provide additional power flow capabilities. These upgrades would require the alteration or replacement of ten existing transmission support structures to increase heights between 4.5 and 9 feet (1 and 3 m).

Increasing structure height involves either modifying the existing structure by extending height using structural steel members or, where the condition of an existing structure suggests that it should be replaced, simply replacing the structure with a structure of like design that has the additional height, at essentially the same location. Where structures would be replaced, there would be a small amount of excavation to allow direct embedding of the structures in a new hole in the ground. There would be no concrete foundations added. The associated construction activity would be comparable to that of the other transmission line construction the Applicant would undertake for structures of this type, with only limited, temporary ground impacts.

This work would progress in a linear sequence and would be performed in accordance with the compliance plan. Erosion control measures would be installed early in the construction process and maintained until disturbed areas had been restored. Prior to the commencement of work on a particular work area, the contractor, along with an Owner's Engineer construction field superintendent and environmental inspector, would conduct a preconstruction walk down to discuss the compliance work plan and identify areas to avoid or watch carefully during construction. Access roads would be constructed, typically utilizing existing roads, developing new roads or by placing timber mats. Next, the crews would begin framing, removing existing structures and erecting and setting the replacement structures. The erection crews would likely utilize temporary crane pads, which would be approximately 5,000 to 10,000 square feet (465 to 929 m^2), as staging structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect transmission structures. After construction activities were completed, disturbed areas outside of the developed footprint would be restored.

Rebuilding Existing Facilities

Alternative 7 would use an existing, occupied PSNH transmission corridor to a large extent. In order to accommodate the installation of the Project in the existing PSNH transmission corridor, the existing PSNH electric lines would need to be relocated within the transmission corridor in some areas. In these areas, the existing 115 kV transmission lines and 34.5 kV distribution lines would be relocated within the transmission corridor to create sufficient width for the Project facilities. During construction, the removal of existing lines would be carefully coordinated with the installation of new lines to allow workers to safely perform construction while customers continue to receive electrical power with no loss of service.

The NESC governs the separation distance required between electric transmission lines within the same transmission corridor to assure safe and reliable operation of the lines. The need to relocate existing lines along the proposed route would be determined by the space available within the existing PSNH transmission corridor. Where line relocation was necessary, Northern Pass would relocate the existing transmission line within the existing transmission corridor. Line relocation would require some vegetation clearing within the existing PSNH transmission corridor. Alternative 7 would require the relocation of fewer existing transmission structures than Alternative 2. No existing lines would need to be relocated in areas where the Project would be buried in roadway corridors. Under Alternative 7, approximately 81 miles (130 km) of existing lines would be relocated. Existing transmission structures within the WMNF would not need to be relocated.

Where relocations would be required, new poles and wires would be first installed in an alternate section of the corridor. Once complete, the existing line would be de-energized so that power could be transferred to the newly built line. The de-energized lines would then be removed so that the Project construction could continue.

Existing structures that require removal would be de-energized and the overhead wires removed. If concrete foundations were encountered, they would be removed below grade, and the area would be filled with appropriate soils. All of the demolition debris such as wood poles, steel structures, insulators, conductor and concrete would be taken off-site to an approved waste management facility for recycling or disposal.

Tangent structures along the relocated 115 kV and 34.5 kV lines would be direct-embedded, meaning that part of the structure itself would be buried in the ground to provide structural support.[27] These direct-embedded structures would have ground openings approximately 3 to 5 feet (1 to 2 m) in diameter. Once the structure was placed in the hole, it would be back-filled with either native material, crushed rock, or a mixture of the two, and compressed to provide a rigid support system. Angle and dead-end structures would be self-supported using an anchor bolt foundation designed to take the larger loading of these structures. These foundations would have a diameter of approximately 4 to 8 feet (1 to 2 m).

Operation and Maintenance

Upon the completion of construction, the operation, maintenance, and repair of portions of the route where transmission lines presently exist would not change substantially from what currently occurs. Along the entire route, Northern Pass and PSNH would perform maintenance of the existing lines, maintenance of rebuilt lines, and implementation of the Project in accordance with Eversource Energy's system maintenance policies and procedures. Specific requirements for high voltage transmission lines include periodic patrols of infrastructure and vegetation management (including vegetation maintenance every three years within cleared areas, and side trimming and tree removal every ten years, or as required).

Maintenance activities in the transmission corridor, depending on the natural features and accessibility of the corridor, would be carried out on foot, by line truck, by track mounted vehicle, by all-terrain vehicle, or by snowmobile, as authorized. All vegetation management and line maintenance activities associated with Alternative 7's new lines and upgrades to existing 345 kV lines would be performed in accordance with the New Hampshire Division of Forest and Lands Best Management Practice for Utility Maintenance

[27] Tangent structures are the type most commonly used on a transmission line and are used on relatively straight portions of the transmission line. Because the conductors are in a relatively straight line passing through them, tangent structures are designed only to handle small line angles (changes in direction) of 0 to 2 degrees. Tangent structures are usually characterized by suspension (vertical) insulators, which support and insulate the conductors and transfer wind and weight loads to the structure.

(NHDRED 2010a). This Best Management Practice publication provides guidance for identifying appropriate means and methods for vegetation management and maintenance in or within the vicinity of jurisdictional wetlands. The Applicant would be required to provide a field manual summarizing the Best Management Practice to all contractors performing maintenance work in the transmission corridor.

Maintenance associated with transition stations, the HVDC converter station, the underground cables, and the Deerfield and Scobie Pond Substation upgrades would also be performed in accordance with Eversource Energy's system maintenance policies and procedures.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER DETAILED ANALYSIS

DOE considered, but eliminated from further detailed study, numerous technology, alignment, and construction alternatives. DOE evaluated each of these and determined them not to be reasonable. Descriptions of those alternatives, and the reasons for elimination, are included below. "Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (CEQ 1981a).

In the draft EIS, the alternatives considered but eliminated from further detailed analysis were described, in many cases, in relation to the then Proposed Action (Alternative 2). In the final EIS, the Proposed Action is now Alternative 7. The alternatives considered but eliminated from further detailed analysis are still described here as they relate to Alternative 2, but could also be similarly described in relation to, or applied to, the current Proposed Action (Alternative 7).

2.4.1 UNDERGROUND TRANSMISSION CABLE WITH 1,200 MW CAPACITY

Under this alternative, the Project would be constructed as an entirely underground transmission cable with a capacity of 1,200 MW, consistent with Alternative 2. This capacity configuration could apply to the Project in any alignment. DOE determined that this alternative was not reasonable due to both engineering feasibility and cost. Comments received during the scoping process, in response to Alternative 2, identified a strong interest in the evaluation of an entirely underground alternative. In light of the significant public interest in an underground alternative, DOE proceeded to further investigate and develop this alternative. In consultation with independent transmission engineers, DOE determined that the design capacity included in Alternative 2 (1,200 MW) would not be feasible for a project with substantial underground segments. For example, a 1,200 MW would typically require six conductors, whereas a 1,000 MW transmission line would require space for two conductors making full burial of a 1,200 MW project impractical from a design and cost feasibility standpoint. The design capacity of Alternative 2 was optimized for overhead transmission, and would be impractical and inefficient for underground transmission.

Rather than eliminating fully underground alternatives entirely and in order to respond to public comments, DOE explored other technologies which could allow for considerable lengths of underground transmission. It was determined that technology capable of delivering 1,000 MW was more realistic and appropriate for analysis in alternatives with substantial underground segments. Therefore, alternatives including full burial (Alternatives 3, 4a, 4b, and 4c) were analyzed in the draft EIS assuming use of technology with a capacity of 1,000 MW. This design element allowed for a meaningful analysis of transmission line burial alternatives that are practical and feasible (CEQ 1981a).

Following the publication of the draft EIS, in August 2015 Northern Pass submitted a further amendment to its Presidential permit application that made changes to the Applicant's proposed project (Northern Pass

2015).[28] The revised project included a change in converter technology and project size allowing for additional underground cable. The new Proposed Action, analyzed in the supplement to the draft EIS and the final EIS as Alternative 7, has a capacity of 1,090 MW. This project revision and design change is further evidence that full burial of a 1,200 MW line is unreasonable with regard to technical feasibility. Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, and 6b have also been revised in the final EIS to have a capacity of 1,090 MW.

2.4.2 UNDERGROUND TRANSMISSION CABLE IN RAILROAD AND CONNECTING ROADWAY CORRIDORS

Under this alternative, the Project would be an underground transmission cable, buried under or adjacent to existing roadways and railroad corridors for nearly its entire length (except for a small northern portion from the U.S./Canada border crossing in Pittsburg, NH to US Route 3 in Clarksville, NH), including the HVDC portion from Clarksville, NH to the alternate North Road Converter Station in Deerfield, NH, and the HVAC portion from the alternate North Road Converter Station to the destination substation in Deerfield, NH. The Project would cross the ANST under an existing roadway corridor. As with Alternative 3, potential techniques for construction could include direct burial, duct bank, or trenchless technology. Typically, transmission cable burial requires a corridor of short-term disturbance approximately 8 to 10 feet (2 to 30 m) wide. Under roadway segments of this alternative, the transmission cable could potentially be buried in the shoulder of the roadway or beneath the road surface (in previously disturbed areas), pending approval from the NHDOT and other relevant authorities. For portions buried along interstate highways, installation of the cable underneath the pavement or in the median would not be permitted, thus the cable could either be buried on the east side of the northbound lane or the west side of the southbound lane (NHDOT 2010a). Underground installation of HVDC may require facilities such as a permanent access/maintenance road throughout the entire length of the corridor and cable splice pads.

As part of the development of this alternative DOE coordinated with New Hampshire Department of Transportation (NHDOT) and Federal Highway Administration (FHWA). For railroad alternatives, DOE consulted extensively with NHDOT to determine which railroads to evaluate and what factors to consider in the assessment of this alternative. DOE conducted a formal meeting with ten representatives from both NHDOT and FHWA on February 5, 2014 in Concord, NH to discuss all of the legal, logistical, real estate and technical considerations for both the railroad and roadway corridor alternatives. In analyzing this alternative, the entire range of active, inactive and abandoned railroad ROWs were considered including the following: Genesee & Wyoming, Pan AM, NH Northcoast Corp., Boston and Maine Corp., New England Central, St. Lawrence & Atlantic, Green Mountain Railroad, Claremont Concord, Conway Scenic Railroad, Mt. Washington Cog Railroad, Berlin Mills Railway, abandoned railroads, inactive railroads, and railroads owned by the State of New Hampshire. Based on all these permutations, the combination that appeared, geographically and logistically, to provide the most continuous route was the combination described in the following paragraphs.

This alternative would rely on railroad ROWs owned by the State of New Hampshire and Genesee & Wyoming, Inc. For segments of railroad track owned in fee by the State of New Hampshire, NHDOT regulations require a separation of 25 to 50 feet (8 to 15 m) between utilities and the centerline of the tracks; in addition, a minimum 4-foot (1-m) depth of cover is required for underground utilities (NHDOT 2010a). For the segments owned by Genesee & Wyoming, Inc., utilities must be located as far as practicable from any tracks or important structures and as close to the property lines as possible, but no closer than 25 feet (8 m) to any track and with a minimum 4-foot (1-m) depth of cover (Genesee & Wyoming, Inc. 2013a). A

[28] As indicated in the discussion in **Section 2.3.12**, the further amended application also included a slight adjustment of 100 feet (30 m) in the proposed international border crossing location due to siting considerations on the Canadian side of the border.

review of the specific rail corridors which might comprise a potential project alignment indicates that the widths of these rail easements vary from 66 feet (20 m) to 99 feet (30 m) from edge to edge.

Under this alternative, the Project would follow (from north to south): the Alternative 2 alignment east from the border crossing to the intersection with US Route 3 in Clarksville, NH; US Route 3 to the intersection with the railroad ROW in Stewartstown, NH; the railroad ROW, generally, along the western border of New Hampshire from Stewartstown to Haverhill, NH; the railroad ROW through the WMNF in Benton, Warren, Wentworth, and Rumney, NH; the railroad ROW east towards Lake Winnipesaukee; south along I-93 until Concord, NH where it would be buried under I-393/NH Route 9/US Route 202; and NH Route 107 to the alternate North Road Converter Station in Deerfield, NH; then, the Project would continue as an underground HVAC transmission cable beneath Nottingham Road to the destination substation in Deerfield, NH (as with Alternatives 4a and 4b). This alternative would be approximately 206 miles (332 km) in length, including approximately 204 miles (328 km) of underground HVDC transmission cable and 2 miles (3 km) of underground HVAC transmission cable with a capacity of 1,090 MW.

DOE determined that this alternative was not reasonable due to space constraints within the narrow rail easements (portions which are 66 feet [20 m] wide). With the minimum required 25-foot (8 m) offset from the centerline of the tracks, there would be approximately 8 feet (2 m) of width potentially available for the Project. The trench necessary for the lines would require 8 to 10 feet (2 to 3 m) of width plus sufficient room for construction equipment and materials (approximately 30 feet [9 m]). Therefore, the width of the railroad ROW would be insufficient to accommodate the Project in many instances. As a result, Northern Pass would need to acquire additional width to meet NHDOT regulations for separation of utilities from railroad tracks and to accommodate actual construction. A physical review of these corridors indicated that many property owners adjacent to the railroad corridor have constructed structures (e.g., fences/walls) along one or both edges of easement such that additional width may not be available. Based on discussions with NHDOT, these corridors also contain stone box culverts which are historic/cultural resources that would create challenges for siting. Furthermore, in many cases the railroads themselves constitute historic resources. Finally, according to NHDOT, for segments owned in fee by the State, there may be limitations on how the land may be used (for example the only allowed use may be for rail transportation).

2.4.3 USE THE NATIONAL GRID PHASE I/II ROUTE

Under this alternative, the Project would be located in the existing National Grid transmission line route in Vermont and New Hampshire. This existing transmission route owned by National Grid crosses the U.S./Canada border in Vermont, and contains transmission lines owned by National Grid that carry electricity from Québec to Massachusetts (the Hydro Québec/New England Phase I/Phase II ±450 kV HVDC transmission system). A subset of this alternative could be to only utilize the portion of this existing transmission route that traverses the WMNF. This segment is an existing electricity transmission route through the WMNF and is occupied by National Grid transmission lines.

DOE determined that this alternative is not reasonable because it does not meet DOE's purpose and need, and it is not economically practical or technically feasible. National Grid owns the right-of-way (ROW) in Vermont and New Hampshire associated with this proposed alternative. Northern Pass and National Grid are direct competitors in the New England electric transmission market. Northern Pass' utilization of National Grid's route would require acquiescence by National Grid and execution of a business arrangement for the Project to legally collocate within the National Grid ROW. There is no proposal from Northern Pass to utilize the National Grid route. Further, National Grid is the co-developer of a proposed project called the Granite State Power Link that would be constructed in Vermont and New Hampshire almost entirely along the existing National Grid corridor. This alternative is therefore not reasonable because the suggested transmission route is owned by a competing transmission company that is pursuing the Granite State Power Link project which would share this corridor with the existing National Grid Phase I/Phase II transmission line.

Further, as currently configured, space and electric system technical constraints also exist that make this alternative technically infeasible. Minimum width of right-of-way required for a transmission line is set by the National Electrical Safety Code. This code is established to address the magnetic and electric fields created by locating transmission lines in a corridor and that can induce current and charges in the transmission system that may jeopardize reliability. The National Grid route, as it exists, is not currently wide enough to accommodate another transmission line; therefore, co-location of an additional transmission system within the same ROW could result in interference between the systems or other hazards that exist due to the physical proximity of multiple transmission systems. Expansion of the ROW would require access to or acquisition of additional land adjacent to the Phase I/Phase II line ROW. DOE is not aware of attempts by Northern Pass to obtain the land necessary to expand this existing ROW.

2.4.4 UNDERWATER TRANSMISSION CABLE IN NAVIGABLE WATERWAYS

Under this alternative, the Project would be submerged in navigable waterways including the Connecticut and Merrimack Rivers.[29]

DOE determined that this alternative is not reasonable because the locations and shallow depth of the waterways makes submerging the cables technically impractical because cable-laying ships could not navigate these waterways. The available waterways do not provide a feasible route between the proposed border crossing and Deerfield, NH. To create a full route, Northern Pass would need to acquire additional property rights. Additionally, there are dams and waterfalls along both the Connecticut and Merrimack rivers that would limit the movement of cable-laying ships along the river. Challenges also arise in logistics regarding delivery of the submarine cable, which would need to be transported to segments of the river via truck in relatively short segments. Use of short segments would require numerous cable joints, which is inefficient and impractical from an engineering standpoint. Due to these technical challenges, DOE determined an underwater transmission route was not a reasonable alternative.

2.4.5 OVERHEAD IN RAILROAD AND CONNECTING ROADWAY CORRIDORS

Under this alternative, the Project would be located overhead within roadway corridors, including roads and railroads. The transmission line would follow the same alignment as the "Underground Transmission Cable in Railroad and Connecting Roadway Corridors" alternative.

DOE determined that this alternative was not reasonable due to space constraints and because locating the Project in these ROWs would conflict with existing uses. The existing ROWs are not currently wide enough to accommodate the Project (typical railroad ROW width is 66 feet [20 m] and the Project (in an overhead configuration) would require approximately 120 feet [46 m]) (see **Section 2.3.2**). New overhead transmission lines parallel to limited-access highways (including interstates) are not permitted according to the NHDOT Utility Accommodation Manual (NHDOT 2010a). With respect to conflicting existing uses, as discussed in the NHDOT Utility Accommodation Manual, "overhead lines affect road systems and rights-of-way primarily because exposed locations may represent a safety hazard to highway users or may interfere with highway maintenance operations" (NHDOT 2010a).

A physical review of these corridors indicated that many property owners adjacent to the railroad ROW have constructed physical structures (e.g., fences/walls) along one or both edges of the easement such that additional width may not be available. These corridors also contain stone box culverts which are historic/cultural resources that would create challenges for siting. Furthermore, in many cases the railroads themselves constitute historic resources. According to NHDOT, for segments owned in fee by the State,

[29] The USACE defines navigable waters as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity." (33 CFR § 329.4)

there may be limitations on how the land may be used (for example the only allowed use may be for transportation)

2.4.6 MULTIPLE ABOVEGROUND, BELOWGROUND OPTIONS IN ALTERNATIVE 2 ALIGNMENT

Under this alternative, specific segments of the Project would be buried in response to a particular, or individual, visual concerns, while other segments would remain as overhead as in Alternative 2. This alternative would involve identifying areas of particular visual sensitivity and burying the infrastructure to reduce impacts specifically within these areas.

The impacts of this alternative are bounded by the range of reasonable alternatives considered in detail in this analysis.

2.4.7 OTHER TRANSMISSION PROJECTS

Under this alternative, other proposed or approved projects such as Champlain Hudson Power Express, Northeast Energy Link, New England Clean Power Link, Maine Green Line, Vermont Green Line, Maine Renewable Energy Interconnect, Granite State Power Link, or other regional projects would serve as alternatives to the Project. This alternative could include either adding capacity to these other projects, joining Northern Pass's Project to one of these other projects, or replacing the Northern Pass Project with one of these transmission projects.

DOE determined that this alternative is not reasonable because it does not meet DOE's purpose and need. Additionally, this alternative is not reasonable due to the fact that joining these projects with the proposed Northern Pass Project is not economically practical and given potential design or ROW constraints, may not be technically feasible. The transmission lines and ROWs associated with the identified projects are not public domain, rather they are controlled by competitors in the New England electric transmission market. Northern Pass' utilization of these other projects would require acquiescence by these entities and execution of a business arrangement for the Project to legally collocate with these projects. It would also require approval by state siting authorities, other applicable permitting authorities and approval of the respective ISO. DOE is not aware of a proposal by Northern Pass to utilize these projects in order to meet their objectives. As for changing the capacity of these other projects or suggesting that they could fully replace the Northern Pass Project, those would entail business and design decisions by the other entities as well as coordination and approval with the state siting authorities, applicable permitting authorities and the respective ISO. Regional energy needs and a plan for meeting those needs within the New England region would ultimately be determined by ISO-NE in coordination with the New England states. While it is impossible to predict exactly what projects might be approved to meet regional energy needs, under the No Action Alternative, it is assumed that existing energy sources would continue to supply the ISO-NE Region.

2.4.8 POWER GENERATION ALTERNATIVES

Under this alternative, the Northern Pass Project would not be built and would therefore not supply 1,090 MW of power to the region. Instead, power generation alternatives (including distributed energy) such as wind power, biomass, natural gas, solar, and other generation sources would be relied upon to provide 1,090 MW to ISO-NE.

DOE determined that this is not a reasonable alternative because it does not meet DOE's purpose and need. Additionally, this alternative is not reasonable because it would not meet all of the project objectives. For example, the use of natural gas would not meet the project objective of diversifying the region's fuel source for electric energy generation which is heavily reliant on an existing natural gas system which faces infrastructure constraints and projected supply shortfalls (see **Section 1.4.1**). Natural gas would also not meet the project objective of utilizing a low-carbon energy source to help achieve objectives and/or requirements to reduce carbon emissions such as the Regional Greenhouse Gas Initiative. Another objective of the project is to provide a significant source of non-intermittent (i.e., baseload), reliable power to the region (see **Section 1.4.3**) that would not be met by certain types of alternative electric power generation, based on current capacity of regional alternative and projected future baseload demands. For example, some electric power generation technologies suggested as generation alternatives, such as wind power, are by nature intermittent power resources [e.g. the power generation is limited to when the wind blows] and market, technical, and regulatory feasibility challenges exist that limit the capacity for power storage necessary to make wind power a reliable source to address baseload demands on the scale of a regional electrical system (Electricity Advisory Committee 2016).

2.4.9 ENERGY CONSERVATION

Under this alternative, reductions in energy use and demand would offset the need for additional electricity in the New England region, thus rendering the Project unnecessary. Consequently, the Project would not be built.

DOE determined that this is not a reasonable alternative to the Proposed Action because it does not meet DOE's purpose and need. It is also not reasonable because this alternative fails to meet the project objectives of diversifying the region's fuel source for electric energy generation, and providing a significant source of non-intermittent (i.e., baseload) reliable supply of electric power to the region (see **Section 1.4**). Although energy conservation measures are serving an increasing role in reducing future energy demand in several New England states, including New Hampshire,[30] all New England states have mandated requirements for additional renewably generated, reliable electricity pursuant to their renewable energy goals. Accordingly, however, energy conservation measures alone do not address the demand for delivery of reliably baseload electricity. This particular limitation of the energy conservation alternative is underscored by ISO-NE studies issued in 2017 that indicate that energy efficiency and conservation cannot alone meet the growing peak electricity demand in ISO-NE, particularly considering planned generation retirements (ISO-NE 2017a, 2017b).

2.4.10 ALTERNATIVE 2 EXCEPT UNDERGROUND TRANSMISSION CABLE THROUGH CONNECTICUT LAKES HEADWATERS PROPERTY

In its 2013 amended Presidential permit application, the Applicant identifies a possible alternative segment in the Northern Section (see 2013 amended application, page 57). Under this alternative, the transmission line would be buried under the Connecticut Lakes Headwaters property. The Connecticut Lakes Headwaters property, located near Clarksville, NH, is owned by the Connecticut Lakes Realty Trust and held under a conservation easement by the New Hampshire Department of Resources and Economic Development (NHDRED). The conditions of the NHDRED conservation easement would require that the Project be buried under this parcel.

DOE determined that this alternative is not reasonable due to access restrictions. The terms of the NHDRED easement prohibit this use. The conservation easement was created to protect the qualities of the viewshed and natural resources on the property, with terminology included to specifically preclude the type of development the Project would require. Further, the Applicant made extensive efforts with the land owner to acquire rights for this use of the land which were unsuccessful.

[30] For example, see New Hampshire Public Utilities Commission, Order No. 25,932 (August 2, 2016): https://www.puc.nh.gov/Regulatory/Docketbk/2015/15-137/ORDERS/15-137_2016-08-02_ORDER_25932.PDF.

2.4.11 TRANSMISSION LINE IN AN ABOVEGROUND PIPELINE WITHIN ALTERNATIVE 2 ALIGNMENT

Under this alternative, the Project would be located within the Alternative 2 alignment in an aboveground "tube" or pipeline.

DOE determined that this alternative was not reasonable due to engineering feasibility. According to an independent transmission engineer, there are no known instances of transmission lines in aboveground pipes.

2.4.12 BURY EXISTING LINE, INSTALL NEW LINE AS PROPOSED

Under this alternative, an existing 115 kV AC transmission line in the PSNH transmission route would be buried for approximately 150 miles (241 km) to make room for the Project as an overhead transmission line. The Project would be constructed as described in Alternative 2.

DOE determined that this alternative was not reasonable due to engineering feasibility. This alternative was evaluated by an independent transmission engineer and eliminated from detailed analysis because of technical constraints associated with burying extended lengths of AC cable. Specifically, AC transmission cannot be buried for long distances without cable capacitance which physically consumes portions of the power fed into the AC cable and is cumulative with cable length. The amount of power which a buried AC cable can transmit decreases with increasing length of cable.

2.4.13 CO-LOCATE THE PROJECT (HVDC AND HVAC) WITH THE EXISTING 115 KV AC TRANSMISSION LINE ON THE SAME SET OF NEW TOWERS

Under this alternative, the Project (both HVDC and HVAC portions) would be located on the same set of towers as an existing 115 kV AC transmission line for the portion of the Project located in the existing PSNH transmission route (presently occupied by an existing PSNH AC transmission line) (approximately 147 miles [237 km]). This alternative would reduce the total number of towers and require less vegetation clearing (for width increase) compared to Alternative 2, resulting in a smaller visual impact. However, this alternative would require the construction of new towers of greater height in order to accommodate both sets of lines.

DOE determined that this alternative was not reasonable due to engineering feasibility. There are technical challenges with co-locating HVDC and AC lines. During normal (steady state) operation as well as during fault conditions, voltages from the AC system would be induced into the HVDC system. These induced voltages may affect the converter transformers and the HVDC control system, which in turn would negatively impact the performance of the HVDC system. Similarly, the HVDC system may negatively impact the performance of the AC system. There are currently no known systems in service that have both HVDC and AC lines on the same tower.

2.4.14 RELOCATE PROPOSED PROJECT CONVERTER STATION AND TERMINUS SUBSTATION

Scoping comments suggested that alternate routes and design options would be possible if the Project did not terminate at the Deerfield Substation. Specific alternate locations for the Project's terminus substation were suggested in comments on the draft EIS: Bow, NH; Londonderry, NH; Buxton, ME; and Vernon, VT. Similar comments on the draft EIS suggested an alternative converter station location in Bow, NH.

DOE determined that this alternative is not reasonable because it does not meet DOE's purpose and need and because it is not technically feasible or economically practical. Northern Pass used power flow studies to identify its proposed converter and terminus substation, and the proposed converter station and substation have been evaluated by ISO-NE. The Deerfield, NH terminus substation was proposed by Northern Pass, in part, because it can receive the capacity of the Project and is owned by a subsidiary of Northern Pass. In contrast, the alternative terminus substations suggested by commenters are not capable of receiving an additional 1,090 MW of power. These other suggested substations would require substantial upgrades in order to accommodate the capacity of the Project. Additionally, substations are not public domain, and some of those suggested are owned by competitors in the New England electric transmission market. Northern Pass' utilization of a substation and associated ROW, owned by another entity, would require acquiescence by these entities and execution of a business arrangement for such use. Further, DOE determined that relocating the proposed Project terminus substation is not reasonable because interconnection with the electric grid is determined by the Applicant in coordination with ISO-NE and would require business-related and reliability decisions on the part of the Applicant and ISO-NE. DOE is not aware of a proposal from Northern Pass to utilize these other stations.

Additionally, some commenters also suggested the use of an alternate converter station at Bow, NH, specifically utilizing the Merrimack coal fired power plant located in Bow and owned by Eversource. DOE determined that the use of the Merrimack facility is not a reasonable alternative because it is not economically feasible. The Merrimack facility is a coal fired power plant, not a converter station. To transform it to a converter station would require the installation of DC-to-AC converter equipment and could require an expansion of the equipment yard. Further, it is not economically feasible because Eversource is in the process of selling the Merrimack facility pursuant to an auction ordered by the State legislature (NHPUC 2016). DOE understands that the auction is scheduled to take place at the end of August 2017.

2.4.15 OVERHEAD ALTERNATIVES CONVERT TO HVAC AT THE NORTH ROAD CONVERTER STATION LOCATION

Under this alternative, overhead Alternatives 2, 5a, 5b, 5c, or 7 would convert to HVAC at the alternate North Road Converter Station rather than the proposed Franklin Converter Station. These alternatives would bypass the proposed Franklin Converter Station site as overhead HVDC and would remain in the Alternative 2 alignment. The Project would then continue from the alternate North Road Converter Station to the Deerfield Substation as an overhead HVAC transmission line.

The impacts of this alternative are bounded by the range of reasonable alternatives considered in detail in this analysis.

2.4.16 UNDERGROUND HVAC FROM THE FRANKLIN CONVERTER STATION TO THE DEERFIELD SUBSTATION

This alternative could be applied to any analyzed alternative that utilizes the proposed Franklin Converter Station (Alternatives 2, 5a, 5b, 5c, 6a, 6b, and 7). Under this alternative, the Project would be constructed as underground 345 kV AC in the Alternative 2 alignment between the Franklin Converter Station and the Deerfield Substation. The portion of the transmission line before the Franklin Converter Station (HVDC line) would be constructed overhead as proposed. This design would involve approximately 34 miles (55 km) of underground HVAC. This alternative would respond to issues raised regarding visual impacts for this portion of the Project.

DOE determined that this alternative was not reasonable due to engineering feasibility. This alternative was eliminated from detailed analysis because burial of HVAC power transmission is technically complex and inefficient. Specifically, AC transmission cannot be buried for long distances without cable capacitance which physically consumes portions of the power fed into the AC cable and is cumulative with cable length. The amount of power which a buried AC cable can transmit decreases with increasing length of cable.

2.4.17 ALTERNATIVE VERMONT BORDER CROSSINGS

Under this alternative, the transmission line would cross the U.S./Canada border at Derby Line, VT where Canadian Route 55 and U.S. I-91 meet. The transmission line would be buried along I-91 to either I-93 or I-89 and would proceed south to Hartford, CT, Boston, MA, or Deerfield, NH.

DOE determined that this alternative is not reasonable because it does not meet DOE's purpose and need. Further, it is not economically practical or technically feasible as there is no proposal by Northern Pass utilizing this border crossing with suggested alignments. A proposed border crossing for a transmission line in Vermont would require a separate Presidential permit application under DOE's regulations at 10 CFR Part 205. Under its Presidential permit program, DOE does not have siting authority for transmission lines. Under this alternative, the State of Vermont, through its Vermont Section 248 and 231 Application process, would have the authority to determine whether to issue a Certificate of Public Good for a new transmission line in the state of Vermont, as well as the siting authority to determine the route of such a line within the state. Additionally, Northern Pass would have to apply for and receive approval from any other states through which this theoretical alternative route would run would since these states would have siting authority within their borders. This alternative would also require review and approval by other state and federal permitting authorities as well as by ISO-NE. The State of Vermont does not have a Section 248 and 231 application for this proposed alternative nor do the other states, permitting authorities or ISO-NE that might be affected by this proposed alternative. A few commenters seemed to suggest a Beecher Falls, VT alternative border crossing followed by a route alignment through Canaan, VT for a portion of the Northern section of the transmission line. DOE determined that this alternative was also unreasonable for the reasons stated above and in Appendix L.

Additionally, DOE determined that the proposed Derby Line, VT border crossing alternative is not technically feasible because there is no electric transmission line existing on the Canadian side of the international border with which the suggested alternative would be technically capable to interconnect. Further, Canada conducts its own review and approval of projects within its borders by Canadian provincial and federal siting authorities (Hydro-Québec TransÉnergie 2016). **Section 1.5.4.1** of this EIS discusses the Canadian provincial and federal approval processes, status of those processes, and provides reference to documentation prepared by Hydro-Québec in compliance with provincial and federal decision-making requirements that has been conducted for the Project. Because there is no proposal for the Derby Line crossing/alignment, there is no similar, ongoing evaluation or consideration by the Canadian provincial and federal siting authorities.

2.5 SUMMARY OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROJECT

Note: this information is repeated from the **Summary**, **Section S.9**.

A summary of potential impacts from the construction, operation, maintenance, and emergency repairs associated with the Project (Alternatives 1, 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7) is presented in the following resource area discussions. **Chapter 3** (Affected Environment) summarizes the existing condition to provide context and explains analysis methods and critical terminology. The detailed impact analysis, along with APMs to avoid or minimize potential impacts, is presented in **Chapter 4** (Environmental Impacts), **Chapter 5** (Cumulative Impacts), and **Appendix H** of this final EIS.

2.5.1 VISUAL RESOURCES

Table 2-2. Summary of Potential Impacts to Visual Resources

Alternative	Net Change in Aggregate Scenic Impact	Aggregate Scenic Impact	Net Change in Miles (km) of Road with Visibility
1 (No Action)	0	85.9	0
2	68.7	154.7	48 (77)
3	0	85.9	0.3 (0.5)
4a	0	85.9	0.2 (0.3)
4b	0	85.9	0.2 (0.3)
4c	0	85.9	0.2 (0.3)
5a	63.7	149.6	45 (72)
5b	67.5	153.4	41 (66)
5c	65.4	151.4	45 (72)
6a	44.7	90.9	6 (10)
6b	44.7	90.7	6 (10)
7 (Proposed Action)	58.4	144.3	40 (64)

Note: The net change in visual resources is measured in comparison with the existing condition, or Alternative 1, which includes the existing PSNH transmission line. The existing condition has a visual magnitude rating of 1.63 (Very Low to Low), and a scenic impact rating of 1.39 (Very Low to Low). The existing PSNH transmission line crosses 144 publicly accessible roads as an overhead line and is visible from approximately 139 miles (224 km) of roads.
Refer to the Glossary for a definition of "scenic impact."
Aggregate scenic impact is calculated by multiplying the average scenic impact value with the total area of the viewshed in order to consider the change in viewshed area as well as the value of the scenic impact variable.

The methods used to determine the potential impact to visual resources are discussed in detail in **Chapter 3, Section 3.1.1**.

Overall, construction of the Project under all alternatives would result in short-term visual impacts from the presence of machinery and construction activities. For overhead portions of the Project (including portions of Alternatives 2, 5a, 5b, 5c, 6a, 6b, and 7), overstory vegetation removal and the visibility of aboveground structures and facilities would result in long-term impacts to visual resources. The visibility of large industrial-appearing lattice structures that have high form and color contrast with existing transmission structures and the surrounding environment, along with vegetation clearing and the construction of a new transmission route would contribute to this impact. Additionally, other permanent facilities, such as transition stations, would alter the visual character of the landscape. Underground portions of the Project (including Alternatives 3, 4a, 4b, 4c, and portions of 2, 5a, 5b, 5c, 6a, 6b, and 7) would not have long-term visual impacts from the transmission cable, but aboveground structures (transition stations, converter station, and substation) would have a visual impact.

2.5.2 SOCIOECONOMICS

Table 2-3. Summary of Potential Impacts to Socioeconomic Resources – Construction

Alternative	Total Construction Costs ($ billion)	Economic Impacts from Construction ($ million)		FTE Construction Jobs (over three years)	Reduction of Taxable Assessed Property Values ($ million)	Reduction in Annual Residential Property Tax Payments ($)
		Direct	Total			
1 (No Action)	--	--	--	--	--	--
2	$1.087	$328.5	$570.4	5,233	$11.8	$320,000
3	$2.128	$643.9	$1,116.1	10,240	--	--
4a	$2.034	$616.2	$1,070.4	9,816	--	--
4b	$2.163	$654.0	$1,134.8	10,411	--	--
4c	$2.094	$634.0	$1,101.3	10,100	--	--
5a	$1.180	$355.7	$615.9	5,655	$10.7	$290,000
5b	$1.252	$376.9	$652.3	5,991	$11.4	$310,000
5c	$1.227	$369.3	$639.1	5,869	$10.8	$290,000
6a	$1.876	$567.5	$988.4	9,062	$5.1	$140,000
6b	$2.002	$604.6	$1,051.5	9,645	$5.1	$140,000
7 (Proposed Action)	$1.410	$424.4	$734.6	6,747	$8.7	$240,000

Table 2-4. Summary of Potential Impacts to Socioeconomic Resources – Operation, Maintenance, and Emergency Repairs

Alternative	Annual Economic Impacts ($ million)		Permanent FTE Jobs	Annual Reduction in Wholesale Electricity Costs – ISO-NE ($ million)	Annual Reduction in Wholesale Electricity Costs – NH ($ million)	Increase in Statewide Property Tax Annual Collections ($ million)	Percent Increase in Net Imported Electricity*
	Direct	Total					
1 (No Action)	--	--	--	--	--	--	--
2	$45.7	$112.1	760	$32.8	$10.1	$29.8	25.5%
3	$72.3	$194.0	1,333	$23.2	$8.6	$57.9	23.1%
4a	$70.9	$189.7	1,303	$23.2	$8.6	$56.5	23.1%
4b	$73.5	$197.5	1,357	$23.2	$8.6	$59.1	23.1%
4c	$72.3	$194.1	1,334	$23.2	$8.6	$58.0	23.1%
5a	$45.7	$114.5	782	$23.2	$8.6	$31.3	23.1%
5b	$48.7	$121.3	823	$32.8	$10.1	$32.9	25.5%
5c	$46.6	$117.2	801	$23.2	$8.6	$32.2	23.1%
6a	$66.9	$177.8	1,221	$23.2	$8.6	$52.5	23.1%
6b	$69.4	$185.4	1,274	$23.2	$8.6	$55.0	23.1%
7 (Proposed Action)	$51.4	$131.5	901	$23.2	8.6	$37.0	23.1%

*Net imported electricity includes electricity delivered by the Project as well as other lines into ISO-NE from Canada.

The methods used to evaluate the socioeconomic effects of the Project are discussed in detail in **Chapter 3, Section 3.1.2**.

As depicted in **Table 2-3**, total construction cost of the Project increases with increasing length of burial across the alternatives. Calculations of the overall economic impacts from construction of the Project is a proportionate function of construction spending. Similarly, alternatives with higher construction costs would be expected to create more construction-related employment. Construction of the Project may impact assessed residential property values and corresponding residential property tax payments to local taxing jurisdictions.

As summarized in **Table 2-4**, ongoing operations, maintenance and repair of the Project would have lasting economic impact within New Hampshire and throughout the area served by ISO-NE. Overall economic impacts, permanent employment, and statewide property tax collections are a function of the assessed value of the Project which is directly tied to the capital cost of the Project and varies by alternative. The more costly alternatives having higher economic impacts, increased employment, and larger property tax collections.

Annual reductions in wholesale electricity costs (within NH and ISO-NE), and the percent increase in net imported electricity vary by the transmission capacity (1,200/1,090 MW) of the alternative.

Electricity generation from natural gas, oil, coal, and domestic hydropower would be expected to fall under all alternatives—slightly more with alternatives with a transmission capacity of 1,200 MW. Net imports, which includes electricity delivered by the Project as well as other lines into ISO-NE from Canada, would increase. Total net imports from Canada would provide no more than approximately 26 percent of the total electricity supply to ISO-NE.

No studies have been completed documenting the potential impacts of transmission lines on tourism, and there is no existing literature with which to judge the potential impact of the Project on tourism in New Hampshire. However, impacts to tourism appear to be more affected by macroeconomic factors such as the stability of the national economy and gasoline prices more than site-specific changes. While it is reasonable to conclude that overhead portions of the Project may have some level of impact to tourism within New Hampshire, and to individual locations proximate to the Project route, these are not quantifiable.

2.5.3 RECREATION[31]

Table 2-5. Summary of Potential Impacts to Recreational Resources – Construction

Alternative	Point Sites	Potential Federal Wild and Scenic Rivers Crossings (Type)	Sites with Spatial Area acres (ha)	Trails	
				miles (km)	ANST[a] Crossings
1 (No Action)	--	--	--	--	--
2	1	9 (overhead)	496 (201)	5.6 (9)	1
3	1	9 (buried)	496 (201)	5.6 (9)	1
4a	--	8 (buried)	112 (45)	0.3 (0.5)	1
4b	--	8 (buried)	141 (57)	0.2 (0.3)	1
4c	--	7 (buried)	82 (33)	0.2 (0.3)	1
5a	1	9 (overhead and buried)	312 (126)	1 (1.6)	1
5b	1	10 (overhead and buried)	410 (166)	0.9 (1.4)	1
5c	1	10 (overhead and buried)	334 (135)	0.9 (1.4)	1
6a	--	8 (overhead and buried)	127 (51)	0.4 (0.6)	1
6b	--	9 (overhead and buried)	155 (63)	0.3 (0.5)	1
7 (Proposed Action)	1	7 (overhead and buried)	295 (119)	0.8 (1.3)	1

Note: Point sites are recreational resources with small spatial area such as a scenic overlook, boat launch, etc. Sites with spatial area are recreational resources such as parks that have larger areas.
[a] ANST impacts are included in the total impact to trails.

Table 2-6. Summary of Recreational Resources with Potential to Experience Long-Term Visual Impacts

Alternative	Point Sites	Sites with Spatial Area acres (ha)	Trails	
			miles (km)	ANST[a] miles (km)
1 (No Action)	--	--	--	--
2	15	2,267 (917)	9 (14)	0.1 (0.2)
3	--	--	--	--
4a	--	--	--	--
4b	--	--	--	--
4c	--	--	--	--
5a	13	2,121 (858)	8 (13)	0.1 (0.2)
5b	14	2,207 (893)	8 (13)	0.1 (0.2)
5c	14	2,161 (875)	8 (13)	0.1 (0.2)
6a	3	--	0.6 (1)	--
6b	3	--	0.6 (1)	--
7 (Proposed Action)	12	2,109 (894)	9 (14)	0.1 (0.2)

Note: Point sites are recreational resources with small spatial area such as a scenic overlook, boat launch, etc. Sites with spatial area are recreational resources such as parks that have larger areas.
[a] ANST impacts are included in the total impact to trails.
[b] Alternatives 3, 4a, 4b, and 4c would be located underground, and the construction and operation would not result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures

[31] Maps of the Project study area for recreation, including all recreational resources considered in this analysis, can be found in the Recreation Technical Report (http://www.northernpasseis.us/library/final-eis/technical-reports).

Short-term construction impacts would include closures of recreational resources and disruption of normal recreational activities and would be limited to the duration of construction, maintenance, and emergency repairs. Regarding impacts to trails, it is likely that trails would be closed at the trailhead during construction, limiting recreational use of portions of these trails beyond the portion directly impacted by construction activities. Short-term construction impacts of underground cable installation could persist for a longer duration, due to the more involved nature of construction.

Construction and operation of an overhead transmission line (including periodic vegetation management) would result in long-term visual impacts. These impacts may detract from the experience of users by affecting their sense of primitiveness and remoteness. There would be no long-term visual impacts resulting from underground cable.

Both Alternative 2 and Alternative 3 would cross the ANST at the existing PSNH transmission line crossing, Alternative 2, as an overhead line, and Alternative 3, as an underground cable. Under all other alternatives the Project would cross the ANST as an underground cable within an existing roadway corridor.

2.5.4 HEALTH AND SAFETY

Table 2-7. Summary of Potential Health and Safety Impacts

Alternative	Summary of Impacts
1 (No Action)	No impacts.
2	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, public safety, and fires would be minimized through the implementation of APMs (see **Appendix H**). In particular, design measures would reduce risks related to extreme weather events. The Project would generate electric and magnetic fields (EMFs), but there would be no impact of the Project due to EMFs outside of the transmission route, and minimal (not harmful) potential impacts due to AC electric fields within the transmission route.
3	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, and fires would be similar to those of Alternative 2. Risks related to weather, public safety, and EMFs would be reduced because the cable would be buried. There could be an increased risk of unearthing hazardous materials and/or contaminated groundwater.
4a	Risks would be similar to those of Alternative 3 because both alternatives would be underground cable, however, there could be more transportation-related risks because the cable would be buried in a roadway corridor.
4b	Same as Alternative 4a
4c	Same as Alternative 4a
5a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5c	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
7 (Proposed Action)	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions

The Project could result in short-term and long-term impacts to health and safety related to construction, operation, maintenance, and emergency repairs. In general, construction and operation of the Project could create and/or increase risks related to: spills/leaks of hazardous materials, petroleum products, and hazardous wastes; exposure of contaminated soils or groundwater; damage to underground pipelines and utilities; fire hazards; fire support services; worker safety; EMFs; extreme weather events and natural disasters; and general public safety concerns. These risks could be either short-term impacts from construction or maintenance activities, or long-term impacts resulting from operation of the Project. These risks could impact worker and public safety, as exposure to contaminated materials or a damaged transmission line can be dangerous.

Maintenance and emergency repair activities could include the same hazards as discussed for construction. Additional potential hazards during operation include EMFs, interference with an existing pipeline or utility, fallen lines or collapsed towers, lightning, extreme weather events, and fires at the transition stations, substations, or converter stations. The Applicant has committed to safety mitigation measures outlined in **Appendix H** and within the further amended Presidential permit application.

Installation of underground cable in roadways could create increased risks for workers, but these risks would be minimized through a transportation management plan (see **Appendix H**).

EMFs generated by underground portions of the Project would be below accepted limits. Overhead portions of the line, including HVDC and HVAC portions, would generate EMFs which would have no impact outside of the transmission route, and minimal impacts within the transmission route. There is no authoritative evidence that exposure to EMFs could increase or create a public health risk.

2.5.5 TRAFFIC AND TRANSPORTATION

Table 2-8. Summary of Potential Traffic and Transportation Impacts – Roads within Study Area and Miles (km) Buried in Roadway Corridors

Alternative	Roadways within Study Area					Miles (km) Buried in Roadway Corridor
	Interstates	US Highways	State Highways	Local Roads	Total	
1 (No Action)	--	--	--	--	--	--
2	3	5	22	186	216	6 (10)
3	3	5	22	186	216	6 (10)
4a	3	6	22	440	471	173 (278)
4b	3	6	25	499	533	188 (303)
4c	3	6	22	574	605	179 (288)
5a	3	5	22	208	238	26 (42)
5b	3	5	22	199	229	19 (31)
5c	3	5	22	247	277	31 (50)
6a	3	5	22	413	443	137 (220)
6b	3	5	25	472	505	152 (245)
7 (Proposed Action)	3	5	24	283	315	58 (93)

Note: The study area is defined as the Project corridors. The names and locations of all roadways are discussed in the Traffic and Transportation Technical Report (http://www.northernpasseis.us/library/final-eis/technical-reports).

Impacts to traffic along these roads would occur throughout the life of the Project, particularly during construction, maintenance, and emergency repairs. Impacts to roads in the study area would include short-term lane closures or full road closures resulting from the installation of the Project. For overhead portions of the Project, closures would be relatively short as the transmission line is suspended across the roadway. For portions of the Project located underground in roadway corridors, traffic closures would likely be longer in duration in order to excavate the trench in the road surface or shoulder.

For overhead portions of the Project, aviators flying in the area (including commercial and private planes) would be required to avoid new aboveground structures, but no impacts to air traffic are expected.

2.5.6 LAND USE

Table 2-9. Summary of Potential Land Use Impacts

Alternative	Land Use Conversion acres (ha)[a]	Forest Plan Standards Inconsistencies[b]
1 (No Action)	--	--
2	454 (184) non-developed to Developed, Open Space	1) Forest-wide, Recreation General Standard S-2, 2) MA 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2, 3) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1, and 4) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2
3	454 (184) non-developed to Developed, Open Space	--
4a	28 (11) non-developed to Developed, Open Space	--
4b	28 (11) non-developed to Developed, Open Space	
4c	28 (11) non-developed to Developed, Open Space	--
5a	454 (184) non-developed to Developed, Open Space	--
5b	454 (184) non-developed to Developed, Open Space	1) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1
5c	454 (184) non-developed to Developed, Open Space	--
6a	28 (11) non-developed to Developed, Open Space	--
6b	28 (11) non-developed to Developed, Open Space	--
7 (Proposed Action)	454 (184) non-developed to Developed, Open Space	--

Notes:
[a] This column summarizes the land area that would be converted to a different land cover type (as defined in the National Land Cover Dataset and Multi-Resolution Land Characteristics Consortium, see **Section 3.1.6.1**) as a result of the Project.
[b] This column summarizes the analysis of the Project in relation to management direction (specifically Standards) in the WMNF Forest Plan. Inconsistencies with Forest Plan Standards would require amendments to the Forest Plan. MA 8.3 is Management Area 8.3 – Appalachian National Scenic Trail.

The majority of the Project would be located either in the existing PSNH transmission route (Alternatives 2, 3, and portions of 5a, 5b, 5c, 6a, 6b, and 7) or in an existing roadway corridor (Alternatives 4a, 4b, 4c, and portions of 5a, 5b, 5c, 6a, 6b, and 7). Where the Project is located in these areas there would be minimal change to the existing land use. The portion of new transmission route in the Northern Section would result in the conversion of currently non-developed land into Developed, Open Space. This conversion could limit future uses of this private land.

Table 2-9 includes a summary of potential impacts of the Project as they relate to USFS management of National Forest System (NFS) lands. The Forest Plan provides guidance for managing and protecting natural resources and visitors' experiences on all National Forest lands. Standards and guidelines are the specific, technical direction for managing resources. Forest-wide standards and guidelines apply across all WMNF lands and management activities, unless more restrictive direction exists for a management area (MA). Management Area standards and guidelines apply only to land allocated to a specific MA. Forest-wide, and within MAs, a *standard* is a course of action that must be followed, or a level of attainment that must be reached, to achieve management goals and objectives, and can only be changed through an amendment to the Forest Plan. A *guideline* also is a required course of action or level of attainment, but permits operational flexibility to respond to variations in conditions. Guidelines can be modified or not implemented if site-specific conditions warrant, but the rationale for doing so must be documented in a project-level analysis and signed decision.

Impacts to conservation lands (parcels that are mostly undeveloped and protected from future development) would occur during construction, operation, maintenance, and emergency repairs. Construction impacts (e.g., vegetation clearing) to aesthetic, wildlife, water, and recreation values of these lands would be short-term. Long-term impacts would include diminishment of landscape character, fragmentation of wildlife habitat, impacts to stream health, riparian habitat, wetlands, and vernal pools, and effects to the recreation experience. These impacts would be in addition to those already occurring from the existing PSNH transmission line. Impacts would be less for alternatives located underground in roadway corridors, where there are limited conservation values currently. Refer to the analyses of impacts to Visual Resources (**2.5.1**), Recreation (**2.5.3**), Wildlife (**2.5.11**), Vegetation (**2.5.12**), and Water Resources (**2.5.13**) for more information.

No impacts to federally designated Wild and Scenic Rivers would be expected under any alternative. State protected rivers are located in the study area, and the Applicant would be required to comply with certain protection measures.

Portions of the Project located underground in roadway corridors could complicate future use of these ROWs, including NHDOT road maintenance and future utility installations.

The portion of the Alternative 3 corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling of these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner.

2.5.7 NOISE

Table 2-10. Summary of Potential Noise Impacts

Alternative	Audible Corona Noise Level (dBA) During Construction			Exceed EPA Guidance Level of 55 dBA
	HVDC Transmission Line (below conductors)	345 kV AC Transmission Line (below conductors)	345 kV AC Transmission Line (150 feet [46 m] from centerline)	
1 (No Action)	--	--	--	--
2	28	44	36	No
3	No audible corona noise associated with underground lines			
4a	No audible corona noise associated with underground lines			
4b	No audible corona noise associated with underground lines			
4c	No audible corona noise associated with underground lines			
5a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5c	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
7 (Proposed Action)	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			

Noise impacts from construction would occur for all action alternatives on a short-term basis. These impacts would result from the operation of construction equipment, blasting, and other construction activities. APMs presented in **Appendix H** would limit the timing and reduce the duration of these impacts. APMs would be expected to keep noise levels below United States Department of Transportation (USDOT) guidelines throughout Project construction. Construction noise could be more impactful for alternatives including burial in roadway corridors because these alternatives would be located in closer proximity to residences and sensitive noise receptors.

The audible noise due to the corona effect would not exceed the EPA guidance level Ldn of 55 dBA for outdoor areas beyond the transmission line. There would be no audible corona noise associated with underground portions of the Project.

Ongoing maintenance activities would include periodic transmission route maintenance activities (e.g., mowing) and routine road maintenance such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized.

2.5.8 HISTORIC AND CULTURAL RESOURCES

Table 2-11. Summary of Potential Impacts to Archaeological Resources – Construction

Alternative	Within Direct APE[a]	NRHP-Listed[b]	NRHP-Eligible[b]	Not Yet Evaluated for NRHP Eligibility[b]
1 (No Action)	--	--	--	--
2	49	--	--	49
3	49	--	--	49
4a	30	--	--	30
4b	35	--	--	35
4c	36	--	--	36
5a	44	--	--	44
5b	52	--	--	52
5c	57	--	--	57
6a	36	--	--	36
6b	41	--	--	41
7 (Proposed Action)	43	--	--	43
AC System Support Projects	6	--	--	6

Sources: Claesson et al. 2014a, 2015a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

[a] The Area of Potential Effects (APE) is defined in **Section 3.1.8.2**.

[b] The National Register of Historic Places (NRHP) is described in **Section 3.1.8**, including a discussion of the process of determining eligibility.

Table 2-12. Summary of Potential Impacts to Archaeologically Sensitive Areas – Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	254	150 (61)
3	254	109 (44)
4a	174	125 (51)
4b	216	118 (48)
4c	270	120 (49)
5a	233	136 (55)
5b	252	145 (59)
5c	273	140 (57)
6a	198	158 (64)
6b	241	161 (65)
7 (Proposed Action)	308	123 (50)
AC System Support Projects	45	--

Sources: Claesson et al. 2014a, 2015a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

Table 2-13. Summary of Potential Impacts to Architectural Resources – Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)	--	--	--	--
2	226	30	17	209
3	225	29	16	209
4a	230	174	49[a]	174
4b	259	248	50[a]	202
4c	347	320	57[a]	283
5a	230	53	17	213
5b	226	34	17	209
5c	232	49	17	215
6a	218	188	27[b]	190
6b	246	212	26[b]	219
7 (Proposed Action)	327	72	20	301
AC System Support Projects	62	--	0[c]	49

Source: Claesson et al. 2014b; Dunham et al. 2017; Higgins et al. 2015, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f
[a] Seven previously evaluated architectural resources were determined to be not NRHP-eligible.
[b] One previously evaluated architectural resources was determined to be not NRHP-eligible.
[c] Thirteen previously evaluated architectural resources were determined to be not NRHP-eligible.

Potentially affected historic and cultural resources were identified within a defined study area called the area of potential effects (APE). DOE determined the APE through Section 106 consultation for the Project (36 CFR § 800.4(a)(1)). The APE is the geographic area within which the proposed Project may directly or indirectly cause alterations in the character or use of historic properties (36 CFR § 800.16(d)). The direct APE consists of the area that could be directly physically impacted by the Project. The indirect APE consists of the area in which other impacts, such as visual impacts, could occur. The direct and indirect APE also allow for the identification, evaluation, and assessment of potential cumulative effects to historic and cultural resources from the proposed Project. For more information about the APE, see **Section 3.1.8.2**. For more information about Section 106 consultation, see **Section 3.1.8**.

Both short- and long-term adverse effects to archaeological resources (or sites) and archaeologically sensitive areas from construction of the Project would potentially result from surface and subsurface ground disturbance.[32] Construction activities would be expected to have the potential to result in short-term, adverse visual impacts on cultural landscapes and other architectural resources for the duration of construction activities. These visual impacts would have the potential to temporarily alter the setting of these architectural resources, as well as temporarily alter views of and from these resources. In addition, construction activities would have the potential for long-term, adverse effects on cultural landscapes and other architectural resources that are located within disturbance areas and which are removed or damaged during construction. Long-term, adverse visual impacts on these resources could occur if they result in changes to the settings of, or views to and from, these architectural resources.

Proposed APMs to avoid, minimize or mitigate adverse effects to historic and cultural resources have been developed by the Applicant and are listed in **Appendix H**. Potential adverse effects on historic properties

[32] Within archaeologically sensitive areas, there is considered to be a higher likelihood of encountering archaeological resources (sites).

will be addressed through DOE's Section 106 consultation, in accordance with the Section 106 PA (see **Section 1.6** and **Appendix K**). Through the implementation of the PA, DOE and consulting parties will develop appropriate measures to avoid, minimize or mitigate adverse effects, which may include the proposed APMs.

DOE is addressing potential adverse effects to historic properties in accordance with Section 106 of the National Historic Preservation Act and its implementing regulations (see **Section 3.1.8.1**). DOE will continue to consult with the Advisory Council on Historic Preservation (ACHP), New Hampshire Division of Historic Resources (NHDHR), the Vermont Division of Historic Preservation (VTDHP), as well as additional consulting parties, to satisfy its obligations under Section 106 of the National Historic Preservation Act (NHPA).

2.5.9 ENVIRONMENTAL JUSTICE

A detailed evaluation of U.S. Census block group data compared the demographic composition of "potentially affected" population (residing within 1,000 feet [305 m] of the Project) against the surrounding "unaffected" population on a county-by county basis. This evaluation was performed separately for each alternative. Three specific demographic measures were identified for each block group: the percentage of minority residents, the median household income, and the percentage of families living below the poverty level.

The demographic composition of the "potentially affected" groups compared to the surrounding "unaffected" population shows very little to no differences in the percentage of minority residents, percentage of families living below the poverty level, and median household income levels. In considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under any of the action alternatives. Specific demographic data are presented for each geographic section in **Chapter 4**, **Sections 4.2.9**, **4.3.9**, and **4.4.9**.

2.5.10 AIR QUALITY

Table 2-14. Summary of Potential Impacts to Air Quality – Construction Emissions and Loss of CO_2 Uptake from Vegetation Removal

Alternative	Total Construction Emissions (Entire Construction Period)							Loss of Carbon Sink from Forest Removal (metric tons CO_2)
	Criteria Pollutants (tons)						GHG Emissions (metric tons)	
	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
1 (No Action)	--	--	--	--	--	--	--	--
2	365	32	229	5.5	724	123	91,930	215,068
3	164	17	150	0.4	421	61	33,734	66,737
4a	134	14	124	0.3	336	48	27,663	16,599
4b	141	15	130	0.3	356	51	28,910	17,283
4c	140	14	129	0.3	353	51	28,744	17,226
5a	362	32	235	5.1	729	122	89,894	186,921
5b	374	33	241	5.4	749	126	93,288	206,295
5c	365	32	237	5.1	738	123	90,615	189,159
6a	183	18	149	1.4	414	63	41,440	16,711
6b	190	18	155	1.4	433	66	42,687	17,411
7 (Proposed Action)	333	30	222	4.3	691	114	81,529	159,651

Under all action alternatives, construction of the Project would result in the short-term emissions of nitrogen oxides, carbon monoxide, and carbon dioxide. Because portions of the Southern Section are located within nonattainment or maintenance areas, the General Conformity Rule would apply.[33] However, construction emissions would not exceed General Conformity *de minimis* thresholds within the applicable counties. Additionally, vegetation removal associated with construction (widening the existing, or creating a new, transmission route, and other infrastructure such as the converter station) would result in the loss of CO_2 uptake capacity. Additionally, the construction of the Scobie Pond Substation would result in the short-term emission of less than 3 metric tons of NO_x, approximately 2 metric tons of CO, and 601 metric tons of CO_2. This impact would be identical for all alternatives.

The electricity provided to the ISO-NE region from the Project could result in a decrease in the use of fossil fuels for thermal electricity generation. The reduction in CO_2 emissions from implementation of the Project could be approximately 2.8 million metric tons of CO_2 annually in 2030, over a 10 percent decrease from existing levels for alternatives with a 1,200 MW capacity, or 2.5 million metric tons of CO_2 per year, over a 9 percent decrease from existing levels for alternatives with a 1,090 MW capacity.

2.5.11 WILDLIFE

Table 2-15. Summary of Potential Impacts to Wildlife Habitat

Alternative	Impacts to Wildlife Habitat acres (ha)
1 (No Action)	--
2	1,838 (744)
3	1,295 (524)
4a	295 (119)
4b	308 (125)
4c	296 (120)
5a	1,663 (673)
5b	1,770 (716)
5c	1,674 (677)
6a	426 (172)
6b	439 (178)
7 (Proposed Action)	1,494 (605)

A total of 5 federally- and 24 state-listed wildlife species have the potential to occur in the study area and were therefore considered in this analysis. For the majority of these federally- and state-listed species, there is no difference in effects determinations between action alternatives.

33 The General Conformity Rule was promulgated by the EPA to ensure that the actions of federal departments or agencies conform to applicable state implementation plans (see **Section 3.1.10.1** for more information). The towns of Allenstown, Pembroke, and Concord, NH, in Merrimack County and Deerfield, NH, in Rockingham County have been designated as the Central New Hampshire area, which is in nonattainment for the 2010 SO_2 NAAQS.

Table 2-16. Determination Summary of Potential Project-wide Effects for Federally-Listed Wildlife Species

Species[a]	Determination of Effects by Alternative[b]
Canada Lynx (*Lynx canadensis*) FT, SE	**Impact for All Alternatives:** No lynx or suitable denning habitat located within study area; suitable foraging habitats are prevalent throughout the Northern Section. **ESA Determination for Alternatives 2, 3, 5a, 5b, 5c, and 7:** "May Affect, but is not Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, 4c, 6a, and 6b:** "No Effect" (Suitable habitat not located in study area)
Dwarf Wedgemussel (*Alasmidonta heterodon*) FE, SE	**Impact for All Alternatives:** Not detected in study area during Project-specific surveys, but could be present downstream.[b] **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"
Indiana Bat (*Myotis sodalis*) FE	**Impact for All Alternatives:** Localized, short-term effects resulting from disturbance/displacement during construction. **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"
Karner Blue Butterfly (*Lycaeides melissa samuelis*) FE, SE	**Impact For Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Localized, short-term effects resulting from disturbance/displacement during construction and maintenance actions, particularly in the Southern Section where wild lupine stands (the Karner Blue Butterfly host-plant) exist. **ESA Determination for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** "May Affect, and is Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, and 4c:** "No Effect" (Suitable habitat not located in study area)
Northern Long-eared Bat (*Myotis septentrionalis*) FT, ST	**Impact For All Alternatives:** Localized, short-term effects resulting from disturbance/displacement during construction and maintenance actions. **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"

Notes:
[a] The species identified are only those with differences in effects determinations between action alternatives. All other species have the same effects determinations for all action alternatives.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/ consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Suitable habitat is located within the study area unless otherwise noted.
Key: FT = federally-threatened; FE = federally-endangered; SE = state-endangered; ST = state-threatened

For the majority of the 24 state threatened and endangered species considered in this analysis, localized, short-term, adverse effects would occur from disturbance/displacement during construction and maintenance actions. For the state threatened and endangered species with differences in impacts between action alternatives, the results are presented below.

Table 2-17. Summary of Potential Project-wide Effects for State Threatened and Endangered Wildlife Species

Species[a]	Effects by Alternative[b]
Fish	
Bridle Shiner (*Notropis bifrenatus*) ST	**Alternative 2, 5a, 5b, and 5c:** No effect for construction and maintenance actions. **Buried Alternatives in Central and Southern Sections (including sections of Alternatives 3, 4a, 4b, 4c, 6a, 6b, and 7)**: localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Invertebrates	
Brook Floater Mussel (*Alasmidonta varicosa*) SE	**Alternative 2, 5a, 5b, 5c, 6a, 6b, and 7:** No effect for construction and maintenance actions. **Buried Alternatives in Southern Section (including sections of Alternatives 3, 4a, 4b, 4c)**: localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.

Notes:
[a] The list of species are all of those known to occur in the State of New Hampshire.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Key: SE = State Endangered; ST = State Threatened; RFSS = Regional Forester Sensitive Species

Impacts to terrestrial species could involve direct mortality or injury to individuals, sensory disturbance, and increased depredation. Construction of the Project would result in habitat loss and modification. Habitat loss and/or modification of existing habitats in the study area during construction would also have adverse impacts on wildlife resources. The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase, causing increased mortalities and/or injuries. Populations of most wildlife species are prevalent in the state of New Hampshire and individuals from adjacent undisturbed habitats would be expected to return to the Project corridors following construction. While adverse impacts to wildlife in the form of mortality or physical injury could occur, no population-level effects are expected and the majority of adverse effects would be short-term.

Impacts to aquatic species could involve direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. With the application of APMs, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction (see APMs in Appendix H), impacts to aquatic species would be minimized. Underground portions of the Project would result in additional impacts to aquatic species resulting from construction activity at waterbody crossings. Impacts would include habitat disturbance in trench areas and suspension of sediments, resulting in short-term, adverse impacts at the specific waterbody crossings. Impacts to aquatic habitat, including bank and channel disturbance, could be avoided through the use of horizontal directional drilling (HDD).

2.5.12 VEGETATION

Table 2-18. Summary of Potential Impacts to Vegetation

Alternative	Impacts to Vegetated Habitats (including Forestlands) acres (ha)	Impacts to Forestlands acres (ha)
1 (No Action)	--	--
2	1,682 (681)	747 (302)
3	1,144 (463)	233 (94)
4a	159 (64)	58 (23)
4b	157 (94)	60 (24)
4c	132 (53)	60 (24)
5a	1,505 (609)	651 (263)
5b	1,607 (650)	717 (290)
5c	1,504 (609)	659 (269)
6a	306 (124)	58 (23)
6b	303 (123)	60 (24)
7 (Proposed Action)	1,303 (527)	558 (226)

A total of 95 federally- and state-listed plant species have the potential to occur in the study area and were therefore considered in this analysis. For the majority of these federally- and state-listed species (50 total species), there is no difference in effects determinations between the action alternatives. For these species, the following effects determination applies: “No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs (**Appendix H**), no population-level impacts are expected.”

For four species analyzed (alpine brook saxifrage, diapensia, mountain sorrel, and Robbins’ cinquefoil), it was determined that there is no suitable habitat in the study area and there would therefore be no effect. No federally-listed small whorled pogonia individuals were identified during Project-specific surveys or in state databases, but if populations are present in the study area, impacts to individuals could occur but no population-level impacts would be expected. The ESA determination for the small whorled pogonia for all action alternatives is: “May Affect, but Not Likely to Adversely Affect.” For all species considered, no population-level impacts are expected from any action alternative.

Table 2-19 presents the effects determinations for species which vary among the action alternatives.

Table 2-19. Comparison of Project-wide Potential Effects for State-Listed Plant Species

Species	Effects by Alternative
Allegheny-vine/Climbing fumitory (*Adlumia fungosa*), SE	**Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** Known populations in the study area in Lancaster, NH based on NHB data (NHB 2014); impacts to individuals are expected; with the application of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 2-19. Comparison of Project-wide Potential Effects for State-Listed Plant Species

Species	Effects by Alternative
Alpine manzanita (*Arctostaphylos alpina*), RFSS	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Red threeawn (*Aristida longespica* var. *geniculata*), SE	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Known populations in the study area in the towns of Concord and Pembroke based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Clasping milkweed (*Asclepias amplexicaulis*), ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Known populations in the study area in the Town of Concord based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c**: if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Dwarf white birch (*Betula minor*), RFSS	**Impacts for Alternatives 2, 3, 5a, 5b, and 5c:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Wiegand's sedge (*Carex wiegandii*), RFSS, SE	**Impacts for Alternatives 2 and 3:** Known populations in the study area in the Town of Lincoln based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Faxon's hawthorn (*Crataegus faxonii*), SE	**Impacts for Alternative 7:** Known populations in the study area in the Towns of Franconia and Sugar Hill, NH, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mountain avens (*Geum peckii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat.

Table 2-19. Comparison of Project-wide Potential Effects for State-Listed Plant Species

Species	Effects by Alternative
Wild lupine (*Lupinus perennis*) ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Project-specific floristic surveys and NHB data (NHB 2014) identified several populations in Concord and Pembroke, NH within the study area; impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine arctic cudweed (*Omalotheca supine*), RFSS, SE	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat.
Boott's rattlesnake-root (*Prenanthes boottii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat.
Satiny willow (*Salix pellita*), SE	**Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** Known populations in the study area in the towns of Clarksville and Stewartstown, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Arizona cinquefoil (*Sibbaldia procumbens*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat.
Moss campion (*Silene acaulis* var. *exscapa*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat.
Licorice goldenrod (*Solidago odora*) ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** NHB data (NHB 2014) identified several populations in Pembroke, NH within the study area; impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Source: NHB 2014 and USDA Forest Service 2012a
Notes: Geographic regions were identified using (USDA NRCS 2015a).
Key: FT = federally-endangered; RFSS = Regional Forester Sensitive Species; MIS = Management Indicator Species; SE = state-endangered; ST = state-threatened

Both short-term and long-term impacts to vegetation would occur during construction. The potential impacts could result from vegetation disturbance and overstory vegetation removal. Long-term impacts would also result from operation, maintenance, and emergency repairs resulting from ongoing vegetation removal. Impacts would consist of those relating to clearing of vegetation for tower installation or line burial, service roads, and staging areas along and within the transmission route, access roads, converter stations, and substations (including the potential removal of listed plant species), maintenance of vegetation clearing so as not to interfere with aboveground or underground components, as well as the short-term and long-term disturbance in sensitive habitats.

Forest-cover located within the Project corridors would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted to scrub-shrub and herbaceous wetland communities, which would persist during operation of the Project. Implementation of APMs listed in **Appendix H**, including vegetation management and maintenance in accordance with the NHDFL's *Best Management Practices for Utility Maintenance,* would minimize adverse effects related to the Project. The conversion of forestlands to herbaceous or shrub communities would change the vegetation community species composition and suitability for a variety of wildlife species but would not be expected to have any population-level effects to vegetation resources because the majority of affected vegetation species are abundant in other parts of the state and region.

Invasive plant species, including noxious weeds, could be introduced and spread through introduction of plant propagules on construction equipment. Soil disturbance and compaction could potentially present conditions for such species to colonize, potentially resulting in both short-term and long-term adverse impacts. Implementation of the APMs (**Appendix H**), specifically an Invasive Species Management Plan, would minimize impacts to vegetation resources. Alternatives including buried transmission cable could have an increased risk for spreading invasive plant species because the areas of linear exposed soils could provide conditions for such species to colonize.

Fragmentation of contiguous vegetation communities or mature forest blocks associated with the creation and maintenance of a new transmission route in the Northern Section (included in Alternatives 2, 3, 5a, 5b, 5c, and 7) is a potential long-term impact that would extend throughout operation. It should be noted that for shade-tolerant plants, forest fragmentation and the creation of a new transmission route would decrease the extent of suitable habitat. However, the creation of a new transmission route would create new habitat for a variety of shade intolerant species.

Loss of forest cover in the transmission route could result in a potential long-term loss of biodiversity. However, the loss of forest cover in the transmission route and alterations of species composition along the transmission route edges would not result in regional impacts because the size of the impacted area would be negligible compared to the extensiveness of forest cover in surrounding areas. Plant species diversity could potentially increase locally through maintenance of the transmission routes in early successional plant communities, and potential creation of early successional wetlands in poorly drained areas. Any potential long-term effects associated with fragmentation and loss of biodiversity would be less for the underground cable due to the narrower transmission route (including portions of new transmission route in the Northern Section) and the previously-disturbed nature of roadway corridors.

2.5.13 WATER RESOURCES

Table 2-20. Summary of Potential Impacts to Water Resources

Alternative	Wetland Disturbance acres (ha)			Impacts to Vernal Pools acres (ha)	Disturbance in Locations Overlying Aquifers acres (ha)	Disturbance in FEMA Flood Zones[a] acres (ha)	Miles (km) of Impaired Rivers Crossed	Disturbance to Water Supply Resources		
	Direct	Temporary	Secondary					PWS Wells	SWPAs acres (ha)	WHPAs acres (ha)
1 (No Action)	--	--	--	--	--	--	--	--	--	--
2	2 (0.8)	212 86)	37 (15)	<0.5 (<0.5)	304 (123)	1,782 (721)	<0.5 (<0.8)	--	1,491 (603)	161 (65)
3	3 (1)	194 (79)	15 (6)	<0.5 (<0.5)	223 (90)	1,250 (506)	<0.5 (<0.8)	--	1,104 (447)	112 (45)
4a[b]	3 (1)	3 (1)	<0.5 (<0.2)	--	117 (47)	275 (111)	<0.5 (<0.8)	--	312 (126)	27 (11)
4b[b]	3 (1)	3 (1)	<0.5 (<0.2)	--	130 (52)	287 (116)	<0.5 (<0.8)	--	343 (139)	28 (11)
4c[b]	2 (0.8)	3 (1)	<0.5 (<0.2)	--	125 (51)	274 (111)	<0.5 (<0.8)	--	325 (132)	26 (11)
5a	2 (0.8)	182 (74)	36 (15)	<0.5 (<0.5)	299 (121)	1,606 (650)	<0.5 (<0.8)	--	1,204 (488)	165 (66)
5b	2 (0.8)	198 (80)	37 (15)	<0.5 (<0.5)	308 (124)	1,714 (693)	<0.5 (<0.8)	--	1,404 (569)	161 (65)
5c	2 (0.8)	183 (74)	36 (15)	<0.5 (<0.5)	311 (126)	1,618 (655)	<0.5 (<0.8)	--	1228 (497)	161 (65)
6a[b]	1 (<0.5)	23 (9)	<0.5 (<0.5)	--	194 (79)	407 (165)	<0.5 (<0.8)	--	443 (179)	75 (30)
6b[b]	1 (<0.5)	23 (9)	<0.5 (<0.5)	--	207 (84)	420 (170)	<0.5 (<0.8)	--	474 (192)	77 (31)
7 (Proposed Action)	2 (0.8)	170 (69)	36 (15)	<0.5 (<0.5)	264 (107)	1,438 (582)	<0.5 (<0.8)	--	1,036 (420)	87 (35)

Note: A vernal pool is a seasonal depressional wetland covered by shallow water for variable periods (often during winter or spring) that may be completely dry during summer and fall. An impaired river is a waterbody identified as impaired according to Section 303(d) of the Clean Water Act. A Public Water Supply (PWS) is defined as a piped water system having its own source of supply, serving 15 or more services or 25 or more people, for 60 or more days per year. Source Water Protection Areas (SWPAs) and Wellhead Protection Areas (WHPAs) are defined and regulated by the NH Department of Environmental Services under the NH State Drinking Water Act and federal Safe Drinking Water Act.

[a] Including all FEMA Flood Zones (Zone A, Zone AE, and Zone X).

[b] No vernal pools were identified in the Project corridor. Additional surveys may be conducted, as necessary.

The Project would result in short-term and long-term impacts to water resources related to construction, operation, maintenance, and emergency repairs. Overhead configurations would span the majority of streams, rivers, and riparian areas and minimize impacts to these resources. In areas where transmission cables would be buried, measures would be taken to minimize impacts, including directionally drilling under larger channels and replacing culverts where necessary. Although there would be some secondary water quality and habitat effects from canopy reduction, mitigation would be undertaken to address those effects. APMs to minimize water resource and wetland impacts can be found in **Appendix H**.

Direct impacts to wetlands include permanent construction, temporary impacts include clearing but no loss of function within various wetland types. Secondary impacts include the conversion of palustrine forested (PFO) wetlands to palustrine emergent (PEM) and palustrine scrub-shrub (PSS) wetlands within a 100-foot buffer near stream crossings. Wetland impacts would be much less extensive under alternatives located underground in roadway corridors because there are fewer wetland resources adjacent to roadways compared with the new transmission route and existing PSNH transmission route, and the area of disturbance for these alternatives is smaller (i.e., disturbance would primarily occur on a road surface). Impacts to wetlands under Alternative 3 are considered temporary; however, due to the amount of trenching proposed, there would be an increased risk of damage to wetland function and values.

Water resources potentially affected by construction would include watersheds, surface water, groundwater, floodplains, and wetlands. General short-term construction impacts would include changes or modification of groundwater or surface water (streams and rivers) quantity and/or quality, potential sedimentation, changes in water flow patterns, increased bedrock fracturing near rock blasting areas (temporarily affecting turbidity in groundwater wells near the blast zone), and increased turbidity in surface water. In general, aboveground facilities would be able to span wetlands and waterbodies, thereby reducing potential impacts.

Impacts to water resources from underground construction would be similar to aboveground construction, except that soil disturbance and resulting erosion and sedimentation would be greater from short-term construction activities, such as excavation of the trench. Trenching would result in impacts on water quality from increased turbidity, potential downstream sedimentation, changes in water flow patterns, and increased likelihood of pollutants reaching waterbodies. Stream crossings could include installation methods for minimizing short-term construction impacts to water quality including trenching or HDD, and/or attaching to existing infrastructure such as bridges. HDD would have the potential for leaks of HDD drilling fluid, which could cause drilling fluid to become suspended or dispersed, impacting water quality.

All action alternatives also include an expansion of the Scobie Pond Substation. This activity would impact 0.2 acre (0.1 ha) of wetlands, no vernal pools, 5 acres (2 ha) overlying aquifers, 5 acres (2 ha) in FEMA flood zones, and less than 0.1 mile (0.2 km) of CWA 303(d) impaired waterbodies. The impacts of other structures, including converter stations and the Deerfield Substation, are captured in **Table 2-20**.

2.5.14 GEOLOGY AND SOILS

Table 2-21. Summary of Potential Impacts to Geologic and Soil Resources

Alternative	Total Ground Disturbance acres (ha)	Disturbance to All Hydric Soils acres (ha)	Disturbance to Prime Farmland, Farmland of Statewide Importance, or Farmland of Local Importance acres (ha)
1 (No Action)	--	--	--
2	1,838 (744)	48 (19)	465 (188)
3	1,295 (524)	51 (21)	345 (140)
4a	295 (119)	7 (3)	103 (42)
4b	308 (125)	7 (3)	111 (45)
4c	296 (120)	6 (2)	109 (44)
5a	1,663 (673)	47 (19)	421 (170)
5b	1,770 (716)	49 (20)	462 (187)
5c	1,674 (677)	47 (19)	431 (174)
6a	426 (172)	13 (5)	210 (85)
6b	439 (178)	13 (5)	219 (89)
7 (Proposed Action)	1,494 (605)	48 (19)	399 (161)

The majority of soil impacts would be short-term and occur during the construction phase. Overstory vegetation removal and ground disturbance associated with clearing and widening the transmission route, constructing laydown areas, and other construction activities would likely result in short-term soil erosion. These impacts would be expected to be localized and extend primarily through the construction period, especially if these features are returned to their pre-existing condition.

Blasting could be used during construction in localized areas for any action alternative, potentially resulting in impacts to surficial geology. While there are several geologic faults within the study area, the likelihood that an earthquake strong enough and close enough to the Project corridor to result in any impacts is low.

Long-term soil impacts would result from clearing and grading for permanent access/maintenance roads, transmission structures, transition stations, converter stations, and the expansion of the Deerfield Substation. These activities could result in compaction and erosion.

The impact of underground cable, and particularly Alternative 3, would be greater than for an overhead line. While the total area of ground disturbance for alternatives including overhead transmission is greater than the area of disturbance for the installation of underground cable, the impacts would require more grading, trenching, and other excavation along with backfilling resulting in more soil disturbance and exposure to erosion during construction. Impacts on soils from construction of the underground cable using directional drilling would be localized and impacts would not be expected with the implementation of APMs for erosion, sediment control, and restoration of the disturbed Project corridor (see **Appendix H**). The impact of cable burial in roadway corridors would be generally less than burial in the new or existing PSNH transmission route because much of the disturbance would be limited to the road surface.

2.5.15 CUMULATIVE IMPACTS

Cumulative impacts are presented in **Chapter 5**, **Section 5.1** for all alternatives and resources considered. Past, present, and reasonably foreseeable future actions that could, with implementation of the Project, have cumulative environmental impacts are listed in **Appendix D**.

Alternatives that involve the majority of the transmission line being constructed aboveground (Alternatives 2, 5a, 5b, 5c, and 7) would result in vegetation clearing, disturbances to wildlife, removal of wildlife habitat types, direct mortality of certain wildlife individuals, soil disturbance and erosion, stormwater runoff, increased noise levels, increased construction traffic and traffic delays along roadways, increased short-term air emissions, decreased long-term air emissions, changes in land use for the new transmission line route, increases in health and safety concerns, changes in socioeconomic indicators, and potential impacts to historic and cultural resources. Multiple activities occurring at the same time and in the same vicinity would have greater impacts than just one project. Alternatives 2, 5a, 5b, 5c, and 7 would result in a moderate contribution to cumulative impacts on visual resources and soils and geology; a moderate beneficial contribution to cumulative impacts at a more localized scale on socioeconomics; a minor contribution to cumulative impacts on recreation, health and safety, noise, wildlife, vegetation, and water resources; a negligible contribution to cumulative impacts on land use; no cumulative impact to environmental justice; and a long-term beneficial contribution to cumulative impacts on air quality. Alternative 2 would result in a negligible contribution to cumulative impacts on traffic and transportation. Alternatives 5a, 5b, 5c, and 7 would result in a substantial short-term contribution to traffic and transportation. Depending on the resource, the impacts would be short-term and/or long-term in duration.

Alternatives that involve the majority of the transmission line being buried (Alternatives 3, 4a, 4b, 4c, 6a, and 6b) would result in limited vegetation clearing and impacts to wildlife and wildlife habitat, direct mortality to certain wildlife species, soil disturbance and erosion, stormwater runoff, increased noise levels, increased construction traffic and traffic delays along roadways, increased short-term emissions, decreased long-term air emissions, limited changes to land use, increases in health and safety concerns and roadway workers, changes in socioeconomic indicators, and potential impacts to historic and cultural resources. The alternatives that would be constructed underground along existing roadways (Alternatives 4a, 4b, 4c, 6a, and 6b) would impose the fewest environmental impacts due to the lack of visual impacts and use of already disturbed roadway corridors. Multiple activities occurring at the same time and in the same vicinity would have greater impacts than just one project. Alternatives 3, 4a, 4b, 4c, 6a, and 6b would result in a moderate beneficial contribution to cumulative impacts at a more localized scale on socioeconomics; a minor contribution to cumulative impacts on noise, vegetation, and water resources; a negligible contribution to cumulative impacts on visual resources, recreation, health and safety, and land use; no cumulative impact to environmental justice; and a long-term beneficial contribution to cumulative impacts on air quality. Alternative 3 would result in a moderate contribution to cumulative impacts on soils and geology; a minor contribution to cumulative impacts on wildlife; and a negligible contribution to cumulative impacts on traffic and transportation. Alternatives 4a, 4b, 4c, 6a, and 6b would result in a substantial short-term contribution to cumulative impacts on traffic and transportation and a negligible contribution to cumulative impacts on soils and geology. Depending on the resource, the impacts would be short-term and/or long-term in duration.

CHAPTER 3
AFFECTED ENVIRONMENT

3 AFFECTED ENVIRONMENT

This chapter provides a description of the existing environment that could be affected by the Project (the affected environment). The affected environment for visual resources, socioeconomics (including tourism), and recreation are addressed first because they were the most frequently expressed areas of concern during public scoping. Following the discussion of those resources, the final EIS addresses the affected environment for the human and built environment followed by the physical and biological environment.

About Chapter 3

Refer to **Chapter 1, Section 1.8** for a discussion of the structure of this document, as well as the "Reader's Guide."

Changes have been made to **Chapter 3** between the draft and final EIS in response to comments received during the draft EIS public review period (see **Section 1.5.3**). Refer to **Appendix L**, Section 1 for a discussion of changes made to the EIS.

This chapter presents a summary of detailed information contained in Technical Resource Reports, which were prepared for each resource area evaluated. These reports were prepared by independent experts at the direction of DOE, and are available for public review on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports).

The Project is divided into three geographic sections: Northern, Central, and Southern. This division is based on county boundaries, as described in **Section 2.2**. In addition, the final EIS addresses the affected environment in the WMNF (which contains areas within both the Northern and Central Sections) as a separate section as an aid to readers.

This chapter provides a description of the affected environment in five sections:

- **Section 3.1** presents background information on the resources analyzed and a discussion of features of the affected environment that are common among all geographic sections
- **Section 3.2** describes the study area of the Northern Section
- **Section 3.3** describes the study area of the Central Section
- **Section 3.4** describes the study area of the Southern Section
- **Section 3.5** describes the study area of the WMNF Section

The potential impacts associated with constructing and operating the Project are discussed in **Chapter 4** based on the environmental resources described in the following sections of **Chapter 3**.

3.1 GENERAL AFFECTED ENVIRONMENT

Section 3.1 provides information about the affected environment and is organized by resource. All resource sections in **Section 3.1** include a definition of the study area. The purpose of the study area is to define the spatial bounds of the analysis. Study areas are defined individually for each resource and may vary across resources. For resources with larger study areas that are more appropriately analyzed at a Project-wide scale, such as Socioeconomics, the majority of affected environment information is provided in **Section 3.1**. In contrast, the study area for Recreation is more specific to each geographic section, and thus more information is provided in **Sections 3.2, 3.3, 3.4,** and **3.5** and less information is in **Section 3.1**.

Resource	Study Area
Visual Resources:	Project corridors and viewshed (area from which the Project would be visible), extending up to 10 miles (16 km) on each side of the Project centerline
Socioeconomics:	Population, Property Valuation, Taxes: Coös, Belknap, Grafton, Rockingham, and Merrimack counties Tourism, Employment, Economic Output: State of New Hampshire Electricity System Infrastructure: State of New Hampshire and ISO-NE Region
Recreation:	Project corridors and viewshed
Health and Safety:	General Health and Safety Topics: Project corridors Contaminated Soils and Groundwater: 250 feet (76 m) on each side of the Project corridors Electric and Magnetic Fields (EMFs): 300 feet (91 m) on each side of the Project centerline
Traffic and Transportation:	Roadways: Project corridors Airports: 20,000 feet (6,096 m) on both sides of Project corridors
Land Use:	Coös, Belknap, Grafton, Rockingham, and Merrimack counties
Noise:	200 feet (61 m) on each side of the Project corridors
Historic and Cultural Resources:	Direct and Indirect Area of Potential Effects (APE) (see **Table 3-7**)
Environmental Justice:	Coös, Belknap, Grafton, Rockingham, and Merrimack counties
Air Quality:	Direct Impacts: Coös, Belknap, Grafton, Rockingham, and Merrimack counties Indirect Impacts: ISO-NE Region
Wildlife:	Project corridors
Vegetation:	Project corridors
Water Resources:	Project corridors
Geology and Soils:	Direct Impacts: Project corridors Earthquakes: 25 miles (40 km) on each side of the Project centerlines

As appropriate, additional information in **Section 3.1** may include: a description of analysis methods; applicable laws, regulations, policies, and guidelines; and a description of the general affected environment common to all geographic sections.

3.1.1 VISUAL RESOURCES

> **Project Corridor(s)**
>
> Area where the Project would be built, including areas of potential disturbance (e.g., laydown areas, access roads, etc.).

The study area for the visual resources analysis consists of the Project corridors as well as surrounding lands within the viewshed of each alternative. For this analysis, 10 miles (16 km) is considered the maximum extent of potential visual impacts. Beyond 10 miles (16 km), if any portion of the Project could be seen, it would have a minimal visual presence.[34]

Existing scenic conditions vary throughout each geographic section. For example, the study area of the Northern Section is characterized by a heavily forested rural landscape with less scenic impact from the

[34] Based on a review of past studies evaluating the visual presence of transmission structures, it was determined that 10 miles (16 km) is an appropriate threshold to consider (Driscoll et al. 1976a; Sullivan 2014a). Structures have the potential to be detected past 10 miles (16 km) by someone with a critical eye who was looking for them. However, 10 miles (16 km) is a more reasonable threshold for a casual observer with an interest in scenery.

existing PSNH transmission line compared to other sections. In contrast, while portions of the study area of the Southern Section are forested and rural, it also includes more developed areas such as Concord, NH, where greater scenic impacts already exist. Therefore, existing scenic conditions are discussed for each section individually in **Sections 3.2.1, 3.3.1, 3.4.1,** and **3.5.1**.

Two distinct methods are used to conduct the analysis:

1. GIS: The first method uses a geographic information system (GIS) to conduct three types of analyses: a visibility analysis, a landscape assessment, and an evaluation of visual exposure from roads (roads-based analysis).[35] This method results in quantitative indicators that are useful for comparing alternatives.

2. Viewpoint Assessment: The second method is a more focused viewpoint assessment that includes a visual inventory of the existing conditions and the preparation of representative photo-realistic visual simulations. An evaluation of Key Observation Points (KOPs) provides an in-depth description of the effects at specific viewpoints.

The visual analysis utilizes several quantitative indicators to characterize the condition of the existing environment and determine impacts that would result from implementation of the Project. These indicators are described below, along with a description of the process used to develop them.

3.1.1.1 GIS Visibility Analysis

The visibility analysis considers topography and surface land cover (i.e., vegetative height and structures) to determine the viewshed of existing and proposed transmission structures in the study area. The viewshed is the area from which the Project would be visible. It is one of four parts that comprise the entire visual analysis of the affected environment. The viewshed was calculated for the existing PSNH transmission line as well as components of the Project, including transmission structures, transition stations, and other aboveground facilities. The existing PSNH transmission line is the most conspicuous and visually impactful feature in the study area for Alternatives 2, 3, and the overhead portions of 5a, 5b, 5c, 6a, 6b, and 7. Therefore, the existing visual impact of the PSNH transmission line was explicitly calculated to more accurately present the potential impacts of the Project.

> **Viewshed**
>
> The area from which the Project would be visible. The viewshed was determined through the visibility analysis.

3.1.1.2 GIS Landscape Assessment

The landscape assessment considers the following variables to evaluate visual resources in the study area:

- *Intrinsic Visual Quality:* This is an index of the landscape's inherent potential for attractiveness, stemming from both landform (i.e., topography) and land cover classification (i.e., vegetation and development). Areas with greater topographic relief and more natural land cover are rated higher. The values range from 1 for "Very Low" (e.g., industrial development on flat land) to 5 for "Very High" (e.g., a mountain lake or forested mountains).[36]
- *Visual Magnitude:* This is an index of visibility weighted to account for the greater visual presence of an object (including transmission structures, transition stations, and other aboveground facilities)

[35] The importance of the visual exposure from roads is not well captured by a broad landscape assessment. The nationally available land cover data are often too coarse to represent the vegetation clearing associated with roads or the opportunity to see under the roadside vegetation canopy. Therefore, only the higher quality terrain and surface elevation data within 1.5 miles (2 km) on each side of the Proposed Action, which corresponds to the aboveground portions of the Project, were used to evaluate the visual condition seen from roads.

[36] This analysis was developed specifically for this EIS based on processes developed and implemented in previous studies (Linton 1968a).

when it is closer to the viewer. For this analysis, the number of structures (associated with the existing PSNH transmission line and proposed Project) visible and the distance from which they are visible was used to assess visual magnitude. The value ranges from 0, indicating "Potential Visibility," but unlikely to be noticed to 5 for "Very High," indicating a very dominant visual presence. For example, a location from which a few structures are visible over 5 miles (8 km) away will have a visual magnitude index of 0. In contrast, a location from which a few structures are visible within 300 feet (91 m) will have a visual magnitude index of 5. The visual magnitude provided in **Sections 3.2.1, 3.3.1, 3.4.1,** and **3.5.1** is the mean value for locations with visibility of the existing PSNH transmission line within each geographic section (i.e., the viewshed). The potential increase in visual magnitude resulting from the Project, when compared with the visual magnitude of the existing PSNH transmission line, is presented in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1**.

- *Visual Impact:* This index combines intrinsic visual quality and visual magnitude (both described above). Therefore, it takes topography, vegetation, and the prominence of visible structures into account, but does not consider the sensitivity of the people or sites affected. Visual impact does not account for context (e.g., a transmission line in an urban environment could have a similar visual impact to one located in a mountainous environment). This index is an intermediate metric used to determine scenic impact.
- *Scenic Impact:* This index accounts for visual impact (an intrinsic measure) and the scenic sensitivity of the viewpoint. Scenic sensitivity considers "social concerns," including the level of designation of a scenic resource, the importance of scenery to the dominant user activity, and the potential for area residents to see the object (in this case, the transmission line and associated facilities). The value ranges from 0, indicating "Potential Visibility," but no scenic impact; to 5 for "Very High," indicating a very high adverse and likely intrusive scenic impact. For example, a location with a low visual impact index and a low level of potential visual exposure will have a scenic impact index of 0 or 1. In contrast, a location with a high visual impact index and a high level of visual exposure will have a scenic impact index of 4 or 5. Scenic impact accounts for both context and intensity, and thus is a good indicator of the overall level of impacts to visual resources. The scenic impact provided in **Sections 3.2.1, 3.3.1, 3.4.1,** and **3.5.1** is the mean value for locations with visibility of the existing PSNH transmission line within each geographic section (i.e., the viewshed). The potential increase in scenic impact resulting from the Project, when compared with the scenic impact of the existing PSNH transmission line, is presented in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1**.

3.1.1.3 GIS Roads-Based Analysis

- *Road Crossings:* This indicator is the number of roads crossed by the Project corridor for the overhead transmission line. Roads are identified by functional class: principle arterial (e.g., Interstate), arterial, collector, local roads, and non-public (e.g., logging roads). The annual average daily traffic (AADT) is provided for road crossings, where available. This was calculated for the existing PSNH transmission line as a feature of the affected environment, and for all proposed sections of overhead transmission line for action alternatives.
- *Vehicle Exposure on Scenic Roads:* This indicator estimates the number of hours that vehicles will travel through areas on state- or nationally-designated scenic roads with visibility of transmission structures. This is derived from the distance along which the Project is visible, a nominal speed limit based on the road's functional classification, and the AADT. This analysis considers the visibility from roads within 1.5 miles (2 km) on either side of the Project (for overhead portions), as determined by the availability of high quality surface and terrain cover data for this 3-mile (5-km) wide corridor. Visibility is considered up to 10 miles (16 km) in either direction within this 3-mile (5-km) wide corridor.

3.1.1.4 Viewpoint Assessment

To provide a representation of how the Project would likely appear several years after construction, a viewpoint assessment was conducted using visual simulations. Several thousand photographs were taken from selected viewpoints along the Project corridor during a field inventory. Viewpoints were selected by identifying potential scenic resources within 3 miles of the Project corridor.[37] Photographs taken at selected viewpoints were chosen to represent the range of landscape types and distances, the most sensitive scenic resources that would be affected, and a geographic distribution along the corridor. Seventy-three locations were identified for use in preparing simulations. Of the 73 visual simulation locations, 22 were identified as KOPs to represent impacted views from a range of distances and landscape contexts, with some emphasis placed on designated scenic resources. Visual simulations for the KOPs are included in **Appendix E** and a detailed description of the viewpoint assessment process can be found in the **Visual Impact Assessment** (http://www.northernpasseis.us/library/final-eis/technical-reports).

- *Contrast-Dominance:* for each KOP location (see **Appendix E**), the contrast-dominance of the existing PSNH transmission line (visible in photographs) and simulated Northern Pass transmission line (visible in simulations produced for this final EIS) were evaluated. The contrast-dominance rating system used in this analysis is based on established systems of visual impact assessments, including systems used by the USACE and the Bureau of Land Management (Sheppard and Newman 1979a; Smarden et al. 1988; BLM 1986a). This analysis provides a numeric metric to compare the overall effect of the Project on the view from particular locations. Six landscape architects who were involved in the field inventory, which included extensive fieldwork and photographically documenting the landscape's visual condition, rated the degree of color, form, line, texture, and scale contrasts, as well as the spatial and scale dominance of the transmission line with the surrounding landscape. **Table 3-1** shows the rating system for contrast-dominance.

Table 3-1. Visual Contrast-Dominance Rating

Contrast-Dominance Rating	Numeric Value Range	Description
Severe	36–45	The visual change is very large, and in sensitive settings is likely considered unreasonably adverse by a casual observer.
Strong	27–35	The visual change is large and is likely to be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
Moderate	18–26	The visual change is clearly noticeable to a casual observer, and is likely to be considered adverse.
Weak	9–17	The visual change is noticeable, but so small as to be considered unimportant.
Negligible	0–8	The visual change is likely to go unnoticed by a casual observer.

Source: Sheppard and Newman 1979a
Note: "Visual change" is evaluated in comparison to the natural condition.

3.1.2 SOCIOECONOMICS

The study area for the socioeconomics analysis is defined at the county or geographic section level for population, property valuation, and taxes (taxes are also analyzed at the town level), and at the state level for tourism, employment, economic output and electricity system infrastructure. Metrics relating to

[37] Beyond this distance, the Project is visually part of the background and will only have a modest visual presence. At the request of the WMNF staff, all WMNF scenic resources within 10 miles of the proposed corridor were included in this initial search.

electricity system infrastructure are also discussed at the regional level. Socioeconomic metrics specific to certain geographic areas are discussed in **Sections 3.2.2**, **3.3.2**, **3.4.2**, and **3.5.2.**

In undertaking an economic evaluation, there are a variety of models which could be selected. Anticipated economic impacts were evaluated using complex software models as well as additional calculations developed specifically for this analysis. Additional information found in the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) provides a description of the methods of the analysis, including the rationale for the selection of the specific models used, as well as a description of the input parameters and assumptions. It is recognized that the specific results of an evaluation of this type may vary based upon the model(s) selected.

3.1.2.1 Population

The Project would cross through five counties in New Hampshire: Coös, Grafton, Belknap, Merrimack, and Rockingham. As of 2015 (the best available data at the time of analysis) New Hampshire had a population of 1.3 million, with approximately 628,000 persons residing in the five potentially affected counties. The bulk of the state's population resides in the southern counties of Rockingham and Hillsborough which together account for more than half of the state's population. Between 2010 and 2015 the population of New Hampshire grew at an average annual rate of 0.27 percent, making the state one of the slowest-growing in the U.S.

Table 3-2 displays population statistics for the potentially affected counties, New Hampshire, and the United States.

Table 3-2. Population Statistics for Potentially Affected Counties and Other Regions, 2015

Region	Population	Annual Population Growth Rate (2010–2015)	Population Density (persons per square mile)
Total – Potentially Affected Counties	627,878	0.12%	110
New Hampshire	1,324,201	0.27%	142
U.S.	316,515,021	0.63%	83

Source: U.S. Census Bureau 2015a, b; 2017a

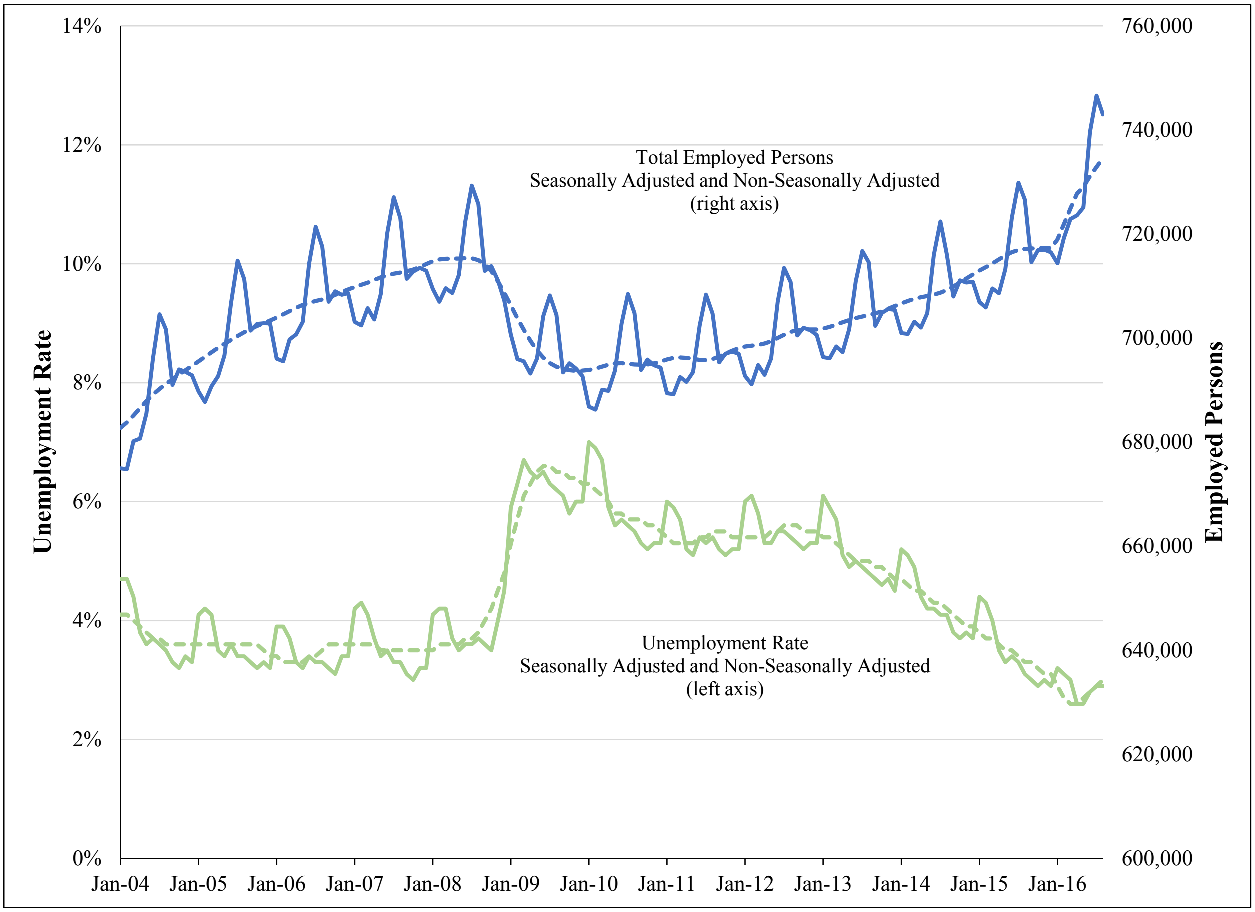
3.1.2.2 Employment

In 2015 the five counties potentially affected by the Project accounted for 48 percent of the employed persons in New Hampshire. As of 2015 the largest percentage of the labor force in the five counties was employed in the "educational, health, and social services" sector, accounting for 25 percent of total employment.[38] The "retail trade" sector was the second largest contributor, accounting for about 13 percent of employment. These two industry groups were also the two biggest employers in New Hampshire and across the U.S. as a whole.

Employment in New Hampshire fluctuates seasonally, peaking in the summer months with the increase in tourism and employment of students. Statewide employment levels during the middle of summer generally exceed mid-winter levels by about 20,000 positions—equivalent to about 3 to 4 percent of New Hampshire's total labor force (see **Chart 3-1**).

[38] Sectors were determined using 2012 the North American Industry Classification System (NAICS) sector codes (U.S. Census Bureau 2015b, 2016d).

Chart 3-1. Employed Persons and Unemployment Rate in New Hampshire, 2004 to 2016



Source: FRED 2016a, BLS 2016a

3.1.2.3 Taxes

New Hampshire funds its budget through a variety of taxes on businesses and residents, with the major contributors being taxes on property, taxes on business profits and enterprise values, and sales taxes for specific consumer purchases, namely tobacco, alcohol, meals, and accommodations. The New Hampshire Department of Revenue Administration (NHDRA) administers 16 such taxes that generated approximately $1.8 billion in revenue in 2016 (NHDRA 2016b). The state has no personal income tax or statewide sales tax. A relevant statewide tax for the purposes of this analysis is the Utility Property Tax, currently set at $6.60 per $1,000 assessed value of utility properties, collected annually.[39]

Municipalities, counties, and other local jurisdictions in New Hampshire generate revenues primarily through property taxes, including taxes on utility-owned properties. For the regions through which the Project would pass, combined tax rates for local, municipal, and county authorities generally fall in the range of 1 to 4 percent ($10 to $40 per $1,000 assessed value), collected annually.

3.1.2.4 Tourism

Tourism is estimated to be the second largest industry in New Hampshire (NPR 2012a). In 2015 there were 38.4 million visitor trips in New Hampshire for recreation and business, with direct spending by travelers of $5 billion (Visit NH 2017). Tourism data are generally aggregated on statewide and regional levels that

[39] A tax imposed upon the value of utility properties within New Hampshire and paid by the utility property owner.

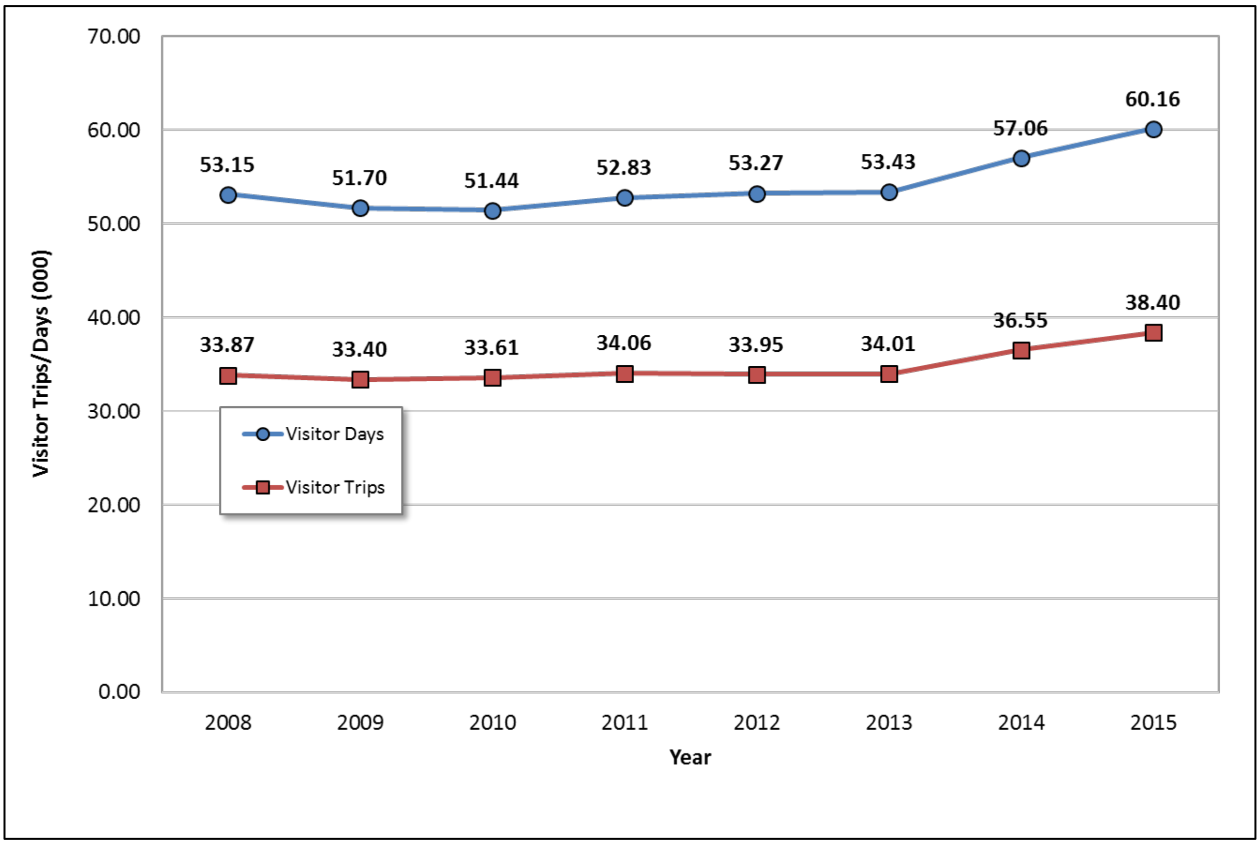
do not specifically align with the study areas of the Northern, Central, Southern, and WMNF Sections. Therefore, the affected environment for statewide tourism is presented in this section.

This section presents general information on the characteristics of tourism within New Hampshire in order to provide a common perspective of the types of tourism, its influence on the overall economy, and the factors that most affect tourism.

Tourism Trips and Purpose of Trips

The estimated annual number of visitor trips to, and visitor days spent in, New Hampshire is presented in **Chart 3-2**. The number of annual visitor trips has been increasing. In 2015 38.4 million visitor trips were recorded, up 5.1 percent from 2014. This increase is correlated with the increase in rooms and meals taxable sales attributable to travelers, as discussed below. This large number of trips and days illustrates that the tourism economy is important to the state as a whole.

Chart 3-2. Total Visitor Days and Visitor Trips in New Hampshire, 2008 to 2015



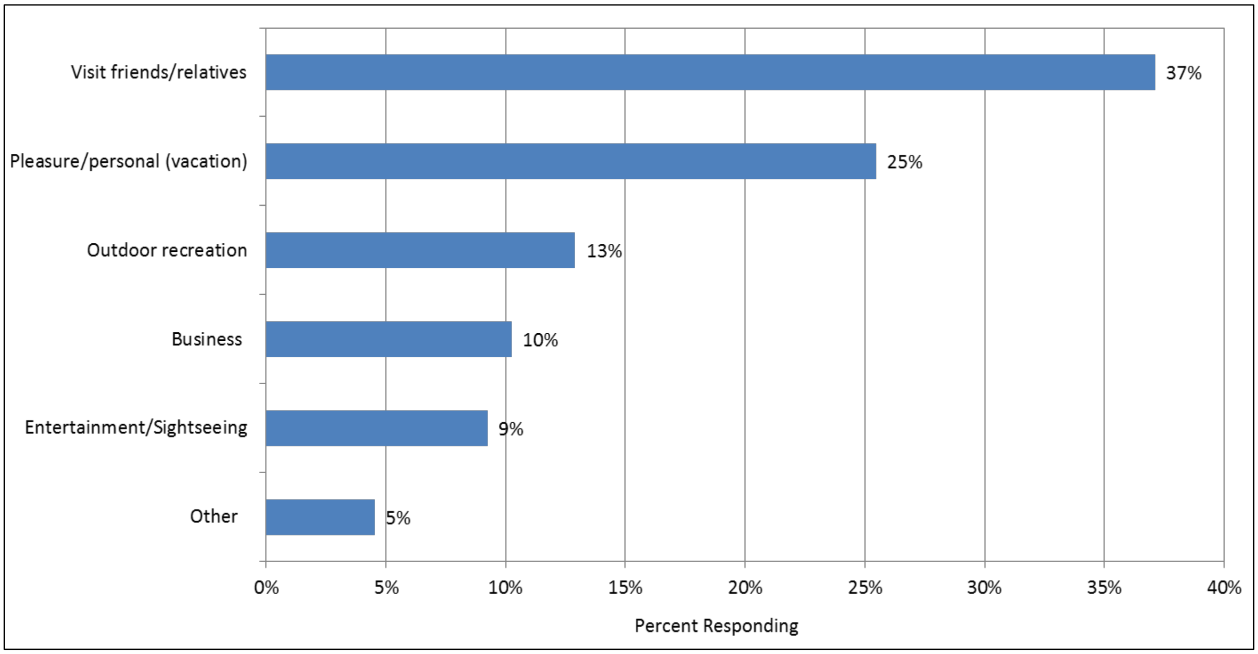
Source: INHS 2017

Plymouth State University's Institute for New Hampshire Studies (INHS) tracks many different aspects of visitation and tourism in the state, including the reasons people visit New Hampshire. The Institute conducts surveys during various timeframes and seasons regarding visitation to New Hampshire.

The most recent seasonal studies are available for spring 2010/11 (combined), summer 2012/13 (combined), winter 2010/11 (combined), and fall 2009. These surveys are typically conducted online with a qualified sample of people who have visited New Hampshire during the period of interest.

The results of the primary purpose of the visit to New Hampshire question by season (summer, fall, winter, and spring) have been consolidated in the following graph. The top reasons for visiting New Hampshire are visiting friends/relatives, pleasure/personal (vacation), outdoor recreation, business, and entertainment/ sightseeing (see **Chart 3-3**).

Chart 3-3. Primary Purpose of Trip to New Hampshire



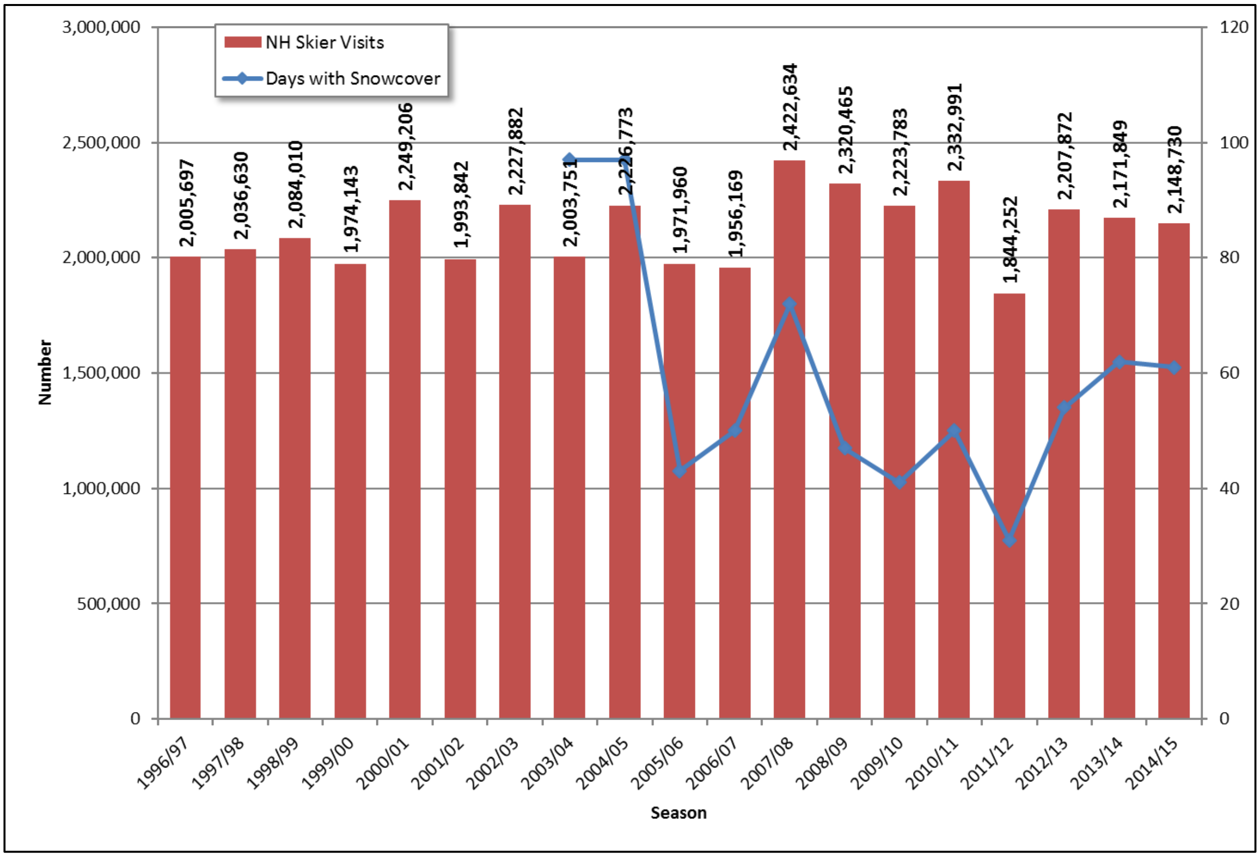
Source: INHS 2015

Some of the key aspects of tourism in New Hampshire are the natural environment, scenery, and outdoor recreation. Indeed, visitors to New Hampshire say that they are participating in a variety of outdoor activities, as presented by research from the INHS. The type of activity varies by time of the year, but across all seasons, visiting friends/relatives is the top activity.

In the winter months, downhill skiing and snowboarding are important contributors to the tourism economy. Other winter activities, including cross-country skiing, snowshoeing, tubing, and snowmobiling also have a measurable contribution to the state's tourism economy.

The downhill ski areas in New Hampshire typically attract around 2.0 to 2.4 million visitors per winter season. Annual fluctuations in visitation to ski areas are correlated with snowfall, as shown in **Chart 3-4**. Even though ski areas have invested in modern snowmaking equipment and can operate with little natural snow, the perception of the conditions is highly influenced by the presence of natural snow cover.

Chart 3-4. Downhill Snowsports Visits and Days with Snow Cover, 1996/97 to 2014/15

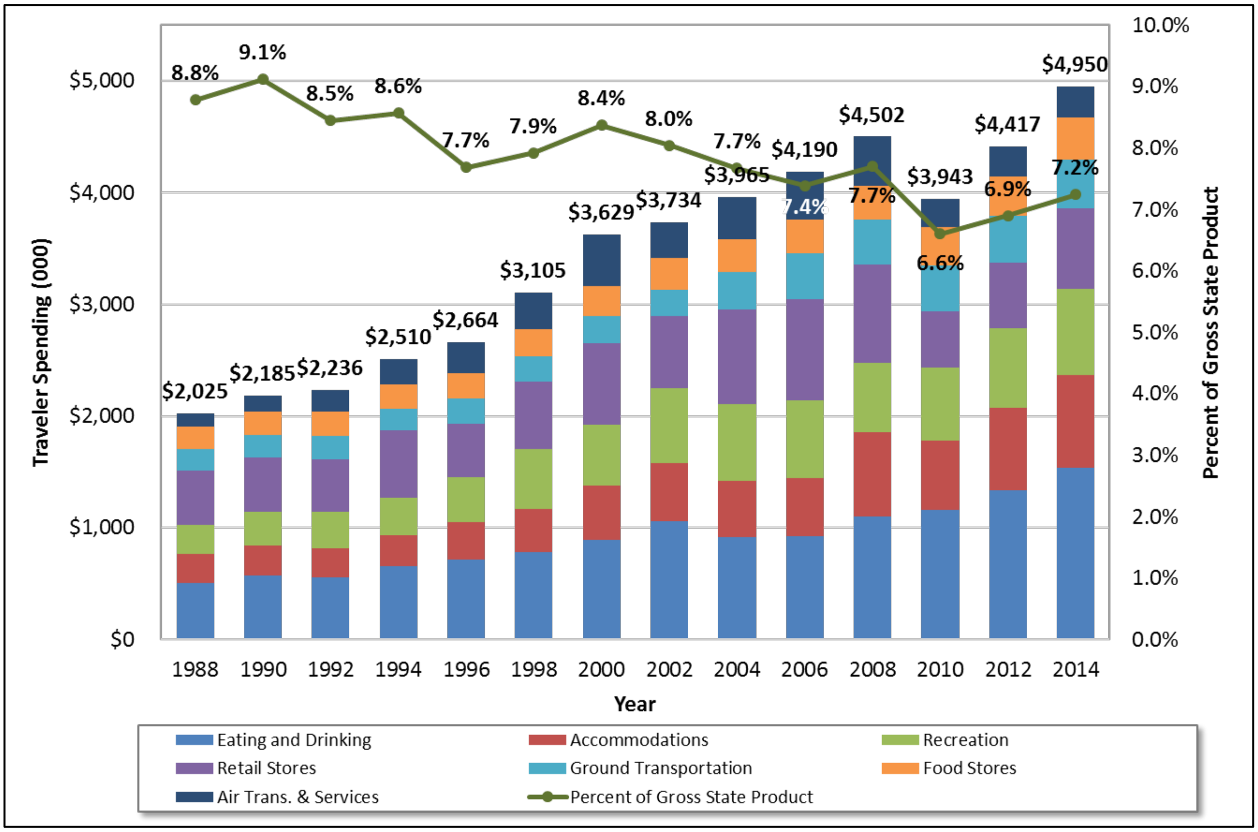


Source: INHS 2017, NSAA 2017

Visitor Spending and Taxable Sales

Direct traveler spending is a key indicator of the level of tourism in the state. **Chart 3-5** shows the direct spending by travelers, as estimated by the INHS. The primary components of direct traveler spending are eating and drinking (about 30 percent of direct spending), accommodations (about 15 percent), recreation (about 15 percent), and retail stores (about 13 percent). The amount of direct traveler spending accounts for about 7 percent of the total gross state product for New Hampshire.

Chart 3-5. Total Direct Traveler Spending by Category, 1988 to 2014



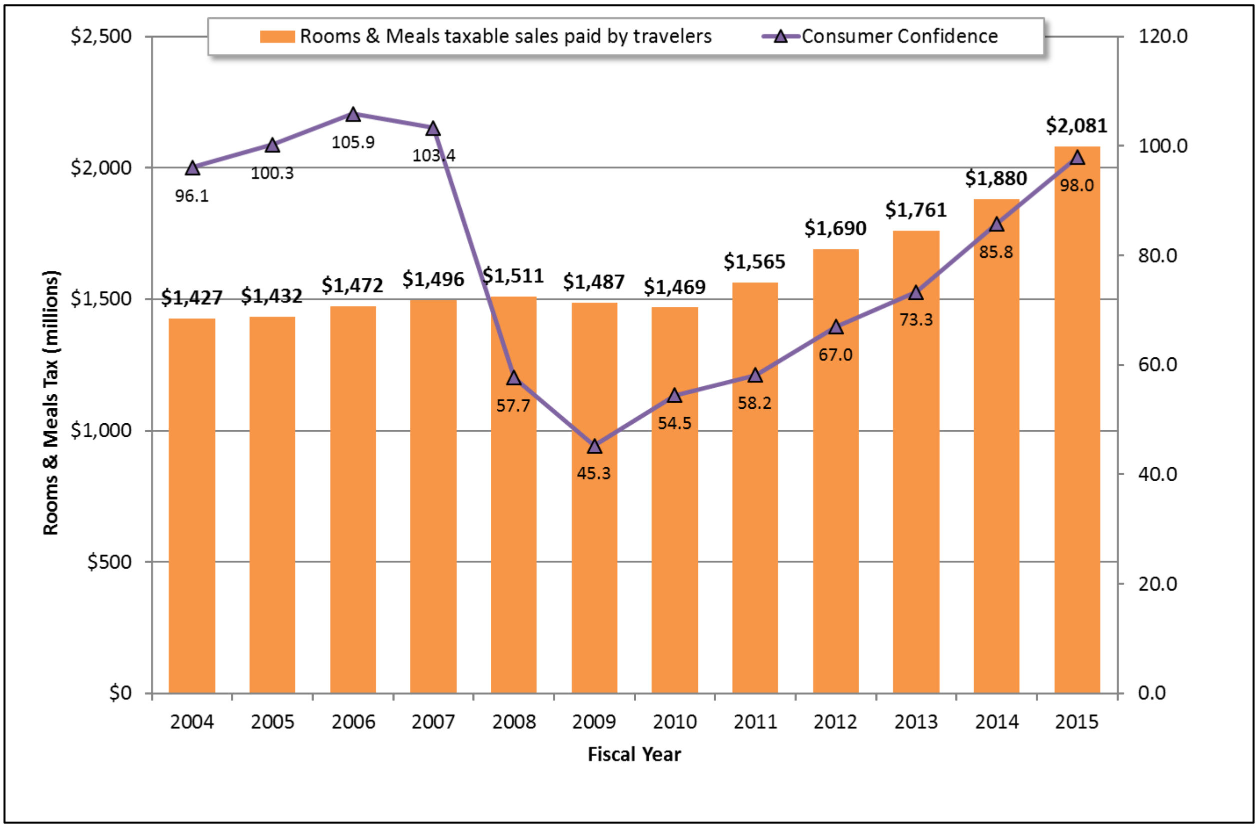
Source: INHS 2015, usgovernmentspending.com 2017

Direct traveler spending is calculated by Visit New Hampshire, which uses seven distinct travel regions to subdivide spending within the state. The Merrimack Valley Region, which includes Concord, Manchester, Nashua, and Salem, NH, accounts for the largest share of direct spending by travelers of any region, at $1.45 billion. The White Mountain Region accounts for $1.26 billion. Summer is the busiest tourism season, accounting for just under 40 percent of annual direct visitor spending, followed by autumn (23 percent), winter (18 percent), and spring (19 percent).

The Rooms and Meals Tax is another reliable indicator of the state's level of tourism. The rooms tax is almost exclusively paid for by tourists, while the meals tax is estimated by INHS to be approximately 50 percent attributable to tourists.

Chart 3-6 displays the pattern of total rooms and meals taxable sales attributable to travelers, as estimated by the INHS. Sales have slowly risen since 2004, with slight recession-related deviations between 2008 and 2010. The relatively quick post-recession recovery in New Hampshire is an indicator of the strength and resiliency of the tourism economy in the state. As shown below, consumer confidence is correlated with the overall level of tourism in the state.

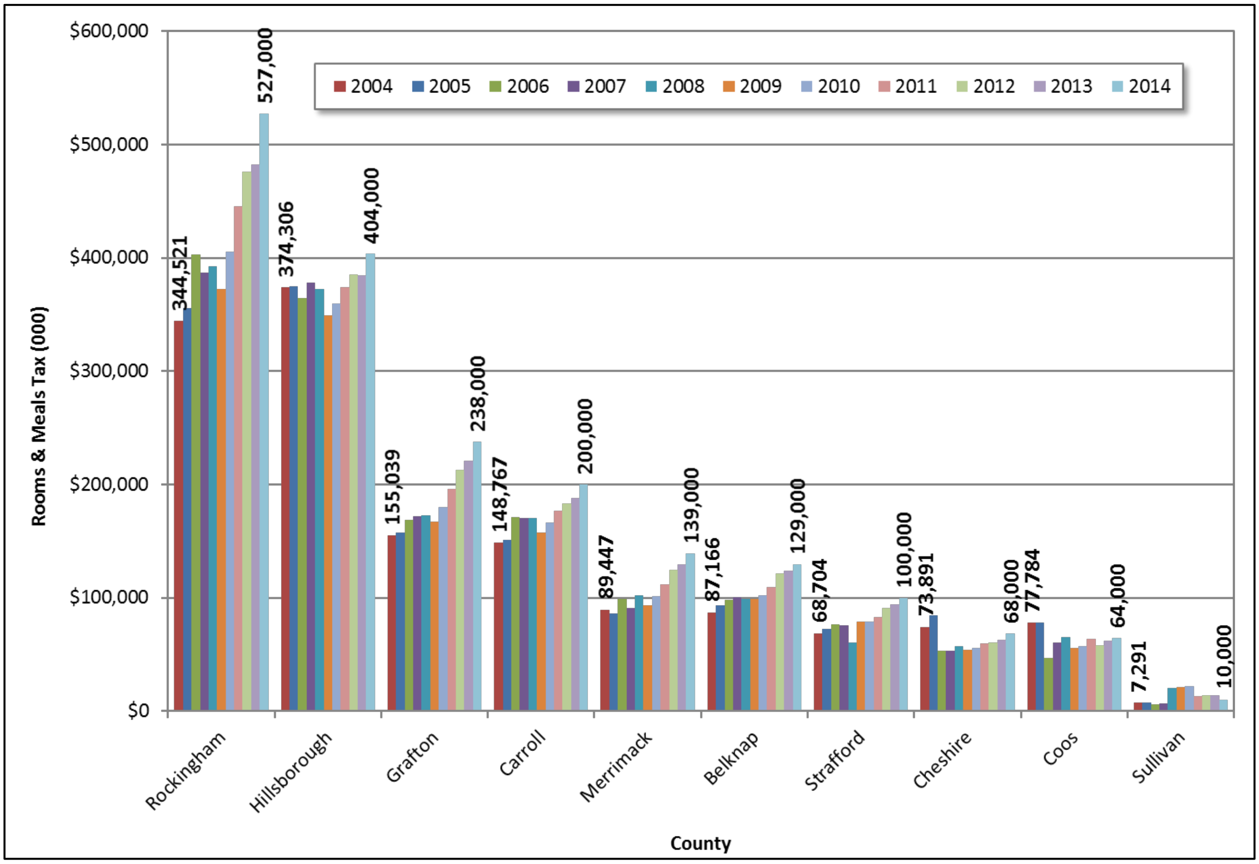
Chart 3-6. Rooms and Meals Taxable Sales Paid by Travelers, FY 2004 to 2015; Consumer Confidence



Source: INHS 2015, The Conference Board 2017

Chart 3-7 shows the rooms and meals taxable sales by county. Urban counties such as Rockingham and Hillsborough have higher levels of sales attributable to travelers. Counties such as Grafton and Carroll that are located in scenic areas with available recreational opportunities, also exhibit high levels of taxable sales.

Chart 3-7. Rooms and Meals Taxable Sales Paid by Travelers by County, FY 2004 to 2014

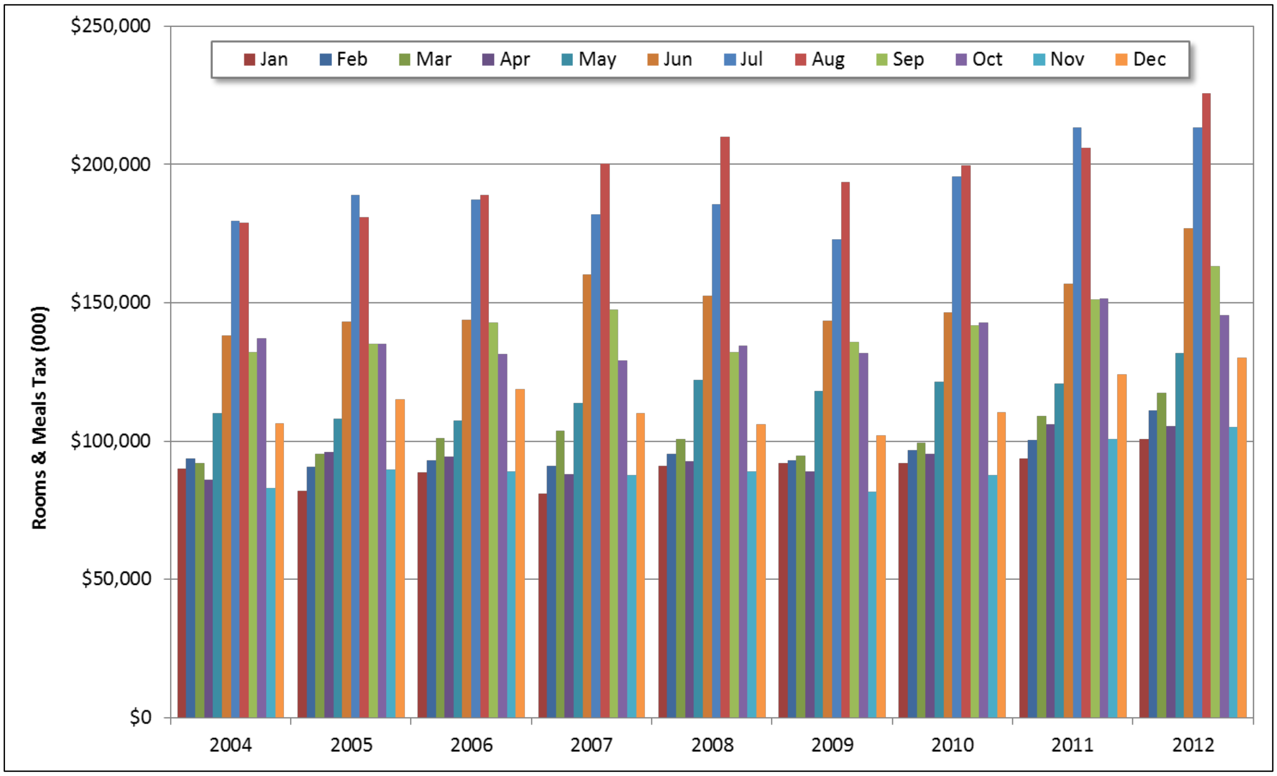


Source: Belin 2013

As a general reference, and depending on the alternative, about 40 percent of the mileage of the Project would be in Coös County and about 32 percent would be in Grafton County, representing two-thirds of the mileage of the Project. Additionally, depending on the alternative, about 20 percent of the mileage would be in Merrimack County, 4 to 8 percent of the mileage would be in Belknap County, and 4 percent in Rockingham County.

The seasonality of tourism in New Hampshire, as measured by monthly collections of rooms and meals taxable sales, shows that August (13.0 percent of annual sales, on average) and July (12.5 percent) are the top months; these months correlate with school vacations and family summer travel. **Chart 3-8** shows rooms and meals taxable sales by month. Data through 2014 are not available by month, but a pattern similar to historic results is assumed to continue.

Chart 3-8. Rooms and Meals Taxable Sales Paid by Travelers by Month, 2004 to 2012



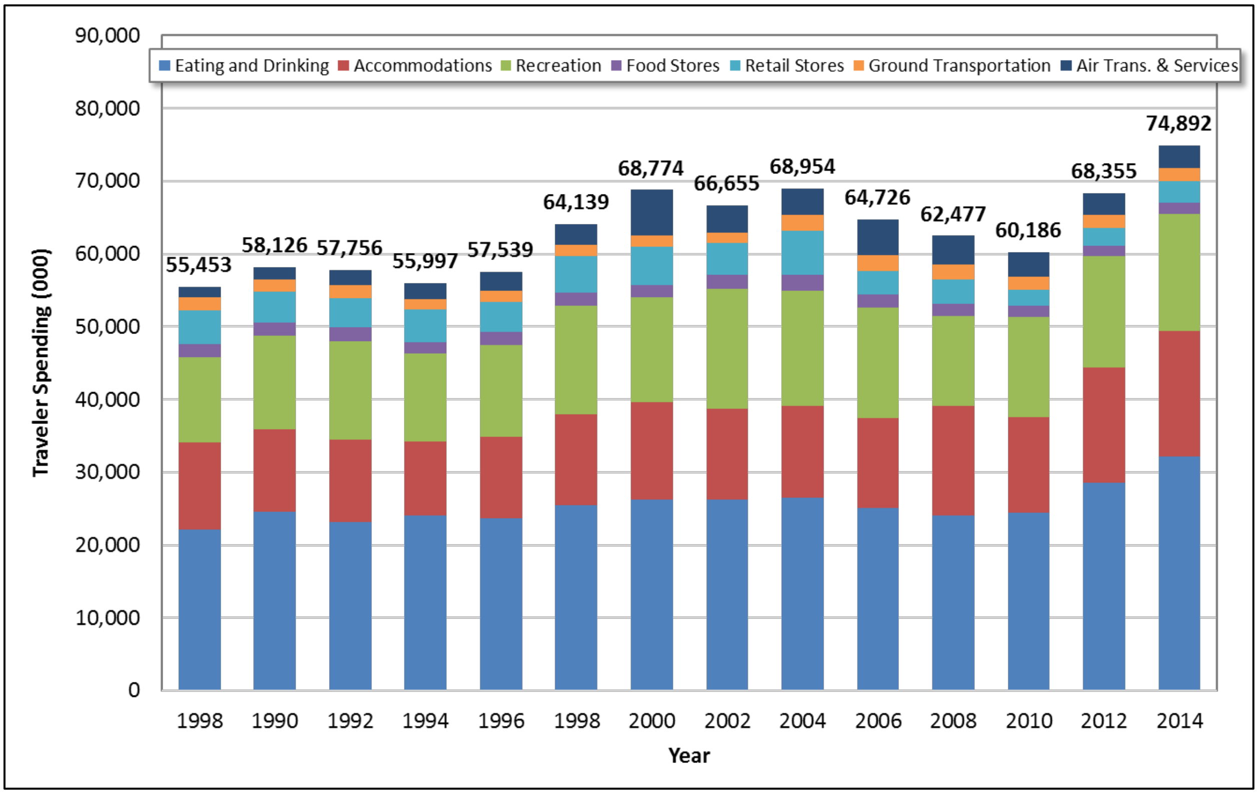
Source: Belin 2013

Second home ownership often reflects the desirability of vacationing in a certain area. The U.S. Census Bureau tracks homes that are used for vacation or occasional use, or “second homes.” According to the 2010 U.S. Census, New Hampshire has just under 64,000 second homes, which is slightly more than 10 percent of the residential housing stock in the state. The primary areas of concentration for second homes are the Lakes Region and the White Mountains (NPR 2011a). Little direct study has been done on the use of these second homes, so little is known about the number of days they are occupied, the amount of jobs and taxes generated, or other factors that might quantify the impact of second homes in New Hampshire.

Tourism-Related Employment

Approximately 68,000 New Hampshire residents are employed in tourism-related industries. Since 2006 businesses such as air travel, ground transportation, and retail stores have employed fewer people. Meanwhile, recreation, accommodations, and eating/drinking establishments have grown in the number of people they employ. **Chart 3-9** shows employment in tourism, by sector.

Chart 3-9. New Hampshire Residents Employed in Tourism by Sector, 1998 to 2014



Source: INHS 2015

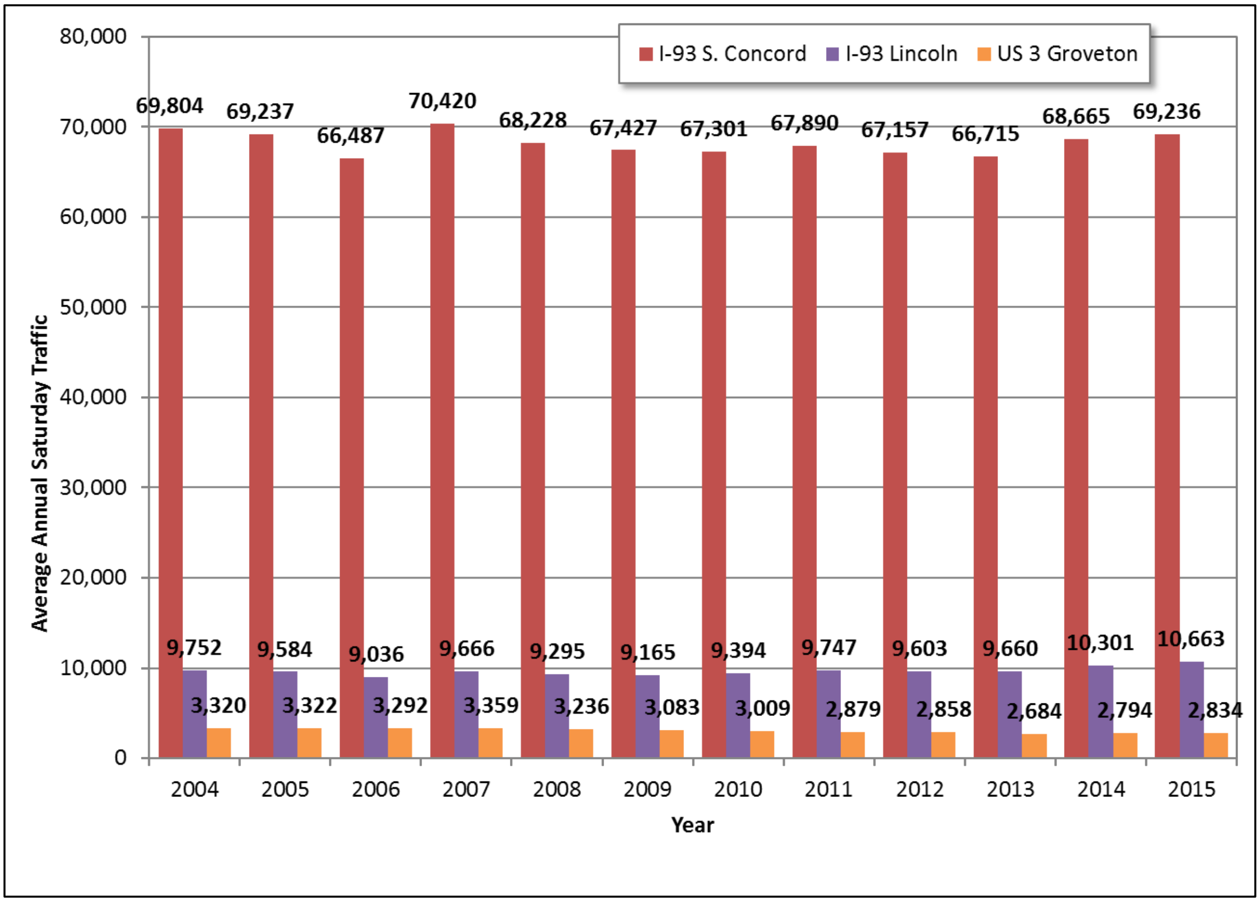
Tourism-Related Automobile Traffic

Saturday traffic is generally used as an indicator of leisure or tourist traffic, because it does not include weekday commuting traffic. However, Saturday traffic still includes some local residents running errands, commercial traffic, and other non-tourism traffic; the exact share of the Saturday traffic volume that is attributable to visitors is not certain. Nonetheless, Saturday traffic volume provides a reasonable proxy for relating general tourism levels.

Several of the Project alternatives cross or utilize the I-93 corridor through the White Mountains. The average number of vehicles passing by Lincoln, NH, on I-93 (both northbound [NB] and southbound [SB]) is about 10,500 vehicles per Saturday between 2004 and 2015. The 2015 average Saturday traffic volume was 10,663, up 0.8 percent over 2014.

Along with I-93 in Lincoln, NH, **Chart 3-10** shows average Saturday traffic on I-93 in South Concord, NH (about 68,000 vehicles per day) and on US Route 3 in Groveton, NH (about 2,800 vehicles per day) between 2004 and 2015. The US Route 3 location in Groveton, NH, is proximate to the proposed Northern Pass line in Coös County.

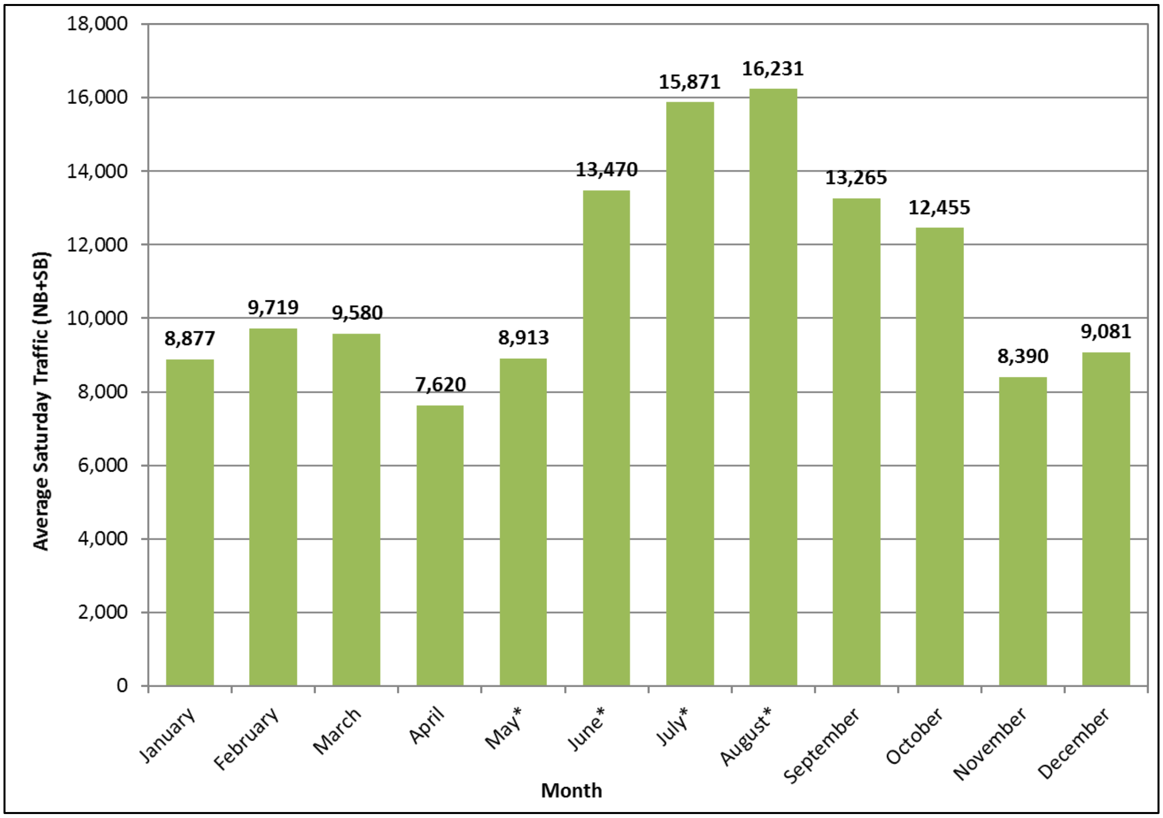
Chart 3-10. Average Annual Saturday Traffic, Selected Routes (NB+SB), 2004 to 2015



Source: NHDOT 2017a, INHS 2017

The seasonality of traffic on I-93 at Lincoln, NH, is presented in **Chart 3-11**. The data show that the busiest days for traffic on I-93 occur in the summer season. Similar to the Rooms and Meals Tax collected by month discussed previously, Saturday traffic on I-93 is highest in August and July, followed by June, September, and October. February is notable as the highest non-summer/fall month of the year, with an average of 9,719 vehicles per Saturday.

Chart 3-11. Average Saturday Traffic by Month, I-93 at Lincoln (NB+SB), 2015



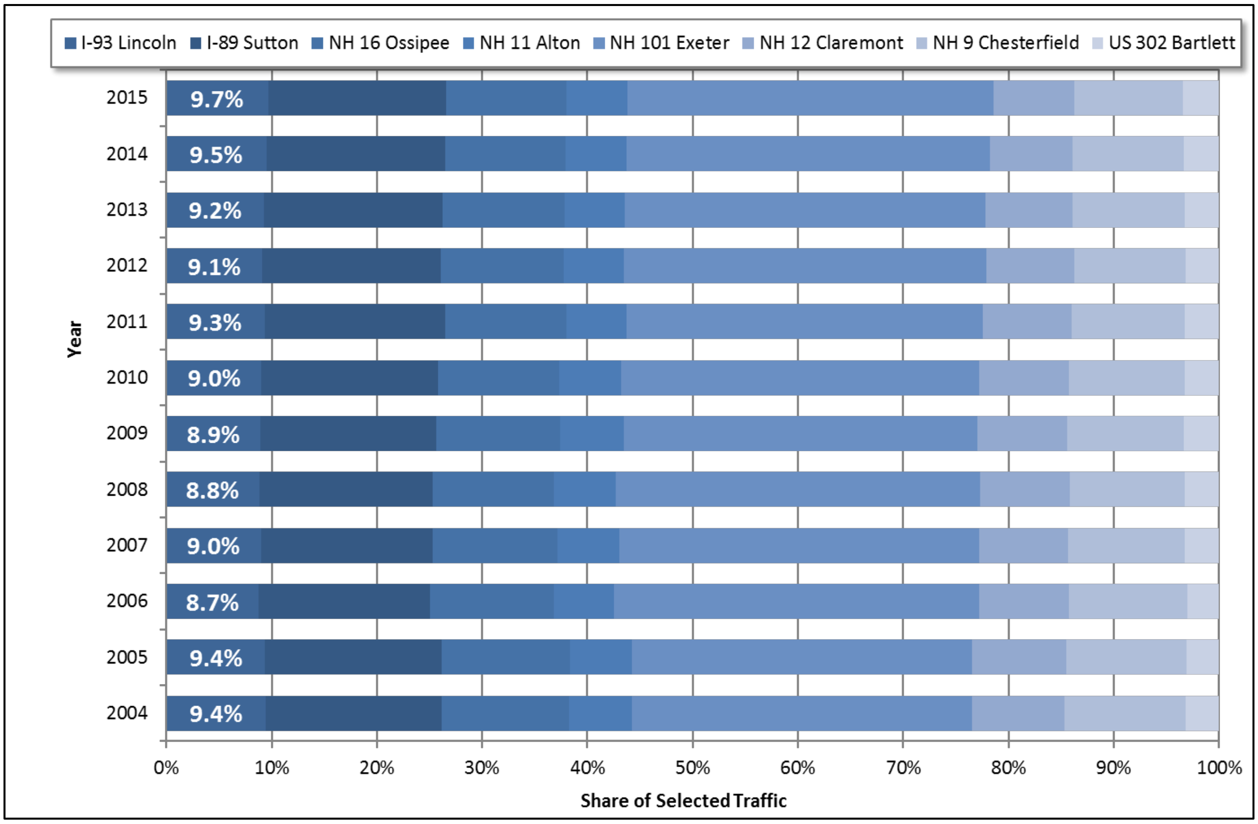
Source: NHDOT 2015, INHS 2017
Note: *data not available; results extrapolated from historic results

To put the Saturday traffic volume on I-93 at Lincoln, NH, in context, traffic on the following tourism routes was gathered and analyzed. The routes selected are a subset of roads that the Institute for Tourism Studies (ITS) at Plymouth State University tracks as indicators of tourism levels in the state and were evaluated based on proximity to the Project. The selected roads are as follows:

- I-93 Lincoln, NH: Main conduit to the western White Mountains area
- I-89 Sutton, NH: Route to the Lake Sunapee area from the east
- NH Route 16 Ossipee, NH: Road to the eastern side of the White Mountains from the south
- NH Route 11 Alton, NH: Route to Lake Winnipesaukee from the south
- NH Route 101 Exeter, NH: Main conduit east/west connecting Manchester to the Seacoast
- NH Route 12 Claremont, NH: Entrance to New Hampshire from I-91 in Vermont, heading to Lake Sunapee from the west
- NH Route 9 Chesterfield, NH: Entrance to New Hampshire from I-91 in Vermont, heading to Keene, NH and the Monadnock region
- US Route 302 Bartlett: Route through the White Mountains passing through Crawford Notch

These roads are the major tourism routes through the state, and the Saturday traffic counts are a comparable proxy of leisure (non-commuting) traffic. **Chart 3-12** shows that I-93 through Lincoln, NH, carries about 9.7 percent of all Saturday traffic on the selected tourism roads in New Hampshire.

Chart 3-12. Share of Average Annual Saturday Traffic, Selected Routes (both directions), 2004 to 2015



Source: NHDOT 2017a, INHS 2017

Cultural and Historical Tourism

The New Hampshire Division of Historical Resources (NHDHR) was established in 1974 to preserve the "historical, archeological, architectural, engineering, and cultural heritage of New Hampshire" and establish that these resources are "among the most important environmental assets of the state" (N.H. Rev. Stat. Ann. § 227-C:1-a).

Since 2001 approximately 288 resources have been listed on the State Register of Historic Places, including eight new additions in 2014. The growing list illustrates the continued importance of preserving these cultural assets, which are enjoyed by both residents of New Hampshire and non-residents. Statistics about the volume and impact of cultural tourism are not specifically collected, but the rich and deep history of New Hampshire certainly contributes to the overall level of tourism in the state.

The New Hampshire tourism board lists nine separate cultural itineraries, and three distinct historical itineraries, for visitors to enjoy. Visitor counts or numbers of people participating in these tours are not specifically tracked or collected.

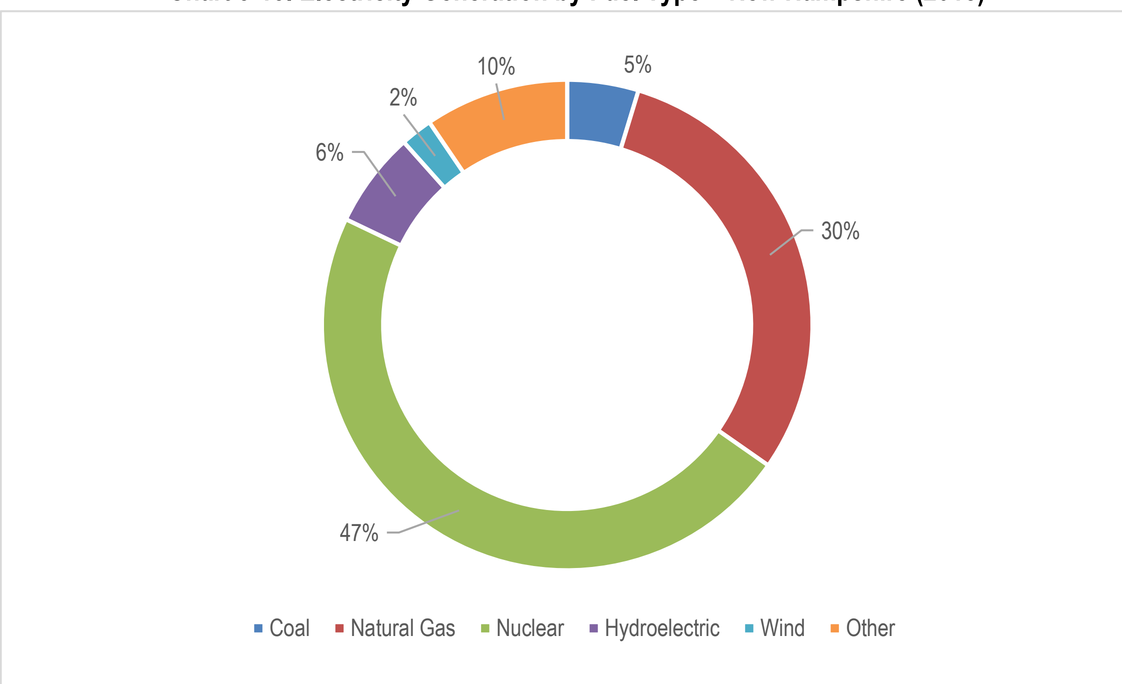
3.1.2.5 Electricity System Infrastructure

Retail sales of electricity in New Hampshire totaled 10,998 gigawatt-hours (GWh) in 2015, representing approximately 0.3 percent of total U.S. electricity consumption. New Hampshire is ranked as the seventh lowest state in terms of electricity consumption per capita, with annual retail sales of about 8,325 kilowatt-hours (kWh) per capita compared to a nationwide average of about 11,858 kWh per capita. In New Hampshire, the residential sector accounts for 41 percent of electricity consumption, the commercial sector for 41 percent, and the industrial sector for 18 percent. The comparable figures for the U.S. as a whole are 38 percent, 36 percent, and 26 percent, respectively.

As of 2015 the average retail price for electricity paid by consumers in the New England region was 16.5 cents/kWh, compared to 10.4 cents/kWh across the U.S. as a whole. Prices in New England (essentially the ISO-NE region) were the highest of any region in the contiguous U.S. Average prices in New Hampshire were 16.0 cents/kWh, ranking fourth-highest across the contiguous states, lower only than prices in Connecticut, Rhode Island, and Massachusetts.

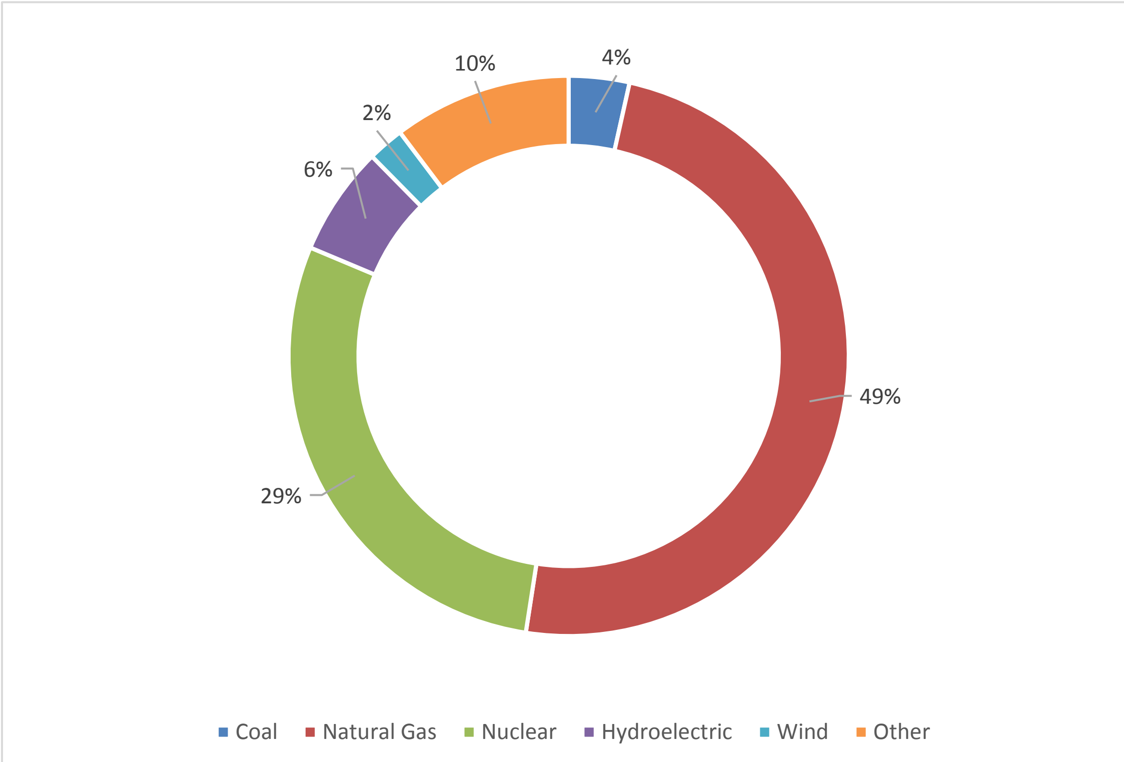
New Hampshire and the broader New England region are primarily reliant on natural gas-fired and nuclear generation for electricity supply, with 77.9 percent of generation in 2015 coming from those two types of power plants across New England (77.3 percent in New Hampshire). In contrast, the U.S. as a whole is more reliant on coal-fired generation (33.2 percent), with nuclear and natural gas responsible for only 52.3 percent of power generation. **Chart 3-13**, **Chart 3-14**, and **Chart 3-15** display the distribution of electricity generation by fuel type for New Hampshire, New England, and the U.S., respectively.

Chart 3-13. Electricity Generation by Fuel Type – New Hampshire (2015)



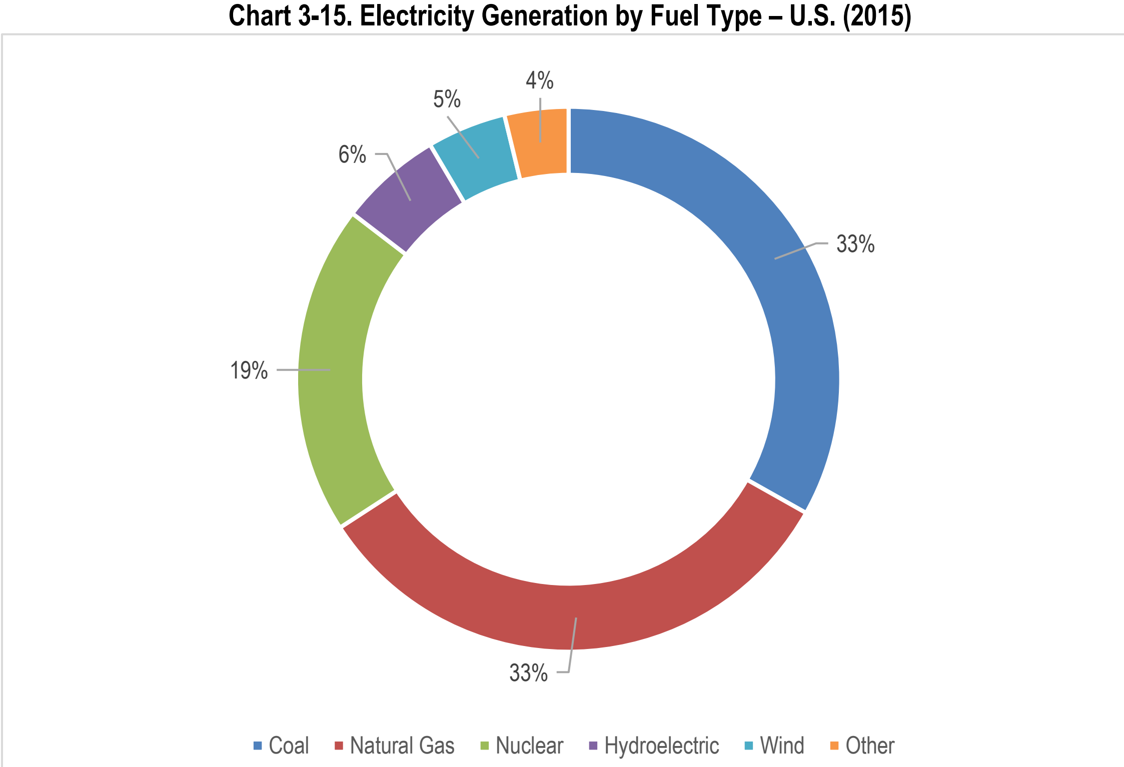
Source: EIA 2017a

Chart 3-14. Electricity Generation by Fuel Type – New England (2015)



Source: EIA 2017a

Chart 3-15. Electricity Generation by Fuel Type – U.S. (2015)



Source: EIA 2017a

3.1.3 RECREATION

The study area for the recreation analysis consists of the Project corridors for all alternatives as well as surrounding lands within the viewshed of each alternative. The study area for Recreation is more specific to each geographic section, and thus more detailed information is provided in **Sections 3.2.3, 3.3.3, 3.4.3,** and **3.5.3** and general Recreation information is discussed below. The study area includes tracts of land and trails managed by the WMNF, USFWS, NHDRED, New Hampshire State Parks and Division of Forests and Lands (NHDFL), counties and municipalities, non-government organizations, and private landowners.

Recreation is a primary land use across New Hampshire, and opportunities for recreation and types of recreational lands vary widely. Recreation resources are analyzed in this final EIS for two potential types of impacts: short-term closures to recreational sites, which would prevent visitors from using those sites, and long-term visual impacts, which would affect the recreation experience throughout the Project's viewshed.

The viewshed is an appropriate spatial scope for this analysis because recreation experience is influenced by scenery. Visual impacts to recreation are distinct from those discussed in the visual resource analysis because the focus in this analysis is how they affect the recreation experience. Aesthetics are important in recreational settings, especially in places where visitors expect a natural-appearing landscape with little evidence of disturbance. Aesthetic qualities of recreational sites are important to visitors, local residents, and those who simply have an interest in their scenic values (USDA Forest Service 1995a).

Recreational sites take many forms, and year-round recreational opportunities across the state range from activities that are self-directed and occur within undeveloped natural landscapes, to those that occur within developed lands and facilities and within organized programs. Recreational activities in New Hampshire generally include the following:

- *Developed Recreation:* Recreation that is dependent upon facilities provided by a land owner or manager, such as the USFS, State Parks, or local municipalities. Examples include camping in developed campgrounds, picnicking, organized sports, and a variety of other facility-dependent activities (spending time at parks and playgrounds, golf courses, dog parks, recreational areas, swimming holes, ski areas, etc.).
- *Motorized Recreation:* The operation of motorized vehicles such as snowmobiles, off-highway vehicles (OHVs), airplanes, automobiles, or motorcycles for recreation as opposed to transportation.
- *Non-Motorized Dispersed Recreation:* A wide range of activities which are not dependent upon developed facilities or motorized equipment, including hiking, backpacking, hunting, wildlife viewing, rock climbing, skiing, snowshoeing, or mountain biking. Dispersed recreation may also include camping outside of a developed campground, such as backcountry camping.
- *Water-based Recreation:* On-water and water-adjacent activities such as motorized and non-motorized boating, rafting, tubing, kayaking, swimming, wading, and fishing.
- *Education/Interpretation:* Recreation based on the pursuit of knowledge and understanding. It ranges from formal displays and programs sponsored by an organization or agency, to outdoor classrooms, interpretive field trips, and citizen-scientist projects. These activities also may overlap with other forms of recreation.

GIS software was used to map recreational sites, the Project corridor, and the Project's viewshed, based upon the best available data at the time of analysis. Recreational sites were identified using GIS data from NH GRANIT, WMNF, Appalachian Trail Conservancy (ATC), DeLorme, the National Conservation Easement Database (NCED), and the Environmental Systems Research Institute (ESRI). For a description of how the viewshed was calculated, refer to **Section 3.1.1**. Additional information regarding the methods of analysis is provided in the **Recreation Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Recreational sites were spatially intersected with the Project corridor and with the viewshed for each alternative in order to identify the recreational areas that could be affected 1) by construction, maintenance, operations, and emergency repairs, and 2) visually. For alternatives proposed to be buried underground, recreational areas were only intersected with the Project corridor, as they would only be affected directly by construction, maintenance, and emergency repairs.

3.1.4 HEALTH AND SAFETY

The study area for health and safety (including EMFs, contaminated soils and groundwater, weather extremes, fire hazards, transmission line safety, and general worker safety) consists of the Project corridors for all alternatives. In general, issues related to health and safety are common to all sections; that is, there is little variation in the types of health and safety hazards throughout the study area. Health and safety hazards discussed generally include weather extremes, transmission line safety and general worker safety, while EMFs, potentially contaminated soils and groundwater and fire hazards are discussed in more detail in **Sections 3.2.4, 3.3.4, 3.4.4,** and **3.5.4**.

Parts of the affected environment that are relevant to public health and safety with respect to this Project are defined by two categories—health and safety hazards that correlated to the location of the Project (including potentially contaminated soils and groundwater sites, weather extremes and fire hazards) and health and safety hazards related to the characteristics of the Project components or the operations of the transmission line (EMFs, transmission line safety and general workers safety).

Additional information and further discussion, including the methods of analysis, of EMFs, potentially contaminated soils and groundwater, weather extremes, fire hazards, transmission line safety, and general worker safety can be found in the **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

3.1.4.1 Electric and Magnetic Fields

> **EMFs**
>
> The frequency of EMFs is measured in Hz and the strength is measured in kV/m or milliGauss (mG).
>
> Refer to the **EMF Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for a full discussion.

Electric and magnetic fields (EMFs) originate from numerous sources. The present discussion focuses on EMFs at powerline frequencies (50 or 60 Hz), which are created by electric distribution systems and appliances at highly variable levels. In ordinary home environments, background levels of 50/60 Hz magnetic fields, away from appliances, arise from net currents flowing through household wiring in a house (which vary depending on the wiring system used), power supply within a house, and neighborhood distribution lines. Background magnetic fields in a home, away from appliances, are typically a few mG at most, but can be considerably higher within apartment buildings in rooms located close to distribution transformers or whose walls contain embedded power distribution lines. Higher (and in some places much higher) levels of EMFs are present in the immediate vicinity of electrical appliances. Neighborhood distribution lines potentially carry currents of hundreds of amperes, which are similar to currents carried by many high voltage transmission lines and create comparatively strong magnetic fields in their immediate vicinity. In some occupational settings, where high-powered electrical equipment is present, workers can be exposed to levels of power-frequency EMFs that are far higher than those present in ordinary nonoccupational settings (National Grid 2015a). Under extreme exposure conditions, which are not present at publicly accessible areas near the line, there is a possibility of locational hazards from EMFs associated with the existing and proposed lines.

The study area (Project corridors) generally transitions from remote, forested areas in the Northern Section to more populated locations in the Southern Section. While the potential for human exposure to EMFs from the lines varies according to population density, the fields produced by the lines will be similar in different segments that have similar design and loading characteristics. The fields represent the combined contributions from existing lines that are presently located within the proposed right of way, and from the new lines to be installed as part of the Project. To allow assessment of potential human safety and environmental consequences of the Project, the Applicant provided existing and potential EMF calculations. These calculations were performed with using standard methods and are considered to be reliable; they were reviewed and corroborated independently by a subject matter expert for use in this final EIS (see the **EMF Technical Report [**http://www.northernpasseis.us/library/final-eis/technical-reports**]**).

3.1.4.2 Potentially Contaminated Soils and Groundwater

Soil, sediments, surface water, and groundwater can become contaminated due to occurrences such as leaks from heating oil tanks or spills from industrial facilities. There are potentially contaminated sites within the study area (i.e., the Project corridors for all alternatives); the specific locations of these sites are described in each geographic section. The Project could result in the exposure of these contaminated areas, resulting in health risks. Results from a comprehensive Environmental Data Resources (EDR) database search within 1 mile (1.6 km) of the Project corridor of each alternative are included in the **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). The majority of the sites identified are from New Hampshire's ALLSITES database, which provides information on sites that either have resulted in groundwater contamination or pose a potential hazard to groundwater supplies.

3.1.4.3 Weather Extremes

Weather extremes that occur in New Hampshire include thunderstorms, blizzards, floods, hurricanes, extreme cold, hail, ice storms, heavy snows, and strong winds (World Media Group LLC 2015a). These weather events can adversely affect construction and operation of transmission lines and towers.

The most common hazard in New Hampshire is flooding with annual flash flooding, main stem river flooding, coastal flooding, or a combination of the three. Flooding occurred in 2005, 2006, 2007, and 2008. Tropical storms, below hurricane intensity, have been responsible for inland flooding experienced in the Northeast (NH Department of Safety 2014a). Flooding can damage transmission line structures, including substations and other facilities, and disrupt construction and damage construction equipment.

In addition, New Hampshire has one or two tornadoes annually that are small and cause localized damage. Southwestern New Hampshire is a special wind hazard area. It has a high proportion of the state's tornadoes and severe wind events (NH Department of Safety 2014a). Tornadoes can damage transmission structures.

Microbursts are another extreme weather phenomena known to occur in New Hampshire. A microburst is a severe localized wind "straight line" blast from a thunderstorm. Microbursts have produced winds up to 175 mph (282 km/h) (NH Department of Safety 2014a). High winds related to microbursts can damage transmission structures.

Ice storms occur in New Hampshire as well. In general, ice storms occur once every ten years. Damage from these storms can include tree limbs falling on power lines as well as ice accretion on transmission lines. With 2 inches (5 cm) of radial ice, transmission lines can break due to their own weight and bring down poles and transformers. In December 2008, New Hampshire had its largest ice storm; thousands of trees were damaged when they became ice laden. Damaged trees fell on structures, cars and power lines. More than half of the state's electric utility customers lost power (NH Department of Safety 2014a).

Heavy snowfalls can adversely affect transmission lines and towers as well. The largest monthly snowfall in New Hampshire on record occurred in February 1893 when 59 inches (150 cm, or 1.5 m) fell (NOAA

2009a). The second largest snowstorm dropped 2 feet (0.6 m) of snow from February 8 to 9, 2013 (NOAA 2014a). The weight of heavy snow on transmission lines and structures can cause them snap and/or collapse.

3.1.4.4 Fire Hazards and Fire Response Services

The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the Fire Departments that are located within 5 miles (8 km) of the Project corridors in all geographic section. Within New Hampshire, most municipalities have fire stations. In addition, 14 mutual fire aid associations serve the state. They operate under a statewide fire mobilization implementation plan that addresses, among other items, large scale events and disasters, fires, the wild land/urban interface, the exhaustion of local and regional resources. The plan provides a structure for the response to incidents and establishment of task forces/strike teams. In addition, it provides assistance to areas once their resources are exhausted (Federation of Fire Mutual Aid Associations of NH 2014).

3.1.4.5 Transmission Line Safety Issues

Under normal operating conditions, public safety hazards associated with HVAC transmission lines include electrical shocks. These can occur from working and recreating under or near transmission lines. Electrical shocks can occur from touching transmission towers or other large metallic structures near power lines. The severity of the shock would reflect the voltage of the power line, the distance from the conductor, the size and length of the object, its orientation to the line, and how well the object is grounded (BPA 2007a).

DC electric fields beneath HVDC lines arise in part from ion currents resulting from corona, an electrical discharge from a conductor caused by the ionization of surrounding gas, which may induce charges on the body of an individual and can discharge when the person touches a grounded surface, potentially causing shock. Codes (in particular the National Electrical Safety Code [NESC]) and health-based exposure guidelines are designed to protect against harmful levels of shock.

Another potential public safety hazard associated with transmissions lines is arc flashes. Arc flashes occur when electricity from a high voltage line travels between conductors through the air. These can occur in normal conditions but also can be caused by smoke from fires (BPA 2007a; Great River Energy n.d.). Arc flashes can produce intense heat and light. If individuals get too close to energized power lines, an arc of electricity can form between the power line and the person and result in serious burns (Great River Energy n.d.).

Most recreation can be done safely in the transmission route, but certain activities are not recommended and could result in public safety hazards, such as flying kites or model planes near power lines, climbing transmission towers or any structure associated with a substation, building fires under power lines, or shooting near line insulators or conductors (BPA 2007a; Great River Energy n.d.). All of these activities are public safety hazards.

3.1.4.6 General Worker Safety

Health and safety risks for large-scale construction projects involving electrical components, working at height, and operating heavy machinery could include:

- Falls from working at height
- Slips and trips
- Cuts and scrapes from sharp tools or construction materials or debris
- Receiving injuries from hand tools and/or rotating machinery
- Electrocution
- Being struck by falling objects

- Manually lifting heavy loads
- Being struck or crushed by a workplace vehicle
- Handling of rough materials
- Exposure to dangerous substances (chemical and biological)
- Working near, in, or over water
- Sustaining injuries as a result of an on-road or off-road accident involving a motor vehicle or construction equipment.

The most recent available data published by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor concerning fatalities and injuries in the construction of power and communication lines and related structures resulted in 23 fatalities and 11,700 non-fatal occupational injuries nationally in 2015. The electrical power transmission, control, and distribution utility sector had 11 fatalities and 5,200 non-fatal occupational injuries nationally in 2015 (BLS 2015a, 2015b, 2015c).

3.1.5 TRAFFIC AND TRANSPORTATION

The study area for the transportation analysis consists of roadways (including interstate highways, federal highways, state routes, and local roads) that would be crossed by the Project corridors for all alternatives. Per FAA regulations that require notification of any construction or alteration that would result in a structure exceeding an imaginary slope from the nearest runway, airports within 20,000 feet (6,096 m) on both sides of the Project corridors were also included in the study area (U.S. Government Printing Office 2013a). Given the highly-localized characteristics of traffic and transportation issues, such as the location and type of transportation infrastructure, the affected environment of this resource is analyzed in detail by section in **Sections 3.2.5, 3.3.5**, **3.4.5**, and **3.5.5**. A general description of the Project corridors for all alternatives is as follows:

Overall, New Hampshire has relatively low volumes of traffic in relation to other states in the Northeastern U.S. A recent study ranked states for urban highway congestion, with higher rankings indicating lower congestion. New Hampshire had a ranking of 13, indicating low level of congestion when compared to neighboring states (Maine had a ranking of 17, 23 in Connecticut, 28 in Massachusetts, and 31 in Rhode Island) (Reason Foundation 2014a). Vermont, with a ranking of 5, was the only state in New England ranked higher than New Hampshire (Reason Foundation 2014a). Reported existing traffic volumes were generally the lowest in the study area of the Northern Section, which is sparsely populated and has fewer interstates and state roadways. The study area of the Central Section has a greater number of interstates and state roads than the study area of the Northern Section, and traffic volumes were higher in this section than in the study area of the Northern Section. The highest traffic volumes were reported on I-93 and I-393 near Concord, NH, in the study area of the Southern Section.

Traffic counts for roadways were obtained from NHDOT and the Central New Hampshire Regional Planning Council and are presented in the full **Transportation and Traffic Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). Additional information regarding the methods of analysis is also provided in the **Transportation and Traffic Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 3-3 shows the approximate distance of existing airports and heliports to overhead portions of the Project and alternatives and **Table 3-4** shows the approximate height that a structure, based on the approximate distance to overhead portions of the Project and alternatives, would exceed the imaginary slope as defined by the FAA and require notification to the FAA.

Table 3-3. Airfields in the Study Area – Distance to Project Corridors for Overhead Portions of the Project

Airport	Town	Length of Longest Runway feet (m)	Public or Private Use	Approximate Distance to Project Corridors by Alternative feet (m)					
				2	5a	5b	5c	6a & 6b	7
Mount Washington Regional Airport	Whitefield	4,002 (1,220)	Public	3,300 (1,006)	3,300 (1,006)	3,300 (1,006)	3,300 (1,006)	N/A	3,300 (1,006)
Franconia Airport	Grafton	2,305 (703)	Public	14,300 (4,359)	8,000 (2,438)	14,300 (4,359)	150 (46)	N/A	N/A
Bradley Field	Woodstock	1,700 (518)	Private	1,900 (579)	1,900 (579)	1,900 (579)	1,900 (579)	N/A	N/A
New Found Valley Airport	Bristol	1,900 (579)	Public	10,300 (3,139)	10,300 (3,139)	10,300 (3,139)	10,300 (3,139)	N/A	10,300 (3,139)
Gile Pond	Sanbornton	1,800 (549)	Private	6,200 (1,890)	6,200 (1,890)	6,200 (1,890)	6,200 (1,890)	N/A	6,200 (1,890)
Ward Field	Sanbornton	1,100 (335)	Private	7,600 (2,316)	7,600 (2,316)	7,600 (2,316)	7,600 (2,316)	N/A	7,600 (2,316)
Cooper Farm Landing Strip	Loudon	1,650 (503)	Private	19,500 (5,944)	19,500 (5,944)	19,500 (5,944)	19,500 (5,944)	19,500 (5,944)	19,500 (5,944)
Concord Airport	Concord	6,005 (1,830)	Public	4,000 (1,219)	4,000 (1,219)	4,000 (1,219)	4,000 (1,219)	4,000 (1,219)	4,000 (1,219)
Murphy Sherwood Park	Nottingham	1,750 (533)	Private	18,200 (5,547)	18,200 (5,547)	18,200 (5,547)	18,200 (5,547)	18,200 (5,547)	18,200 (5,547)
Blue Light Heliport	Plymouth	N/A	Private	5,622 (1,714)	5,622 (1,714)	5,622 (1,714)	5,622 (1,714)	N/A	N/A
Speare Memorial Hospital	Plymouth	N/A	Private	10,688 (3,258)	10,688 (3,258)	10,688 (3,258)	10,688 (3,258)	N/A	N/A
Lancaster Heliport	Lancaster	N/A	Private	9,120 (2,780)	9,120 (2,780)	9,120 (2,780)	9,120 (2,780)	N/A	9,120 (2,780)
Brigham Heliport	Pembroke	N/A	Private	2,605 (794)	2,605 (794)	2,605 (794)	2,605 (794)	2,605 (794)	2,605 (794)
Concord Hospital	Concord	N/A	Private	19,151 (5,837)	19,151 (5,837)	19,151 (5,837)	19,151 (5,837)	19,151 (5,837)	19,151 (5,837)
Waste Heliport	Concord	N/A	Private	498 (152)	498 (152)	498 (152)	498 (152)	498 (152)	498 (152)
D. W. Heliport	Franklin	N/A	Private	6,969 (2,124)	6,969 (2,124)	6,969 (2,124)	6,969 (2,124)	10,000 (3,048)	6,969 (2,124)
Franklin Regional Hospital	Franklin	N/A	Private	7,922 (2,415)	7,922 (2,415)	7,922 (2,415)	7,922 (2,415)	N/A	7,922 (2,415)

Source: FAA 2013a,b

Notes: Study area includes airports within 20,000 feet (6,096 m) of the Project for overhead alternatives.

The imaginary slope as defined by the FAA includes:

1) For airports with a runway greater than 3,200 feet (975 m) in length, 1 vertical foot (0.3 m) for every 100 horizontal feet (30 m) for a horizontal distance of 20,000 feet (6,096 m).
2) For airports with a runway 3,200 feet (975 m) or less in length, 1 vertical foot (0.3 m) for every 50 horizontal feet (15 m) for a horizontal distance of 10,000 feet (3,048 m).
3) For heliports, 1 vertical foot (0.3 m) for every 25 horizontal feet (8 m) for a horizontal distance of 5,000 feet (1,524 m).

Table 3-4. Airfields in the Study Area – Height Limit to Notify FAA

Airport	Town	Approximate Height Limit to Notify FAA by Alternative feet (m)					
		2	5a	5b	5c	6a & 6b	7
Mount Washington Regional Airport	Whitefield	33 (10)	33 (10)	33 (10)	33 (10)	N/A	33 (10)
Franconia Airport	Grafton	N/A	160 (49)	N/A	3 (1)	N/A	N/A
Bradley Field	Woodstock	38 (12)	38 (12)	38 (12)	38 (12)	N/A	N/A
New Found Valley Airport	Bristol	N/A	N/A	N/A	N/A	N/A	N/A
Gile Pond	Sanbornton	124 (38)	124 (38)	124 (38)	124 (38)	N/A	124 (38)
Ward Field	Sanbornton	152 (46)	152 (46)	152 (46)	152 (46)	N/A	152 (46)
Cooper Farm Landing Strip	Loudon	N/A	N/A	N/A	N/A	N/A	N/A
Concord Airport	Concord	40 (12)	40 (12)	40 (12)	40 (12)	40 (12)	40 (12)
Murphy Sherwood Park	Nottingham	N/A	N/A	N/A	N/A	N/A	N/A
Blue Light Heliport	Plymouth	N/A	N/A	N/A	N/A	N/A	N/A
Speare Memorial Hospital	Plymouth	N/A	N/A	N/A	N/A	N/A	N/A
Lancaster Heliport	Lancaster	N/A	N/A	N/A	N/A	N/A	N/A
Brigham Heliport	Pembroke	104 (32)	104 (32)	104 (32)	104 (32)	104 (32)	104 (32)
Concord Hospital	Concord	N/A	N/A	N/A	N/A	N/A	N/A
Waste Heliport	Concord	20 (6)	20 (6)	20 (6)	20 (6)	20 (6)	20 (6)
D. W. Heliport	Franklin	N/A	N/A	N/A	N/A	N/A	N/A
Franklin Regional Hospital	Franklin	N/A	N/A	N/A	N/A	N/A	N/A

Source: FAA 2013a,b
Notes: Study area includes airports within 20,000 feet (6,096 m) of the Project for overhead alternatives.
The imaginary slope as defined by the FAA includes:

1) For airports with a runway greater than 3,200 feet (975 m) in length, 1 vertical foot (0.3 m) for every 100 horizontal feet (30 m) for a horizontal distance of 20,000 feet (6,096 m).
2) For airports with a runway 3,200 feet (975 m) or less in length, 1 vertical foot (0.3 m) for every 50 horizontal feet (15 m) for a horizontal distance of 10,000 feet (3,048 m).m
3) For heliports, 1 vertical foot (0.3 m) for every 25 horizontal feet (8 m) for a horizontal distance of 5,000 feet (1,524 m).

3.1.6 LAND USE

The study area for the land use analysis consists of the five counties potentially affected by the Project. While land use impacts would primarily occur within the Project corridors, surrounding land uses may also be impacted. Study of the greater land use throughout Coös, Belknap, Grafton, Rockingham, and Merrimack counties provides context to potential impacts. Construction of the Project as well as on-going operations, maintenance, and emergency repairs are considered in the analysis. Land use is highly variable by section, with generally more developed uses moving from north to south in the state. Therefore, the affected environment of this resource is analyzed in detail by section in **Sections 3.2.6**, **3.3.6**, **3.4.6**, and **3.5.6**. This section provides an overview of relevant law, regulation, and policy which shape land use in the study area. Additional information regarding the methods of analysis is provided in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

3.1.6.1 Land Use and Land Cover

The National Land Cover Dataset (NLCD) 2011, the most recent national land cover product created by the Multi-Resolution Land Characteristics Consortium (MRLC), was used to describe land use across the study area. **Table 3-5** describes the land use categories used to describe land use characteristics in the study area. The terms in the "Land Use Category" column are the classifications used in this analysis, and represent one or multiple classes from the NLCD (listed in "Included NLCD Classes" column).

Table 3-5. Functional Land Use/Land Cover Legend

Land Use Category	Category Description	Included NLCD Classes
Open Water	These are areas of open water, generally with less than 25% cover of vegetation or soil.	Open Water
Rural Residential and Recreation Uses	These areas contain a mixture of constructed materials and vegetation with impervious surfaces, such as pavement or buildings, accounting for 49% or less of the total land cover. These areas most commonly include single-family housing units, golf courses, highways, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	Developed, Open Space; Developed, Low Intensity
Developed Residential, Commercial and Industrial Uses	These developed areas contain a mixture of constructed materials and vegetation with impervious surfaces accounting for 50% or more of the total cover. These areas most commonly include smaller lot single-family housing units, apartment complexes, row houses and commercial/industrial uses. In the New Hampshire context, these areas generally indicate a town center, business park, industrial area, or shopping center.	Developed, Medium Intensity; Developed, High Intensity
Agricultural Uses	These areas are generally used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops are also included. This class also includes all land being actively tilled. Crop or pasture/hay vegetation accounts for greater than 20% of total vegetation.	Pasture/Hay; Cultivated Crops
Barren land	These are areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover. They can be undeveloped (talus) or developed (gravel pits).	Barren Land
Shrubland and Herbaceous Lands	These undeveloped areas are dominated by shrubs less than 5 m tall, gramanoid, or herbaceous vegetation, generally greater than 80% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions. The herbaceous areas in this class are not subject to intensive management such as tilling as the agricultural lands are, but can be utilized for grazing. Herbaceous wetlands are also included in this class.	Grassland/Herbaceous; Shrub/Scrub; Emergent Herbaceous Wetlands
Forested Lands	These undeveloped areas are dominated by trees generally greater than 5 m tall, and greater than 20% of total vegetation cover. This tree cover includes both deciduous and evergreen species. Woody wetlands are also included in this class.	Deciduous Forest; Evergreen Forest; Mixed Forest; Woody Wetland

Source: MRLC 2013

3.1.6.2 Conservation Lands

The study area contains conservation lands under a range of ownership and management arrangements. For the purposes of this analysis, conservation lands include parcels that are mostly undeveloped and protected from future development. Overlapping areas between conservation lands and the Project were quantified and the ownership (municipal/county, federal, state, private, etc.), public access, and land status of the potentially impacted conservation lands were considered. See the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for a list and map of conservation lands in or adjacent to the Project corridors.

3.1.6.3 Rights-of-Way

New and Existing Transmission Routes

The existing PSNH transmission route (in which portions of Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7 would be located) is permitted through a combination of ownership (parcels that PSNH owns), easements (parcels on which PSNH has been granted rights to construct and operate a transmission line), and SUPs (parcels on which PSNH has permission from the USFS to construct and operate a transmission line). The easements and SUPs governing use of the existing PSNH transmission route all allow for overhead transmission, but only a portion allow for underground transmission.

The existing roadway corridors (in which portions of all alternatives would be located) are not currently used as transmission routes.

Transmission Route

As used within this document, "transmission route" specifically refers to the corridor of land upon which a transmission system (including line/cable and associated facilities) may be located. This term is used to refer to the land currently occupied by the existing PSNH transmission line, as well as the potential location of the Project. Land use authority for the construction and operation of the Project is, or may be, granted to the Applicant via a combination of rights and privileges which may include: fee simple ownership, long-term lease agreement, rights-of-way (granted by easement), or SUP (authorized by the USFS).

3.1.6.4 Law, Regulation, and Policy

Various governmental agencies have jurisdiction within the study area and the following laws, regulations, and policies describe those responsibilities relevant to the land use analysis. A brief description of each is provided below. Regulations specific to the WMNF are discussed in **Section 3.5.6.5**.

Protected Rivers

This analysis considers National Wild and Scenic Rivers and State-protected rivers under the Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]).

A National Wild and Scenic River is a federal designation that protects U.S. rivers from certain activities. New Hampshire has approximately 10,900 miles (17,542 km) of river, of which 38 miles (61 km) are designated as National Wild and Scenic Rivers—approximately 0.3 percent of the state's river miles (USFWS 2014b). There are nine rivers within the study area that may be potentially eligible Wild and Scenic Rivers as identified in the Nationwide Rivers Inventory (NRI) maintained by the NPS. An additional five rivers within the study area are potentially eligible Wild and Scenic Rivers as identified in the WMNF Forest Plan. Eligible Wild and Scenic Rivers from both the Forest Plan and the NRI are considered equally in this analysis.

The Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]) established a statewide rivers program for New Hampshire. The Rivers Management and Protection Program (RMPP) provides certain instream protection measures for designated rivers and a river classification system to match general river characteristics with the specific protection measures. The RMPP contains 21 State Designated Rivers and 990 total designated miles (NHDES 2014a).

Federal and State Highway Systems Rights-of-Way

The FHWA has determined that the use of roadway corridors to accommodate public utility facilities is in the public interest (23 CFR § 645.205(a)). Non-highway use of these ROWs is subject to the airspace leasing requirements of 23 CFR § 710.405, with the purpose of ensuring that the non-highway use does not impact the NHDOT's ability to maintain and operate the highway in a safe manner. Longitudinal utility facilities in limited access ROWs are not permitted under the NHDOT Utility Accommodation Manual and would require an exception from the Commissioner or their designee (NHDOT 2014).

The FHWA's policy allows each state to decide whether to permit or prohibit new utility facilities within a federal-aid or direct federal highway corridor. For a project that may be located within a federal-aid or direct federal highway corridor, the FHWA and the NHDOT review and decide on the application for new utility facilities within a highway corridor.

Local Highway Rights-of-Way

Local roads that do not fall under the jurisdiction of NHDOT are subject to approval by a local board of selectmen or others having jurisdiction over the issuance of permits or licenses to use the local roadway corridors to accommodate public utility facilities.

3.1.7 NOISE

The study area for noise quality consists of a corridor 200 feet (61 m) on each side of the Project corridors for all alternatives. This study area was further refined based on the analysis and focused on the area where noise levels could exceed regulatory guidelines. The noise environment is characterized by the presence of sensitive noise receptors. These are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the designated land uses. Typically, sensitive noise receptors include residences, hospitals, places of worship, libraries and schools, daycare centers, nature and wildlife preserves, and parks.

Existing noise levels and the presence of sensitive noise receptors is highly variable, depending primarily on land use in the vicinity of the Project. Therefore, the affected environment of existing noise levels is examined in detail in **Sections 3.2.7**, **3.3.7**, **3.4.7**, and **3.5.7**. This section provides background information on the existing noise levels common throughout all geographic sections. Additional information regarding the methods of analysis is provided in the **Noise Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The Project would traverse urban, suburban, and forested rural and undeveloped areas. As a result, the noise setting varies along the Project corridors. Most of the study area is characterized by rural areas that may have localized noise sources. Construction of the Project could cause direct, short-term, adverse impacts depending upon proximity to sensitive noise receptors and land uses. Operational noise associated with the transmission lines and converter stations could also result in longer-term impacts. Ambient noise sources along the Project include the commercial timber operations located in Wagner Forest in Dixville, Millsfield, and Dummer, NH. Near Concord, NH, ambient noise levels reflect the level of development and traffic in the area, including the Concord Airport. See **Sections 3.2.6**, **3.3.6**, **3.4.6**, and **3.5.6** for a discussion of land uses and land use designations in the vicinity of the Project. **Table 3-6** provides typical ambient noise levels for land use types.

Table 3-6. Typical Ambient Noise Levels for Land Use Types

Category	Description	Typical Ambient Noise Level (dBA)	
		Day	Night
I	Low-density urban residential, open space park, suburban	40 to 50	35 to 45
II	Average urban residential, quiet apartments and hotels, open space, suburban residential, or occupied outdoor area near busy streets	45 to 55	40 to 50
III	High density urban residential, average semi-residential/commercial areas, parks, museums and noncommercial public building areas	50 to 60	45 to 55
IV	Commercial areas with office buildings, retail stores, etc., primarily daytime occupancy; central business district	50 to 70	
V	Industrial areas or freeway and highway corridors	Over 60	

Source: Cowan 1994a
Note: Levels are based on typical L50 data. L50 is the sound level exceeded 50% of the time during a measurement period.
Key: dBA = A-weighted decibels

3.1.8 HISTORIC AND CULTURAL RESOURCES

This section describes the historic and cultural resources and the potential impacts from the Project on these resources. This section also describes those historic and cultural resources that have been listed in, or determined eligible for listing in, the National Register of Historic Places (NRHP) called historic properties in the Section 106 process (discussed below).

NEPA requires that federal agencies consider the potential impacts of a proposed action on historic and cultural resources (40 CFR § 1502.16(g)). Section 106 of the National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. § 306108), as amended, and its implementing regulations (36 CFR Part 800 – Protection of Historic Properties) developed by the Advisory Council on Historic Preservation (ACHP) also require that federal agencies take into account the effects of their undertakings and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. This process includes developing measures to avoid, minimize, or mitigate any adverse effects on historic properties.

For the purposes of compliance with Section 106 of the NHPA, DOE determined that the issuance of a Presidential permit for the proposed Project's international border crossing is an undertaking, as defined in 36 C.F.R. § 800.16(y), requiring compliance with Section 106 and with the potential to adversely affect historic properties listed in or eligible for listing in the NRHP (36 CFR § 800.3(a)). DOE and the USFS are coordinating their compliance with Section 106 with their NEPA review in accordance with the ACHP implementing regulations (36 CFR § 800.8). The information gathered during the Section 106 process is being used to inform the final EIS.

Historic and cultural resources generally consist of archaeological sites or districts, historic architectural or built resources, such as buildings, structures, districts, and objects, and Native American resources, such as properties of traditional religious and cultural importance to a federally-recognized Indian tribe, like sacred sites, Traditional Cultural Properties (TCPs), or Traditional Cultural Landscapes (TCLs).

Historic and cultural resources identified for the Project at the time of issuance of this document include archaeological resources (prehistoric and historic archaeological sites or archaeologically sensitive areas) and architectural resources (buildings and structures).[40] Historic properties are historic and cultural resources that are listed in, or determined eligible for listing in, the NRHP and may be any prehistoric or

[40] Within archaeologically sensitive areas, there is considered to be a higher likelihood of encountering archaeological resources (sites).

historic district, site, building, structure, object, including properties of traditional religious and cultural importance to a federally-recognized Indian tribe that meet the NRHP criteria (36 CFR § 800.16(l)). Historic properties may also include eligible or NRHP-listed landscapes, such as "Rural Historic Districts," and cultural landscapes.[41] [42] Listing in the NRHP provides formal recognition of a property's historical, architectural, or archeological significance based on national standards. The NRHP is authorized by the NHPA (54 U.S.C. § 300101 *et seq*.) and implemented in accordance with 36 CFR Part 60 – National Register of Historic Places. To be considered eligible for the register, a historic or cultural resource must meet the National Register Criteria for Evaluation (NPS 1997a). Historic and cultural resources are considered to be NRHP-eligible, and therefore historic properties, if they display the quality of significance in one or more of the following areas: American history, architecture, archaeology, engineering, or culture. Determining NRHP eligibility involves examining a property's age, integrity, and significance. Generally, a property must be at least fifty years old and appear much the way it did in the past.

The historic or cultural resource also must possess integrity of location, design, setting, workmanship, feeling, and association, and generally have to meet one of the following four NRHP criteria (NPS 1997a):

- Criterion A – properties that are associated with the events that have made a significant contribution to the broad patterns of American history; or
- Criterion B – properties that are associated with the lives of persons significant in our past; or
- Criterion C – properties that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- Criterion D – properties that have yielded or may likely yield information important in prehistory or history.

The completion of historic and cultural resource identification and evaluation of eligibility for listing on NRHP, assessment of the potential for adverse effects on historic properties (i.e., those historic and cultural resources listed on or eligible for listing on the NRHP), and consultation concerning measures (e.g., avoid, minimize, or mitigate) to resolve any adverse effects on historic properties, will be carried out using a phased approach in accordance with 36 C.F.R. § 800.4(b)(2), 36 16 C.F.R. § 800.5(a)(3). The Section 106 Programmatic Agreement (see **Section 1.6** and **Appendix K**) will also address any project changes (e.g., route, design, construction methods) including after a final route has been selected or potentially approved by the appropriate siting authorities and thereafter (see **Section 1.7**).

3.1.8.1 Section 106 of the National Historic Preservation Act of 1966

As stated above, Section 106 of the NHPA requires that federal agencies take into account the effects of a federal undertaking on any historic properties identified within the area of potential effects (APE) for a proposed action. The Section 106 process comprises four steps: Initiation (36 CFR § 800.3); Identification of historic properties (36 CFR § 800.4); Assessment of adverse effects (36 CFR § 800.5); and Resolution of adverse effects (36 CFR § 800.6).

Participants in the Section 106 process include the federal agency (or agencies if more than one federal agency is involved), the Advisory Council on Historic Preservation (ACHP), consulting parties, and the public (36 CFR § 800.2). In accordance with the Section 106 regulations, consulting parties may include:

[41] See "Definitions and Translations," Attachment A, in ACHP's *NEPA and NHPA A Handbook for Integrating NEPA and Section 106*, March 2013.

[42] Contributing resources to a cultural landscape may include but are not limited to historic properties, cultural resources, and natural features, e.g., Bear Rock in the Northern Section. For more information about how cultural landscapes are being addressed, see **Section 3.1.8.3**.

the state historic preservation officer (SHPO) (36 CFR § 800.2(c)(1); federally-recognized Indian tribes and Native Hawaiian organizations attaching religious and cultural significance to historic properties that may be affected by an undertaking (36 CFR § 800.2(c)(2); representatives of local governments (36 CFR § 800.2(c)(3); the applicant (36 CFR § 800.2(c)(4); and certain individuals and organizations with a demonstrated interest in the undertaking who may participate as consulting parties due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties (36 CFR § 800.2(c)(5)).

The SHPO and consulting parties are engaged throughout the Section 106 process to inform the identification of historic properties, assessment of potential adverse effects, and resolution of adverse effects, if necessary. For more information regarding this engagement, see **Section 4.1.8**.

The Section 106 implementing regulations provide for public involvement opportunities in the Section 106 process (36 CFR § 800.2(d)(1)). The public is engaged in a manner that reflects the nature and complexity of the undertaking and its effects on historic properties, the likely interest of the public in the effects on historic properties, confidentiality concerns of private individuals and businesses, and the relationship of the federal involvement in the undertaking. The public may comment and provide input regarding the undertaking's effects on historic properties. This input may be sought using the agency's procedures for public involvement under NEPA. For more information about public involvement for this Project, see **Sections 1.5** and **1.6**.

The Section 106 process for complex project situations and where effects on historic properties cannot be fully determined prior to approval of an undertaking often concludes with an agreement document such as a Programmatic Agreement (PA). The PA outlines the terms of a formal, legally binding agreement between the SHPO, the federal agency, and the applicant which establishes a process to achieve compliance with Section 106 and address potential adverse effects of a project. For this Project, DOE is satisfying its Section 106 obligations through a PA developed pursuant to 36 CFR § 800.14(b) and in consultation with ACHP, NH SHPO, VT SHPO, USFS, and USACE and other consulting parties to ensure that stipulations developed to identify cultural resources and historic properties, determine the effects of the Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on cultural resources and historic properties are implemented. Section 106 consultation is on-going in accordance with the terms of the draft PA that can be found in **Appendix K** of this EIS.

3.1.8.2 Study Area – Area of Potential Effects

As previously discussed, potentially affected historic and cultural resources are identified based on a defined study area called the Area of Potential Effects (APE). The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR § 800.16(d)).

For the purposes of the impact analysis on historic and cultural resources, DOE determined that the study area for the Project will be the APE for the Project. The APE is defined in the Section 106 regulations and consists of a direct APE, within which direct impacts or effects (generally from construction and/or maintenance activities) may occur on historic and cultural resources, and an indirect APE, within which indirect impacts (generally visual or audible that may occur during construction, operation, and/or maintenance activities) may occur on historic and cultural resources.

DOE consulted with the New Hampshire SHPO, the Vermont SHPO, and additional Section 106 consulting parties to define the APE for the Project in accordance with the implementing regulations for Section 106 of the NHPA (36 CFR §§ 800.4(a)(1) and 800.4(b)(2)). As a result of this consultation, DOE defined the direct APEs and indirect APEs for the various alternatives for the Project (Mills 2013a, 2013b, 2015a, 2016a; Boisvert 2013a, 2015a; Trieschmann 2016). The NH SHPO concurred with the definition of the APE for the Project in April 2015 and the VT SHPO concurred with the definition of the APE in September 2016. Generally, the direct APE consists of the area that could be directly physically impacted by the Project. The indirect APE consists of the area in which other impacts, such as visual impacts, could occur. The purpose of defining the APEs was to allow DOE to gather sufficient information to make a preliminary assessment of the potential direct, indirect, and cumulative impacts of the alternatives for the Project on cultural resources under NEPA, and a preliminary determination of the potential direct, indirect, and cumulative effects from the alternatives for the Project on historic properties under Section 106 of the NHPA.

The direct APE for the Applicant's Proposed Project (Alternative 7) consists of the construction footprint for the new transmission route and aboveground facilities for the Project and the entire width of the legally-defined transmission route for the existing PSNH transmission line. The direct APE is located entirely within New Hampshire and does not extend into Vermont. Specifically, the direct APE for the Proposed Action (Alternative 7) consists of a 120-foot-wide transmission route proposed for the area of new transmission route, the legally-defined transmission route for the existing PSNH transmission line (generally 200–feet-wide with variations), and the footprint for new aboveground facilities not included in the transmission route for the Project, such as substations, converter stations, and transition stations. Where the Proposed Action (Alternative 7) would be buried along existing roadways, the direct APE consists of a 20-foot-wide area extending out from the outer edge of pavement along both sides of the existing roadways. **Table 3-7** summarizes the direct APEs for the various alternatives to the Applicant's Proposed Project, particularly those alternatives that have different alignments or configurations of buried and overhead components of the Project, including those alternatives with buried components within or adjacent to existing roads (i.e., Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7) (Mills 2013a, 2015, 2016a). The NHDHR and VTDHP concurred with DOE's definitions of the direct APEs for the various alternatives for the Project (Boisvert 2013a, 2015a; Trieschmann 2016). It is noted that the direct APEs for all the action alternatives include a disturbance area within which construction activities (e.g., construction or improvement of access roads, material and equipment storage areas, or any other physical disturbance) for project components would occur; the disturbance area may be smaller than the direct APEs. Therefore, there may be cultural resources that are within the direct APE but are outside the disturbance area. The potential for direct effects on all cultural resources within the direct APEs (including the disturbance area) is considered in **Chapter 4** (**Sections 4.1.8, 4.2.8, 4.3.8, 4.4.8**, and **4.5.8**).

The indirect APE was defined to address the aboveground and buried components of the Applicant's Proposed Project (Alternative 7), as summarized in **Table 3-7**. Typically, the indirect APEs for the majority of the aboveground components of the various alternatives for the Project (i.e., Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7) consists of a 1-mile-wide area on either side of the centerline of the new and existing transmission route for aboveground transmission lines and a 1-mile radius around new aboveground facilities such as substations, converter stations, and transition stations, although the indirect APEs for portions of the southern sections of Alternatives 6a and 6b is a 1.5-mile-wide area on either side of the centerline of the existing transmission route because new higher towers would be installed for these two alternatives. For all of the aboveground components of the various alternatives for the Project (i.e., Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7), the indirect APE is located in New Hampshire, and, at the beginning of each alternative, extends into the Town of Canaan, Essex County, Vermont. The New Hampshire and Vermont SHPOs concurred with DOE's definitions of the indirect APEs for the aboveground components of the various alternatives (Boisvert 2013a, 2015a; Trieschmann 2016). As such, the indirect APEs include the direct APE. For the various alternatives that include buried components of the Project within or adjacent to existing roads (i.e., Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7), the indirect APEs consist of a 200-foot-wide area on each side of the existing roads, within which architectural or built resources visible from the existing roads were identified (Mills 2015a, 2016a). **Table**

3-7 also summarizes the indirect APEs for the various alternatives, particularly those that have different alignments or configurations of buried and overhead components of the Project, including those alternatives with buried components within or adjacent to existing roads (i.e., Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7). The NHDHR and VTDHP concurred with DOE's definitions of the indirect APEs for the various alternatives (Boisvert 2013a, 2015a; Trieschmann 2016). It is noted here that the indirect APE for assessing visual effects on historic properties is approximate because there may be some situations where the visual effects may extend somewhat beyond the 1-mile limit due to local topographic and historic factors and that visual effects shall include not only visual effects associated with the structures to be constructed as part of the transmission line, but also visual effects associated with the physical alteration of current conditions, such as areas that are currently forested or otherwise vegetated that may be cleared in order to construct the transmission line. It is also noted that survey access for the indirect APE for all alternatives was limited to public roadways; consequently, some structures, if not visible from a public road, may not have been fully evaluated as part of the architectural investigations.

Table 3-7 illustrates the extent of the direct and indirect APEs for the Project.

Table 3-7. Extent of the Direct and Indirect APE

Alternative	Direct APE	Indirect APE
2	– New clearing in North 47[a] (generally 120 feet wide)[b] – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep)[b,c] – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations) – Footprint of access roads and laydown areas – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of the centerline of new clearing for North 47 and centerline of legally-defined ROW – 1-mile radius around new Franklin Converter Station and new transition (aboveground to buried line) stations – 200 feet from the edge of pavement on both sides of existing roadways
3	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep) – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations and 6 feet deep) – Footprint of new North Road Converter Station and new transition stations[d]	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around new North Road Converter Station and new transition stations – 200 feet from the edge of pavement on both sides of existing roadways

Table 3-7. Extent of the Direct and Indirect APE

Alternative	Direct APE	Indirect APE
4a	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance (generally 8 to 10 feet wide and 6 feet deep), excluding median of I-93)[e,f] – Footprint of new North Road Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around new North Road Converter Station and new transition stations – 200 feet from the edge of pavement on both sides of existing roadways
4b	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance (generally 8 to 10 feet wide and 6 feet deep)[e] – Footprint of new North Road Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around new North Road Converter Station and new transition stations – 200 feet from the edge of pavement on both sides of existing roadways
4c	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep), excluding the median of I-93)[f] – Footprint of new North Road Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around new North Road Converter Station and new transition stations – 200 feet from the edge of pavement on both sides of existing roadways
5a	– New clearing in North 47 (generally 120 feet wide) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep)[c] – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations) – Roadway corridors or ROWs near Franconia Notch (generally 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried and 6 feet deep, excluding the median of I-93)[e,d] – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for North 47 and centerline of legally-defined ROW – 1-mile radius around new Franklin Converter Station and new transition stations – 200 feet from edge of pavement on both sides of existing roadways

Table 3-7. Extent of the Direct and Indirect APE

Alternative	Direct APE	Indirect APE
5b	– New clearing in North 47 (generally 120 feet wide) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep)[c] – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations) – Roadway corridors or ROWs through WMNF (generally 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried and 6 feet deep)[e] – Footprint of new Franklin Converter Station and transition stations	– 1 mile on either side of centerline of new clearing for North 47 and centerline of legally-defined ROW – 1-mile radius around new Franklin Converter Station and new transition stations – 200 feet from the edge of pavement on both sides of existing roadways
5c	– New clearing in North 47 (generally 120 feet wide) – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep)[c] – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations) – Roadway corridors or ROWs through WMNF (generally 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried)[e] – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for North 47 and centerline of legally-defined ROW – 1-mile radius around new Franklin Converter Station and new transition stations – 200 feet from edge of pavement on both sides of existing roadways
6a	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – Roadway corridors or ROWs for proposed roadway burial routes (generally 20 feet wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried and 6 feet deep on both sides of roadway, excluding the median of I-93)[e,f] – Legally-defined ROW for existing PSNH transmission line between Franklin Converter Station and Deerfield Substation (generally 200 feet wide with variations) – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around new Franklin Converter Station and new transition stations – 1.5 miles on either side of centerline of legally-defined ROW between Franklin Converter Station and Deerfield Substation (for potential higher towers)[f] – 200 feet from edge of pavement on both sides of existing roadways

Table 3-7. Extent of the Direct and Indirect APE

Alternative	Direct APE	Indirect APE
6b	– New clearing in North 47 (generally 50 feet wide and 6 feet deep) – Roadway corridors or ROWs for proposed roadway burial routes (generally 20-feet wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried and 6 feet deep on both sides of roadway, excluding the median of I-93)[e,f] – Legally-defined ROW for existing transmission line between Franklin Converter Station and Deerfield Substation (generally 200 feet wide with variations) – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of centerline of new clearing for buried portion in North 47 – 1-mile radius around Franklin Converter Station and new transition stations – 1.5 miles on either side of centerline of legally-defined ROW between Franklin Converter Station and Deerfield Substation (for proposed higher towers) – 200 feet from edge of pavement on both sides of existing roadways
7	– New clearing in North 47 (generally 120 feet wide)[b] – 20-foot-wide area extending away from the edge of pavement on both sides of existing roads in which portions of the Project may be buried; roadway burial disturbance in portions of North 47 (generally 8 to 10 feet wide and 6 feet deep)[c] – Legally-defined ROW for existing PSNH transmission line (generally 200 feet wide with variations) – Footprint of access roads and laydown areas – Footprint of new Franklin Converter Station and new transition stations	– 1 mile on either side of the centerline of new clearing for North 47 and centerline of legally-defined ROW – 1-mile radius around new Franklin Converter Station and new transition stations – 200 feet from edge of pavement on both sides of existing roadways

Notes: The direct and indirect APEs for Alternative 2 were initially determined by DOE in consultation with NH and VT SHPOs (Mills 2013a, 2016a; Boisvert 2013a; Trieschmann 2016), and subsequently amended for the new transmission route proposed for the North 47 (Mills 2015a, Boisvert 2015a).

[a] "North 47" is a term used only in DOE's consultation with the NHDHR on the APE, and refers to the area of new transmission route in the Northern Section. This section is approximately 47 miles (76 km) in length.

[b] Northern Pass has determined that the width of new clearing for the new transmission corridor in the North 47 would be 120 feet wide.

[c] Northern Pass defined the workspace needed for roadway burial in the North 47 as 8 to 10 feet (2 to 3 m). Therefore, DOE has determined that this is the width of the direct APE for roadway burial in the North 47 for Alternatives 2, 3, 5a–5c, and 7 as the Northern Sections of these alternatives are identical to each other. DOE used a conservative approach for considering the width of workspace that would be needed for roadway burial for these alternatives that is consistent with DOE's analysis for all alternatives for this Project. DOE has determined that a 20-foot-wide workspace from the edge of pavement would be the width of the direct APE for roadway burial for Alternatives 2, 3, 5a-5c, and 7.

[d] The North Road Converter Station is included in certain alternatives because it is technically difficult to bury extended lengths of HVDC cables. This alternative converter station location was provided by Northern Pass and is approximately 3 miles from the Deerfield Substation, and burial of HVAC cable for this distance would be technically feasible.

[e] Because Alternatives 4a–4c and 6a–b and portions of Alternatives 5a-c are alternatives developed by DOE from scoping comments, DOE used a conservative approach for considering the width of workspace that would be needed for roadway burial for these alternatives. DOE has determined that a 20-foot-wide workspace from the edge of pavement would be the width of the direct APE for roadway burial for Alternatives 4a–c and 6a–b.

[f] Installation of a buried transmission line in the median of I-93 is not allowed. "Only the Commissioner or their designee may authorize special case exceptions for longitudinal installations. However, in no instance will utilities be allowed to be installed longitudinally within the median area of freeways." (See *NHDOT Utilities Accommodation Manual* at page 50 [NHDOT 2010a].)

[g] Higher transmission towers are likely necessary because of the co-location of the new HVDC cable with the existing AC cable on the same set of new towers. Therefore, the indirect APEs for portions of the southern sections of Alternatives 6a and 6b is a 1.5-mile-wide area on either side of the centerline of the existing transmission route because the new higher towers that would be installed for these two alternatives.

3.1.8.3 Methodology for Historic and Cultural Resources Investigations

To support the phased identification of historic and cultural resources and historic properties, DOE performed a Phase IA cultural resources survey (i.e., desktop literature review) and an architectural survey in order to identify previously recorded historic and cultural resources and historic properties within the APE for the Project. The purpose of DOE's cultural resources investigations was to develop a sufficient amount of information for known cultural resources and historic properties to allow DOE to consider the potential effects of the Project on historic properties under Section 106 of the NHPA and informs DOE's NEPA review as presented in this EIS. For additional information about the work completed by DOE, see **Appendix K**. The remaining identification work will be conducted in accordance with the draft Section 106 PA to conduct identification and evaluation efforts due to the multiple corridors being considered for the Project alternatives, as well as because the effects of the proposed Project are complex, involve large land areas, and cannot be fully determined prior to issuing a Presidential permit for the proposed Project (see **Appendix K**).

The methodology for the Phase IA archaeological investigations of the direct APEs for the alternatives for the Project was developed to assist DOE with meeting the requirements of Section 106 of the NHPA for identifying historic properties and considering the potential impacts and effects of a Project on archaeological resources that are historic properties, and informing DOE's NEPA review as presented in this EIS. The Phase IA archaeological investigations consisted of combination of background research, desktop-based and GIS analyses, and fieldwork. Background research and desktop analyses were used to assess archaeological site sensitivity (or presence/absence) of Pre-Contact and Post-Contact archaeological sites based on known site locations along the Project corridor. Fieldwork was used to further refine site sensitivity models by conducting a systematic pedestrian survey of the direct APE (for Alternative 7) and a combination of systematic roadway and pedestrian survey of the direct APEs for those portions of the remaining alternatives that do not share the same configuration of aboveground and buried components and/or alignment as Alternative 7 (i.e., Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b) to identify landforms where archaeological sites are located or may exist based on environmental parameters such as soil conditions, slope, elevation, and proximity to water sources.

The Phase IA investigations included background documentary research and site file searches to develop the environmental and cultural contexts for the direct APE. Based on the results of this work, Pre- and Post-Contact site sensitivity assessments of the study areas for the alternatives were developed not only to identify potential presence of cultural resources, but also to identify areas where environmental or areas of disturbance suggest cultural resources are likely to be absent. The methodology for the Phase IA archaeological investigations of the direct APEs for all alternatives for the Project was also developed according to *New Hampshire Division of Historical Resources Archaeological Standards and Guidelines* (NHDHR 2004a) and in accordance with NHDHR's policies for archaeological investigations (NHDHR 2007a).

The NHDHR standards, guidelines and policies specified the level of effort necessary to conduct the Phase IA archaeological investigation for the Project, including background research, site file search and pedestrian survey of the direct APE, and to report the results of the Phase IA archaeological investigation for the Project. Specific NHDHR policies that were applicable to the Phase IA archaeological investigations included the NHDHR memoranda for *Wintertime Archaeological Fieldwork* (Boisvert 2003a), *Access to Archaeological and Historic Inventory Files* (Muzzey 2007a), *File Reviews Required for Project Review* (Feighner 2012a), *Electronic Filing of Project Reports, Request for Project Review Forms using Compact Disks (CD) or Email* (Feighner 2012b), and *Archaeological Report Submittals* (Feighner 2013a) and NHDHR's archaeology forms and manuals, including the *Pre-* and *Post-Contact Archaeology Site Form Manuals* and *Pre-* and *Post-Contact Archaeology Site Forms*, the *Archaeological Report Requirements*, and *Historic Context List* (NHDHR 2007b).

Using the methodology identified above to assist DOE with meeting the requirements of Section 106 of the NHPA and the NHDHR standards, guidelines, polices, the Phase IA archaeological investigations of the direct APEs for the all the alternatives for the Project were implemented to:

- identify known archaeological resources within the direct APE
- develop environmental and cultural contexts and data that may be used to identify areas of Pre- and Post-Contact archaeological sensitivity
- identify areas of Pre- and Post-Contact archaeological sensitivity and disturbance within the direct APE through pedestrian reconnaissance
- document Pre- and Post-Contact archaeological resources or sites within the direct APE visible during pedestrian reconnaissance
- recommend, as needed, areas and sites within the direct APE for Phase IB archaeological investigation

Phase IB archaeological investigations have not yet been conducted because DOE has elected to implement a phased process, as outlined in the draft Section 106 PA in **Appendix K** of this EIS, to conduct identification and evaluation efforts due to the multiple corridors being considered for the Project alternatives in accordance with implementing regulations for Section 106 of the NHPA (36 CFR § 800.4(b)(2)). These investigations would be completed for any alternative that may be selected or approved for the Project. All required archaeological investigations would be conducted prior to construction in order to identify any additional archaeological resources in areas that have not previously been subject to subsurface investigations. Consistent with NHDHR's recommendations, Phase IB investigations would be conducted for any newly identified archaeological sites or archaeologically sensitive areas that have been identified in the direct APE, or known resources for which this level of archaeological investigation has not previously been conducted. Subsequent archaeological investigations would include detailed surface and subsurface investigations to identify cultural remains, delineate site boundaries, and where possible, evaluate and make recommendations regarding NRHP eligibility or the need for additional Phase II archaeological investigations to evaluate NRHP eligibility. If the results of Phase IB archaeological investigations identify any sites that cannot be determined NRHP-eligible, then additional Phase II archaeological investigations, consisting of additional background research and additional subsurface testing would be necessary to evaluate the NRHP eligibility of such archaeological sites. Subsequent Phase IB and Phase II archaeological investigation would also be conducted in accordance with the appropriate NHDHR standards, guidelines and policies specified the level of effort necessary to conduct Phase IB or Phase II archaeological investigations for the Project.

The methodology for the reconnaissance survey of architectural resources for the Project was developed to assist DOE with meeting the requirements of Section 106 of the NHPA for identifying historic properties and considering the potential impacts and effects of the Project on architectural resources that are historic properties. The reconnaissance survey of architectural resources for the Project consisted of background research, site file searches and literature review to understand the historical contexts for the Project area and indirect APE; analysis of key environmental characteristics, including soils, proximity to waterbodies, and topography; identification of historic roads, railroads and other transportation routes within the Project area and/or indirect APE; and reconnaissance-level fieldwork to document previously identified historic architectural resources, including architectural resources that were previously determined historic properties (or determined not historic properties), and previously unrecorded historic architectural resources along public roads within the indirect APE and visual aspects of these resources to use in evaluating the integrity of their settings.

The field methods for the reconnaissance survey of architectural resources for Alternative 7 were designed to: 1) locate previously identified aboveground resources, 2) identify previously undocumented historic resources, and 3) recognize visual aspects of properties where historic setting may contribute to significance, which are located within the indirect APE for Alternative 7. A driving or windshield survey covered all public roads within the direct and indirect APEs for Alternative 7 in order to examine existing buildings, structures, and other aspects of the built environment. Architectural resources considered potentially significant were photographed and noted. The locations of these resources were documented by GPS and noted on field maps, described in photo logs, and physical property addresses noted.

Using the methodology identified above to assist DOE with meeting the requirements of Section 106 of the NHPA, the reconnaissance survey of architectural resources within the indirect APE for Alternative 7 was implemented to:

- locate previously identified historic architectural resources within the indirect APE
- identify previously unrecorded historic architectural resources within the indirect APE
- document the visual aspects of these historic architectural resources where historic setting may contribute to significance

A reconnaissance survey of architectural resources was also conducted for those portions of the alternatives that do not have the same configuration of aboveground and buried components and/or do not follow the same alignment as Alternative 7 (i.e., Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b). The reconnaissance survey of architectural resources for the alternatives to the Proposed Action consisted of examining existing buildings, structures, and other aspects of the built environment visible from public roads and highways, including previously identified architectural resources that were listed or eligible for listing in the NRHP or on file at NHDHR, and newly identified architectural resources. Given the differences in the design and location of these alternatives, the survey methodology was different from that of Alternative 7.

Additionally, NHDHR's policies and guidance for the level of effort necessary to conduct architectural surveys in New Hampshire required preparation of Project Area Forms (PAFs) for the Project (NHDHR 2007c). Specific NHDHR guidance that was applicable to preparing the PAFs included the NHDHR's *Introduction to Architectural Survey in New Hampshire* (NHDHR 2013a), *Architectural Survey Policy* (NHDHR 2013b), *Area Form Survey Manual*, including the Area Form and Appendices A-E (NHDHR 2013c), and *Access to Archaeological and Historic Inventory Files* (Muzzey 2007a). During DOE's consultation on the methodology for identifying cultural resources and historic properties under Section 106, NHDHR indicated that preparation of PAFs were necessary for Alternative 7, to assist with the identification of architectural resources that reflect important historic contexts for the Project area and whose setting may be impacted or affected by the Project. NHDHR indicated that preparation of PAFs was not necessary for the other Project alternatives (i.e., Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b), because they either consist of buried project components, such that there will be no substantive changes to the setting of architectural resources, or consist of aboveground components that are in the same locations as for Alternative 7.

Preparation of PAFs for Alternative 7 incorporated all of the methodology employed for the reconnaissance survey. The locations of all NRHP-listed and-eligible properties, previously inventoried NHDHR architectural resources and architectural resources identified during the reconnaissance survey were identified within the indirect APE. Furthermore, locations of resources were superimposed on viewshed modeling to establish a Zone of Visual Influence (ZVI) for the Project, which indicated areas within which one or more project components were visible, to identify which architectural resources, including those architectural resources that are historic properties, may be visually impacted by the Project. Finally, individual resources, districts, and/or areas were recommended for intensive-level survey or inventory. Additional architectural investigations will be conducted in accordance with the Section 106 PA (see **Appendix K**).

Cultural resources and historic properties within the APE for each section and under each alternative and the potential impacts expected to result from the Project, including potential impacts to those resources that are historic properties, are further described in **Sections 4.1.8**, **4.2.8**, **4.3.8**, **4.4.8**, and **4.5.8**. Additional detailed descriptions of the cultural resources and historic properties within the APE for each section and under each alternative, including additional detailed discussion of potential impacts, are presented in the Cultural Resources Technical Report.

The need for cultural landscape studies for the Project in New Hampshire was determined as a result of DOE's initial identification efforts in New Hampshire and as a result of DOE's consultation with NH SHPO and Section 106 Consulting Parties for the Project on the results of cultural resources investigations for the Project in New Hampshire. DOE's initial identification efforts in Vermont and DOE's consultation with VT SHPO and Section 106 Consulting Parties for the Project on the results of cultural resources investigations in Vermont did not indicate the need for cultural landscape studies for the Project in Vermont.

The NHDHR developed a scope of work for the identification and evaluation of cultural landscapes in New Hampshire specifically for the Project, based on guidance extracted from California Department of Transportation's 1999 "General Guidelines for Identifying and Evaluating Historic Landscapes" (NHDHR 2016). Cultural landscape studies will be conducted in accordance with the terms of the PA that was developed for the Project (see **Appendix K**).

NHDHR's scope of work for cultural landscape studies for the Project in New Hampshire established professional qualifications for the study team that would conduct the studies, established the context and requirements for identification of cultural landscapes, and outlined the procedure by which information would be gathered and documented to inform identification of cultural landscapes and how that information would be evaluated against NRHP criteria to determine whether a cultural landscape was a historic property. For additional information about the cultural landscape studies, see the **Cultural Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Per the NHDHR's scope of work, the cultural landscape studies for the Project in New Hampshire would evaluate the significance, integrity, and NRHP eligibility of any cultural landscapes that exist within the Pemigewasset River Valley and the Suncook River Valley. In light of the results of these studies, it will also be determined whether additional cultural landscapes are present in the Great North Woods area of the Project in New Hampshire and a scope for identification and evaluation for these additional cultural landscapes in New Hampshire would be recommended (NHDHR 2016).

3.1.9 ENVIRONMENTAL JUSTICE

The study area for environmental justice includes populations in the five counties in which the Project would be located (Coös, Grafton, Belknap, Merrimack, and Rockingham), because these populations would be potentially impacted by the Project. The affected environment for environmental justice is discussed generally below and specifically by geographic section under **Sections 3.2.9**, **3.3.9**, **3.4.9**, and **3.5.9**. Additional information regarding the methods of analysis is provided in the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Executive Order 12898 (February 11, 1994) states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The EPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA 2015a). An analysis of environmental justice impacts therefore requires an assessment of the demographics of the potentially affected populations to determine if the potential impacts could disproportionately affect minority or low-income residents.

Minority populations include members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997b). Low-income populations can be identified as those whose income falls below the annual statistical poverty thresholds from the U.S. Census Bureau's Current Population Report, Series P-60 (CEQ 1997b). Median household income is included for further comparison.

To evaluate whether the Project could "disproportionately" affect low-income or minority residents of New Hampshire, an analysis of data from the U.S. Census was conducted. The assessment identified "block groups" (a group of residences designated by the Census) with any part of the group lying within 1,000 feet (305 m) of the proposed placement of a component of the Project.[43] For the purposes of this analysis of environmental justice, residents of these block groups are defined as the "potentially affected" populations. This evaluation was performed separately for the Proposed Action and for each alternative. For comparison, other block groups within the New Hampshire counties through which the Project would pass (the potentially affected counties of Belknap, Coös, Grafton, Merrimack, and Rockingham) were identified, as well as block groups within the five other New Hampshire counties (Carroll, Cheshire, Hillsborough, Strafford, and Sullivan). Three demographic measures were identified for each block group: the percentage of minority residents, the median household income (categorized by the Census within ranges), and the percentage of families living below the poverty level.

Table 3-8 shows the combined demographic characteristics of the five counties in the study area. The percentage of minority populations is less than New Hampshire as a whole, while families below poverty level is 1 percent higher. The average of median household income in the five study area counties is lower than New Hampshire as a whole. However, individual counties (e.g., Rockingham) have higher median household income than the state as a whole.

Table 3-8. Demographic Characteristics of the Study Area Counties and Comparator Regions, 2015

	Study Area Counties	New Hampshire	United States
Total Population	630944	1,330,608	321,418,820
Percent White	93.6%	91.0%	61.6
Percent Black or African American	1.0%	1.5%	13.3%
Percent American Indian and Alaska Native	0.3%	0.3%	1.2%
Percent Asian	1.8%	2.6%	5.6%
Percent Native Hawaiian and Other Pacific Islander	0.0%	0.0%	0.2%
Percent Other Race	0.3%	0.3%	0.2%
Percent 2 or More Races	1.5%	1.6%	2.6%
Percent Hispanic	2.0%	3.4%	17.6%
Total Percent Minority Population	*7.0%*	*9.7%*	*40.7%*
Percent Families below Poverty Level	6.6%	5.6%	11.3%
Median Household Income	$61,483	$66,779	$53,889

Source: U.S. Census Bureau 2017c,d

3.1.10 AIR QUALITY

The study area for direct air quality impacts consists of Coös, Grafton, Belknap, Merrimack, and Rockingham counties, NH. The Project would also have indirect impacts resulting from the changes within the ISO-NE electricity region. The study area for effects on air quality consists of the ISO-NE electricity

[43] Census block groups in New Hampshire comprise an average of about 1,428 residents and have an average land area of about 9.7 square miles (25.1 km²), with a median of 2.9 square miles (7.5 km²).

region (i.e., Maine, Massachusetts, Connecticut, Rhode Island, Vermont, and New Hampshire) for changes to the supply and generation of electricity. In order to analyze the impact of GHG emissions in the ISO-NE region resulting from this Project, CO_2 emissions were quantified and are presented in **Section 4.1.10**. Air quality specific to geographic areas are discussed in **Sections 3.2.10**, **3.3.10**, **3.4.10**, and **3.5.10**. Additional information regarding the methods of analysis is provided in the **Air Quality Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

This section provides a discussion of existing air quality in the five counties directly affected by the Project. This section also describes the federally based air quality programs likely to affect activities associated with the development of a transmission line:

- National Ambient Air Quality Standards (NAAQS) and State Ambient Air Quality Standards (SAAQS)
- Regional Haze
- Prevention of Significant Deterioration (PSD)
- General Conformity

3.1.10.1 Law, Regulation, and Policy

National Ambient Air Quality Standards

Air quality is defined by ambient air concentrations of specific pollutants determined by EPA to be of concern related to the health and welfare of the general public and the environment. The Clean Air Act of 1970, 42 U.S.C. § 7401 *et seq*., amended in 1977 and 1990, is the primary federal statute governing air pollution. The CAA designates air quality standards for the following criteria pollutants: particulate matter (particulate matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). The NAAQS for these criteria pollutants have been promulgated to protect public health and welfare (see **Table 3-9**) (EPA 2014g).

Table 3-9. National Ambient Air Quality Standards

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and Secondary	Rolling 3-month average	0.15 $\mu g/m^3$[a]	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile, averaged over three years
		Primary and Secondary	Annual	53 ppb[b]	
Ozone (O_3)		Primary and Secondary	8-hour	0.070 ppm[c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over three years
Particulate Matter	$PM_{2.5}$	Primary	Annual	12 $\mu g/m^3$	Annual mean, averaged over three years
		Secondary	Annual	15 $\mu g/m^3$	Annual mean, averaged over three years
		Primary and Secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over three years
	PM_{10}	Primary and Secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over three years

Table 3-9. National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Sulfur Dioxide (SO_2)	Primary	1-hour	75 ppb[(d)]	99th percentile of 1-hour daily maximum concentrations, averaged over three years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: EPA 2016
Notes:
[a] In areas designated nonattainment for the lead standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.
[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
[c] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards additionally remain in effect in some areas. Revocation of the previous (2008) ozone standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
[d] The previous sulfur dioxide standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet one year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous sulfur dioxide standards or is not meeting the requirements of a SIP call under the previous sulfur dioxide standards (40 CFR § 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.
Key:
µg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ppb = parts per billion
ppm = parts per million

The CAA also sets out specific requirements for states located in the Ozone Transport Region (OTR). As a state in the Northeast OTR, New Hampshire is required to submit a State Implementation Plan (SIP) and install a certain level of controls for the pollutants that form ozone, even if they meet the ozone standards (EPA 2014c).

Areas that do not meet the NAAQS are designated as "nonattainment" for that criteria pollutant standard. Nonattainment status is further defined by the extent the standard is exceeded. There are six classifications of ozone nonattainment status (transitional, marginal, moderate, serious, severe, and extreme) and two classifications of CO and PM_{10} nonattainment status (moderate and serious). The remaining criteria pollutants have designations of either attainment, nonattainment, or unclassifiable. Areas redesignated from nonattainment to attainment are commonly referred to as maintenance areas, indicating the area is in attainment but subject to an EPA-approved maintenance plan for a specific pollutant. In areas that exceed the NAAQS, the CAA requires preparation of a SIP. The CAA prohibits federal agencies from engaging in, supporting, or providing financial assistance for licensing, permitting, or approving any activity that does not conform to an applicable SIP (42 U.S.C. § 7401 *et seq*.).

The General Conformity Rule

The General Conformity Rule was promulgated by the EPA to ensure that the actions of federal departments or agencies conform to applicable SIPs. The General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas and covers direct and indirect emissions of criteria pollutants or their precursors that are caused by a federal action, are reasonably foreseeable, and can be controlled practicably by the federal agency through its continuing program responsibility.

A conformity applicability analysis is the first step of a conformity evaluation and assesses whether a federal action must be supported by a conformity determination. A federal action is exempt from applicability of the General Conformity Rule requirements if the action's total net emissions are below the *de minimis* levels specified in the rule or are otherwise exempt per 40 CFR § 93.153 (see **Table 3-10**). If a federal action is exempt, no further action is necessary. Total net emissions include direct and indirect emissions from all stationary point and area sources, construction sources, and mobile sources caused by the federal action.

Table 3-10. *De Minimis* Levels for Exemption from General Conformity Rule Requirements

Pollutant	Tons/Year
Ozone (VOCs and NO_X)	
Serious nonattainment areas	50
Severe nonattainment areas	25
Extreme nonattainment areas	10
Marginal and moderate ozone nonattainment and ozone maintenance areas outside an ozone transport region	
Volatile organic compounds (VOCs)	100
Nitrogen oxides (NO_X)	100
Marginal and moderate nonattainment and ozone maintenance areas inside an ozone transport region	
Volatile organic compounds (VOCs)	50
Nitrogen oxides (NO_X)	100
CO	
All nonattainment and maintenance areas	100
SO_2 and NO_2	
All nonattainment and maintenance areas	100
Particulate Matter (PM_{10})	
Moderate nonattainment and maintenance areas	100
Serious nonattainment areas	70
Particulate Matter ($PM_{2.5}$) (and its precursors)	
Direct Emissions	100
SO_2	100
NO_X (unless determined to not be a significant precursor)	100
VOCs or ammonia (if determined to be significant precursors)	100
Lead	
All nonattainment and maintenance areas	25

Source: 40 CFR Part 93
Key:
CO = carbon monoxide
NOX = nitrogen oxides
NO2 = nitrogen dioxide
PM10 = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Coös, Grafton, and Belknap counties are in attainment for all NAAQS; therefore, the Conformity Rule does not apply to actions in these counties. Parts of Merrimack and Rockingham counties are designated nonattainment for the 2010 SO_2 NAAQS; therefore, the SO_2 thresholds apply (EPA 2015).

EPA Regional Haze Rule

The EPA's Regional Haze Rule calls for state and federal agencies to work together to improve visibility in 156 national parks and wilderness areas. In New Hampshire, this includes the Great Gulf Wilderness and the Presidential Range–Dry River Wilderness, both of which surround Mount Washington in the study area of the Central Section. The rule requires the states, in coordination with EPA, the NPS, the USFWS, the

USFS, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. New Hampshire is a member of the Mid-Atlantic Northeast Visibility Union (MANE-VU), and established the New Hampshire Regional Haze SIP (NHDES 2011a) to comply with the Regional Haze Rule.

Prevention of Significant Deterioration

PSD is applicable to all major sources (or existing sources making a major modification) located in an area that is in attainment of the NAAQS (NHDES 2011a). A major source is an emissions source that has the potential to emit more than 100 tons per year (TPY) of any pollutant. One of the purposes of the PSD program is to protect air quality in national parks, wilderness areas, and other areas of special natural, scenic, or historic value. The PSD permitting process requires a technical air quality analysis and additional analyses to assess the potential impacts on soils, vegetation, and visibility at Class I areas (NHDES 2011a).

WMNF Forest Plan

The WMNF Forest Plan established air quality goals to ensure that WMNF ecosystems are not adversely affected by air pollution, and WMNF management activities are conducted to protect or maintain air quality (USDA Forest Service 2005a). The WMNF assesses major new sources of air pollution to determine if they would have an adverse effect on Air Quality Related Values (AQRVs) in Class I Airsheds and advises the Regional Forester and appropriate air quality regulators. Specifically, the Forest Plan’s guideline G-1 states: “The Great Gulf and Presidential Range/Dry River Wilderness Class I Airsheds should be managed to protect air quality related values (AQRVs) such as visibility, vegetation, and water quality” (USDA Forest Service 2005a).

Greenhouse Gases and Climate Change

GHGs are gaseous emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include CO_2, methane, and nitrous oxide. GHGs are primarily produced by the burning of fossil fuels and through industrial and biological processes.

According to EPA, “climate change refers to any significant change in measures of climate lasting for an extended period of time” (EPA 2014h). Climate change affects weather, oceans, snow, ice, ecosystems, and society (EPA 2014d). As a result of climate change, water resources, coastal regions, crop and livestock production, and human health are impacted (EPA 2014d). Human activities are contributing to climate change, primarily by releasing billions of tons of CO_2 and other heat-trapping gases, known as GHGs, into the atmosphere every year (EPA 2014d).

Regional Greenhouse Gas Initiative

The State of New Hampshire is participating in the RGGI with other Northeast and Mid-Atlantic states. RGGI is a regional plan to implement a flexible, market-based program to reduce GHG emissions (primarily CO_2) from power plants in the Northeast and Mid-Atlantic states. New Hampshire and eight other states have adopted laws and/or regulations to establish a framework for implementing RGGI in their respective states (NHDES 2013a). In New Hampshire, RGGI proceeds are used to fund energy efficiency programs and projects through the state’s greenhouse gas reduction fund or energy efficiency reduction fund (NHPUC 2013). While RGGI is not specific to this Project, the program indicates the commitments from NH and other northeastern states to reduce greenhouse gas emissions from the region.[44]

The New Hampshire Climate Action Plan established the goal to “achieve a long term reduction in greenhouse gas emissions of 80 percent below 1990 levels by 2050,” and included the Task Force

[44] For Canadian hydropower to be eligible for credit under RGGI, the generation and transmission facilities would need to be outfitted with tracking and reporting systems to validate the clean energy attributes of the electricity.

Recommendation to "Enable Importation of Canadian Hydro and Wind Generation (EGU 2.6)" (NHDES 2009).

ISO-NE Region

Electricity generation in New England represents a major source of pollutant emissions, primarily from the burning of fossil fuels. Emissions from electricity generation have decreased over the past decades, resulting primarily from regulatory requirements for more efficient equipment, cleaner fuels, and improved pollution control technologies. In 2014 New England's electricity energy generation was dominated by natural gas (43 percent), while coal (5 percent) and oil (2 percent) made up a much smaller portion of the conventional thermal fleet generation. ISO-NE also has nuclear and hydro capacity, making up approximately 34 percent and 7 percent of the total generation, respectively (ISO-NE 2016a). Renewable energy such as biomass/refuse, wind, and solar also make up a small but growing portion of ISO-NE's generation (5 percent), which includes over 800 different individual generators (ISO-NE 2014e).

The most recent air emissions report from ISO-NE provides air emission data from 2014 operations. ISO-NE generated 108,357 GWh of electricity, while 120,612 GWh was generated in 2011(ISO-NE 2016, 2014d). SO_2 emissions decreased between 2011 and 2012, the result of unit retirements, new emission control technologies installations (such as at the Merrimack Station), and a large decrease in generation by coal-fired units (ISO-NE 2014d). **Table 3-11** summarizes annual emissions from ISO-NE electricity generation in from 2011 to 2014.

Table 3-11. Electricity Generation Air Emissions, ISO-NE, 2011–2014

Year	NO_x		SO_2		CO_2	
	Emission Rate (lbs/MWh)	Total Emissions (kTons)	Emission Rate (lbs/MWh)	Total Emissions (kTons)	Emission Rate (lbs/MWh)	Total Emissions (kTons)
2011	0.42	25.3	0.95	57.01	780	46,959
2012	0.35	20.32	0.28	16.61	719	41,975
2013	0.36	20.32	0.32	18.04	730	40,901
2014	0.38	20.49	0.32	11.68	726	39,317

Source: ISO-NE 2014d,e and 2016
Key:
CO_2 = carbon dioxide
kTons = kilotons (1,000 short tons)
lbs/MWh = pounds per megawatt hour
NOx = nitrogen oxides
SO_2 = sulfur dioxide

NO_X, SO_2, and CO_2 represent the primary sources of emissions from electricity generation. Depending on the fuel type used, emissions will also include CO, particulate matter, VOCs, mercury, and other hazardous air pollutants.

3.1.10.2 Existing Air Quality

Implementation of the state and federal air control programs have resulted in improvements in air quality throughout the Northeastern U.S. Coös, Grafton, and Belknap counties are in attainment for all of the NAAQS. Parts of Merrimack and Rockingham counties are not in attainment for the 2010 SO_2 NAAQS (EPA 2016).

Table 3-12. Summary of NAAQS Attainment Status in the Study Area

County	Attainment Status
Coös	Full attainment
Grafton	Full attainment
Belknap	Full attainment
Merrimack	Partial non-attainment for SO_2
Rockingham	Partial non-attainment for SO_2

The EPA's Air Quality Index (AQI) is another metric used to describe existing air quality. According to the AQI reporting for New Hampshire, between 2013 and 2014 the five counties potentially affected by the Project experienced zero to two days of air quality considered to be unhealthy for sensitive groups, which represents exceedances of one or more of the NAAQS levels (see **Table 3-12**). The AQI is an indicator of overall air quality because it takes into account all of the criteria air pollutants measured within a geographic area, but does not indicate the attainment status of a county (EPA 2014f). **Table 3-13** provides AQI for all New Hampshire counties in the study area.

Table 3-13. Air Quality Index for New Hampshire Counties

County	2013				2014			
	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy
Belknap	102	4	0	0	208	5	0	0
Coös	156	23	2	0	352	13	0	0
Grafton	191	20	0	0	331	34	0	0
Merrimack	158	23	0	0	346	19	0	0
Rockingham	153	28	0	0	271	94	0	0

Source: EPA 2015c

3.1.10.3 Climate and Weather

The climate in New Hampshire is predominantly a humid continental climate, which is characterized by year-round precipitation, with an average monthly rainfall of 3 inches (8 cm; NHDRED 2014a). The state experiences mild summers and cold winters. In the southeast of New Hampshire, the Atlantic Ocean results in milder temperatures and more precipitation, while the northern mountainous regions experience longer and colder winters. The weather station on Mount Washington has recorded some of the coldest temperatures and strongest winds in the continental U.S. (NHDRED 2014a). Average annual snowfall ranges from 60 inches (152 cm) to over 100 inches (254 cm) across the state. Extreme weather is often associated with nor'easters or hurricanes. Hurricane Irene, which was a tropical storm when it hit New Hampshire in August 2012, resulted in the loss of power to over 160,000 customers. More than 250 roads were closed at some point because of the storm (Armstrong 2012a).

3.1.11 WILDLIFE

The study area for the wildlife analysis consists of the Project corridors for all alternatives. This section provides an overview of the wildlife analysis at the state scale, the affected environment specific to each geographic section is described below in **Sections 3.2.11**, **3.3.11**, **3.4.11**, and **3.5.11**. Some species and features of wildlife habitat are discussed at larger scales, including USFS Lynx Analysis Units (LAUs) and at the county level for Coös, Grafton, Belknap, Merrimack, and Rockingham counties, NH.

The Project would extend across a range of habitats for both terrestrial and aquatic wildlife species. **Table 3-14** lists all the federally- and state-listed wildlife species in New Hampshire, and their potential occurrence within the geographic sections. Field surveys were conducted in 2013/14 to assess the potential presence of protected wildlife species within the study area. The species-specific wildlife surveys included a freshwater mussel survey, bat acoustic survey, winter tracking survey, herpetofauna survey, Bicknell's thrush survey, breeding bird survey (BBS), and an aerial raptor nest survey. Field surveys were targeted at protected species, rather than unprotected species. Additional information regarding the methods of analysis is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

3.1.11.1 Federally- and State-listed Wildlife Species

Table 3-14 presents the federally- and state-listed species in New Hampshire, and their potential occurrence within the geographic sections. Species that do not have potential to occur in the study area, as determined through the field studies or desktop review, are included in **Table 3-14** for disclosure purposes, but are eliminated from further analysis. *Only species with the potential to occur in the study area and that had potentially suitable habitat available within the disturbance area were assessed for Project effects.* Species whose habitat is not present within the study area, such as alpine or marine/estuarine species, are also not further addressed. Federally-listed species in the Project corridor are discussed in more detail in the geographic section in which they are found (see **Sections 3.2.11.1**, **3.3.11.1, 3.4.11.1,** and **3.5.11.1**).

There is no federally designated critical habitat found within the study area. The state of New Hampshire categorizes locations which provide important habitat for state listed wildlife species; additional discussion is provided under Vegetation Resources (see **Section 3.1.12**).

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Birds				
American Black Duck	*Anas rubripes*	Coastal, freshwater, and forested habitats	SGCN	N, C, S, W
American Kestrel	*Falco sparverius*	Grasslands	SSC	N, C, S, W
American Peregrine Falcon	*Falco peregrinus*	Cliffs, rock outcrops	ST, RFSS	N, C, S, W
American Pipit[a]	*Anthus rubescens*	Alpine	SSC	N, C, S, W
American Three-Toed Woodpecker	*Picoides dorsalis*	Spruce-fir forests	ST	N, C, W
American woodcock	*Scolopax minor*	Forests with dense shrub habitat	SGCN	N, C, S, W
Bald Eagle	*Haliaeetus leucocephalus*	Riparian	ST	N, C, S, W
Bank Swallow	*Riparia riparia*	Riparian	SSC	N, C, S, W
Bay-breasted Warbler	*Setophaga castanea*	Mature tree stands, coniferous-mixed boreal forest, often at low elevations and near water	SGCN	N, C, W
Bicknell's Thrush	*Catharus bicknelli*	Spruce-fir forests	SSC, RFSS, UR	N, C, S, W

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Black-billled Cuckoo	*Coccyzus erythropthalmus*	Early successional dominated habitat, open woodlands, open forest edges, and shrubby wetlands	SGCN	N, C, S, W
Blackburnian Warbler	*Setophaga fusca*	Mature softwood/mixed forests	MIS, N	N, C, S, W
Blue-winged Warbler	*Vermivora cyanoptera*	Early successional dominated habitat, open woodlands, open forest edges, and shrubby wetlands	SGCN	S
Bobolink	*Dolichonyx oryzivorus*	Grasslands with relatively dense litter layer	SGCN	N, C, S, W
Brown Thrasher	*Toxostoma rufum*	Early successional dominated habitat, shrubby wetlands, and open woodlands/forest edges	SGCN	N, C, S, W
Canada Warbler	*Cardellina canadensis*	Forest habitats	SGCN	N, C, S, W
Cape May Warbler	*Setophaga tigrina*	Forest habitats including wetlands, mature boreal, and intermediate-aged	SGCN	N, C, W
Cerulean Warbler	*Setophaga cerulea*	Hardwood/mixed forests	SSC	S
Chestnut-sided Warbler	*Setophaga pensylvanica*	Early successional hardwood forests	MIS	N, C, S, W
Chimney Swift	*Chaetura pelagica*	Manmade structures in urban areas and forested landscapes	SGCN	N, C, S, W
Cliff Swallow	*Petrochelidon pyrrhonota*	Grasslands and developed	SCC	N, C, S, W
Common Gallinule[b]	*Gallinula galeata*	Wetlands	SCC	N, S
Common Loon	*Gavia immer*	Lakes and rivers	ST, RFSS	N, C, S, W
Common Nighthawk	*Chordeiles minor*	Shrublands and developed	SE	N, C, S, W
Common Tern	*Sterna hirundo*	Rocky islands, barrier islands, and salt marshes	ST	None
Eastern Meadowlark	*Sturnella magna*	Grasslands	SSC	N, C, S, W
Eastern Towhee	*Pipilo erythrophthalmus*	Early successional dominated habitat, open woodlands, open forest edges, and shrubby wetlands	SGCN	N, C, S, W
Eastern Whip-poor-will[c]	*Caprimulgus vociferus*	Forest and shrublands	SSC	N, C, S, W
Field Sparrow	*Spizella pusilla*	Early successional dominated habitat, open woodlands, open forest edges, and shrubby wetlands	SGCN	N, C, S, W
Golden Eagle	*Aquila chrysaetos*	Forested areas with cliffs, and edges of tundra and forest habitats	SE	N, C, S, W
Golden-winged Warbler	*Vermivora chrysoptera*	Shrublands	SSC	C, S, W
Grasshopper Sparrow	*Ammodramus savannarum*	Grasslands	ST	C, S, W

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Horned Lark	*Eremophila alpestris*	Grasslands	SSC	N, C, S, W
Least Bittern	*Ixobrychus exilis*	Wetlands	SSC	N, C, S, W
Least Tern	*Sternula antillarum*	Beach habitat, often on islands, with limited or no vegetation	SE	None
Magnolia Warbler	*Setophaga magnolia*	Early successional softwood/mixed forests	MIS, N	N, C, S, W
Marsh Wren	*Cistothorus palustris*	Saltwater and freshwater wetlands and marshes	SGCN	N, C, S
Nelson's Sparrow	*Ammodramus nelsoni*	Saltwater and freshwater marshes	SSC	None
Northern Goshawk	*Accipiter gentilis*	Mature, often disturbed, tree stands with pine cover	SGCN	N, C, S, W
Northern Harrier	*Circus cyaneus*	Grasslands	SE	N, C, S, W
Olive-sided Flycatcher	*Contopus cooperi*	Spruce-fir forests	SSC	N, C, S, W
Osprey	*Pandion haliaetus*	Lakes and rivers	RFSS, N	N, C, S, W
Pied-Billed Grebe	*Podilymbus podiceps*	Wetlands	ST, RFSS	N, C, S, W
Piping Plover	***Charadrius melodus***	**Beach habitats with little to no vegetation and/or open beach**	**FT, SE**	**None**
Prairie Warbler	*Setophaga discolor*	Early successional dominated habitat, open woodlands, open forest edges, and shrubby wetlands	SGCN	C, S
Purple Finch	*Haemorhous purpureus*	Anthropogenic habitats such as urban areas with suburban yards, conifer plantations, orchards, and golfcourses	SGCN	N, C, S, W
Purple Martin	*Progne subis*	Developed	SSC	N, C, S, W
Purple Sandpiper	*Calidris maritima*	Coastal	SGCN	None
Red Knot	***Calidris canutus***	**Coastal**	**FT, SGCN**	**None**
Roseate Tern	***Sterna dougallii***	**Coastal**	**FE, SE**	**None**
Ruddy Turnstone	*Arenaria interpres*	Coastal, often with rock substrate	SGCN	None
Ruffed Grouse	*Bonasa umbellus*	Aspen/spruce/birch forests	MIS, SGCN	N, C, S, W
Rusty Blackbird	*Euphagus carolinus*	Spruce-fir and wetlands	SSC	N, C, S, W
Saltmarsh Sparrow	*Ammodramus caudacutus*	Salt marshes	SSC	None
Sanderling	*Calidris alba*	Coastal	SGCN	None
Scarlet Tanager	*Piranga olivacea*	Mature hardwood/mixed forests	SGCN, MIS	N, C, S, W
Seaside Sparrow	*Ammodramus maritimus*	Salt marshes	SSC	None
Sedge Wren	*Cistothorus platensis*	Wetlands	SE	S

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Semipalmated Sandpiper	*Calidris pusilla*	Coastal	SGCN	None
Sora	*Porzana carolina*	Wetlands	SSC	N, C, S, W
Spruce Grouse	*Falcipennis canadensis*	Spruce-fir forests	SSC	N, C, W
Upland Sandpiper	*Bartramia longicauda*	Grasslands	SE	N, C, S, W
Veery	*Catharus fuscescens*	Moist hardwood forests	SGCN	N, C, S, W
Vesper Sparrow	*Pooecetes gramineus*	Grasslands	SSC	N, C, S, W
Whimbrel	*Numenius phaeopus*	Coastal	SGCN	None
Willet	*Tringa semipalmata*	Salt marshes	SSC	None
Wood Thrush	*Hylocichla mustelina*	Hardwood and mixed forests	SGCN	N, C, S, W
Fish				
Alewife	*Alosa pseudoharengus*	Estuaries and oceans Spawning occurs in freshwater habitats with slow moving water	SSC	S
American Brook Lamprey	*Lethenteron appendix*	Small rivers and streams with cool temperatures Spawning occurs over coarse sand and gravel substrates at the head of riffle areas	SE	None
American Eel	*Anguilla rostrata*	Marine, estuarine, and freshwater	SSC	C, S
American Shad	*Alosa sapidissima*	Reside in the Gulf of Maine and Bay of Fundy in the summer and fall then migrate to saltwater habitat Spawning occurs on the coastline of the Atlantic Ocean in freshwater rivers	SSC	S
Atlantic Sturgeon	***Acipenser oxyrinchus***	**Marine waters. Spawning occurs in estuarine and fresh waters**	**FT, ST**	**None**
Banded Sunfish	*Enneacanthus obesus*	Freshwater streams, lakes, and ponds with high vegetation	SSC	S
Blueback Herring	*Alosa aestivalis*	Coastal waters Spawning occurs in flowing rivers and streams	SSC	S
Bridle Shiner	*Notropis bifrenatus*	Lakes, ponds, rivers, and streams with dense submerged aquatic vegetation	ST	C, S
Burbot	*Lota lota*	Large lakes and rivers	SGCN	N, C, S
Eastern Brook Trout	*Salvelinus fontinalis*	Coldwater streams or spring-fed aquatic systems	SGCN	N, C, S, W
Finescale Dace	*Chrosomus neogaeus*	Streams, rivers, and ponds with slow to moderate flow and vegetation coverage	SSC	N

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Lake Trout	*Salvelinus namaycush*	Deepwater habitat such as large reservoirs and lakes with variable bottom contour Spawning occurs in rocky substrate habitats	SGCN	N, C
Lake Whitefish	*Coregonus clupeaformis*	Pelagic, cold waters	SSC	C
Northern Redbelly Dace	*Chrosomus eos*	Slow moving freshwater streams, lakes, and ponds, often with high acidity	SSC	N, C
Rainbow Smelt	*Osmerus mordax*	Estuarine Spawning occurs in shallow riffles within fast flowing rivers with gravel substrates	SSC	N, C, S
Redfin Pickerel	*Esox americanus*	Fresh and brackish waters with low flow, dense vegetation, high acidity, and low levels of dissolved oxygen	SSC	S
Round Whitefish	*Prosopium cylindraceum*	Deep, coldwater lakes and rivers	SSC	N, C
Sea Lamprey	*Petromyzon marinus*	Ocean Reproduces in freshwater streams	SSC	S
Shortnose Sturgeon	***Acipenser brevirostrum***	**Estuarine, coastal, and freshwater habitats. Spawning occurs in muddy and/or sandy substrates in tidal environments**	**FE, SE**	**None**
Swamp Darter	*Etheostoma fusiforme*	Flowing streams, shallow lakes, and ponds with high vegetation and detritus cover, and muddy, soft substrates	SSC	S
Invertebrates, Including Freshwater Mussels (Mussel)				
Alewife Floater (Mussel)	*Anodonta implicata*	Freshwater	SGCN	S
American Bumble Bee	*Bombus pensylvanicus*	Areas with flowering vegetation	SGCN	None
Appalachian Tiger Beetle	*Cincindela ancocisconensis*	Sand and gravel bars of forested streams and rivers	RFSS, SGCN	N, C
Barrens Itame	*Speranza exonerate*	Woodlands and pine barrens	SSC	S
Barrens Xylotype	*Xylotype capax*	Woodlands and pine barrens	SSC	S
Broad-lined Catopyrrha	*Esatria coloraria*	Woodlands and pine barrens	SSC	S
Brook Floater (Mussel)	*Alasmidonta varicosa*	Flowing rivers and streams with coarse-sandy or cobble substrates	SE	S
Cobblestone Tiger Beetle	*Cicindela marginipennis*	Riverbanks with flowing water and cobble beaches with sand and sparse vegetation	SE	None
Coppery Emerald	*Somatochlora georgiana*	Forested peatlands, forest streams, and near the Atlantic White Cedar Swamp	SSC	None

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Cora moth	*Cerma cora*	Woodlands and pine barrens	SSC	S
Creeper (Mussel)	*Strophitus undulatus*	Low to moderately flowing rivers and streams	SGCN	N, C, S
<u>Dwarf Wedgemussel (Mussel)</u>	***<u>Alasmidonta heterodon</u>***	**<u>Moderately flowing rivers and streams</u>**	**<u>FE, SE</u>**	**<u>N, C</u>**
Eastern Pearlshell (Mussel)	*Margaritifera margaritifera*	Rivers and streams with cold water and present populations of trout or salmon	SGCN	N, C, S
Eastern Pondmussel (Mussel)	*Ligumia nasuta*	Freshwater habitats with low to negligible flow	SSC	None
Edward’s Hairstreak	*Satyrium edwardsii*	Woodlands and pine barrens	SGCN	S
<u>Frosted Elfin Butterfly</u>	*<u>Callophrys irus</u>*	<u>Pine barrens with wild lupine</u>	<u>SE</u>	<u>S</u>
Graceful Clearwing	*Hemaris gracilis*	Woodlands and pine barrens	SGCN	S
Hessel’s Hairstreak	*Callophrys hesseli*	Swamps	SGCN	None
Incurvate Emerald	*Somatochlora incurvata*	Sphagnum bogs	RFSS, N	Unknown
<u>Karner Blue Butterfly</u>	***<u>Lycaeides melissa samuelis</u>***	**<u>Pine barrens with wild lupine</u>**	**<u>FE, SE</u>**	**<u>S</u>**
Kennedy’s Emerald	*Somatochlora kennedyi*	Swamp, bog, and fen habitats with actively flowing water	SGCN	N, C
Lyre-tipped Spreadwing	*Lestes unguiculatus*	Wetlands	SGCN	N
Margined Tiger Beetle	*Cicindela marginata*	Mudflats, salt pannes, and upland dune habitats on the coastaline of the Atlantic Ocean	SGCN	None
Mayfly	*Ameletus browni*	Freshwater habitats	RFSS, N	Unknown
Mayfly	*Ameletus tertius*	Freshwater habitats	RFSS, N	Unknown
Monarch	*Danaus plexippus*	Areas with flowering vegetation	SGCN	N, C, S
New Jersey Tea Span Worm	*Apodrepanulatrix liberaria*	Woodlands and pine barrens	SGCN	S
Noctuid moth	*Chaetaglaea cerata*	Woodlands and pine barrens	SGCN	S
Ocellated Emerald	*Somatochlora minor*	Forested uplands, peatlands, and streams	SGCN	N, C
<u>Persius Duskywing Skipper</u>	*<u>Erynnis persius</u>*	<u>Pine barrens with wild lupine</u>	<u>SE</u>	<u>S</u>
Phyllira Tiger Moth	*Grammia phyllira*	Woodlands and pine barrens	SSC	S
Pine Barrens Bluet	*Enallagma recurvatum*	Coastal plain ponds	SSC	None
<u>Pine Pinion Moth</u>	*<u>Lithophane lepida</u>*	<u>Woodlands and pine barrens</u>	<u>ST</u>	<u>S</u>
Pinion Moth	*Xylena thoracica*	Woodlands and pine barrens	SGCN	S

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Puritan Tiger Beetle	***Cicindela puritana***	**Sandy beaches adjacent to clay banks or bluffs**	**FT, SE**	**None**
Rapids Clubtail	*Gomphus quadricolor*	Rivers	SSC	S
Ringed Boghaunter Dragonfly	*Williamsonia lintneri*	Sphagnum wetlands	SE	S
Ringed Emerald	*Somatochlora albicincta*	Ponds with high elevations and surrounding tundra and forest habitats	SGCN	N, C, W
Rusty-patched Bumble Bee	***Bombus affinis***	**Areas with flowering plants**	**FE, SGCN**	**None**
Sedge Darner	*Aeshna juncea*	Small ponds at high elevation with friging peatlands and/or graminoid fens	SGCN	None
Skillet Clubtail	*Gomphus ventricosus*	Low flowing rivers	SSC	S
Sleepy Duskywing	*Erynnis brizo brizo*	Woodlands and pine barrens	SSC	S
Triangle Floater (Mussel)	*Alasmidonta undulata*	Flowing freshwater	SGCN	N, C, S
Twilight Moth	*Lycia rachelae*	Woodlands and pine barrens	SGCN	S
White Mountain arctic Butterfly[a]	*Oeneis melissa semidea*	Alpine	RFSS, ST	None
White Mountain fritillary Butterfly[a]	*Boloria chariclea*	Alpine	RFSS, SE	None
Yellow Bumble Bee	*Bombus fervidus*	Areas with flowering vegetation	SGCN	Unknown
Yellowbanded Bumble Bee	*Bombus terricola*	Areas with flowering vegetation	SGCN	Unknown
Pine Barrens Zale	*Zale* sp. *1 nr. Lunifera*	Woodlands and pine barrens	SGCN	S
Mammals				
American Marten	*Martes americana*	Forest and tree stand habitats	ST	N, C, W
American Water Shrew (Eastern)	*Sorex palustris albibarbis*	Coniferous forests with wet areas and/or water	SGCN	N, C, S, W
Big Brown Bat	*Eptesicus fuscus*	Caves/mines, forests, and buildings with nearby wetlands and/or streams	SGCN	N, C, S, W
Canada Lynx	***Lynx canadensis***	**Boreal forests and southern extensions**	**FT, SE**	**N, C, W**
Eastern Red Bat	*Lasiurus borealis*	Deciduous forests, habitats with fragmentation, and urban areas	SSC	N, C, S, W
Eastern Small-footed Bat	*Myotis leibii*	Structures, caves, mines, rock crevices, talus piles, wetlands, riparian corridors	RFSS, SE	N, C, S, W
Gray Wolf (Eastern)	***Canis lupus***	**Historically inhabited mixed forests and a variety of habitats**	**FE, SE**	**None**

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	*Scientific Name*	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Hoary Bat	*Lasiurus cinereus*	Deciduous and coniferous forests, often with Eastern hemlock (Tsuga Canadensis)	SSC	N, C, S, W
Indiana Bat	***Myotis sodalis***	**Trees, structures, caves, mines, wetlands, riparian corridors**	**FE, N**	**N, C, S, W**
Little Brown Bat	*Myotis lucifugus*	Trees, structures, caves, mines, wetlands, riparian corridors	RFSS, SGCN	N, C, S, W
Long-tailed Shrew	*Sorex dispar*	Coniferous, deciduous, and mixed forests in high elevations that are damp and cold, and often near structures with shaded crevices	SGCN	N, C, S, W
Moose	*Alces americanus*	Hardwood or mixed wood stands with nearby water	SGCN	N, C, S, W
New England Cottontail	*Sylvilagus transitionalis*	Native shrublands and regenerating forests	SE	S
Northern Bog Lemming	*Synaptomys borealis sphagnicola*	Sphagnum bogs, low elevation spruce-fir forests	RFSS, SSC	N, C, S, W
Northern Long-eared Bat	***Myotis septentrionalis***	**Trees, structures, caves, mines, wetlands, riparian corridors**	**FT, ST**	**N, C, S, W**
Rock Vole	*Microtus chrotorrhinus*	Coniferous and mixed forests at high elevations often with moss-covered rocks and talus slopes near streams	SGCN	N, C, W (Unknown)
Silver-haired Bat	*Lasionycteris noctivagans*	Large trees with moderate decay in deep cavities relatively high off the ground	SSC	N, C, S, W
Southern Bog Lemming	*Synaptomys cooperi*	Upland meadows and forests, marshes, and bogs	SGCN	N, C, S, W
Tricolored Bat	*Perimyotis subflavus*	Trees, structures, caves, mines, wetlands, riparian corridors	RFSS, SSC	C, S, W
Reptiles and Amphibians				
Blanding's Turtle	*Emydoidea blandingii*	Wetlands with permanent shallow water and emergent vegetation	SE	C, S, W
Blue Spotted Salamander	*Ambystoma laterale*	Forested uplands and wetlands	SSC	N, C, S
Eastern Box Turtle	*Terrapene Carolina carolina*	Woodlands, forests, fields, and clearings	SSC	S
Eastern Hognose Snake	*Heterodon platirhinos*	Sandy, gravely soils, open fields, river valleys, upland hillsides	SE	S
Eastern Ribbonsnake	*Thamnophis sauritus*	Wetlands, marshes, floodplains, ponds, and lakes with emergent vegetation	SGCN	C, S
Fowler's Toad	*Bufo fowleri*	Lakes, rivers, floodplains, and sandy substrates	SSC	C, S
Marbled Salamander	*Ambystoma opacum*	Various wooded habitats	SE	None
Mink Frog	*Rana septentrionalis*	Cold water; boarders of lakes and ponds	SGCN	N, C, W

Table 3-14. Federal and State-listed Wildlife Species Considered in this Analysis

Common Name	Scientific Name	Preferred Habitat	Conservation Status	Potential Occurrence in Section
Northern Black Racer	*Coluber constrictor*	Dry bushy pastures, woodlands, power line corridors, rocky ledges, and grasslands	ST	S
Northern Leopard Frog	*Rana pipiens*	Slow streams, marshes, bogs or ponds	SSC	N, C, S, W
Smooth Green Snake	*Opheodrys vernalis*	Upland grassy fields, pastures, meadows, blueberry barrens and forest openings	SSC	N, C, S, W
Spotted Turtle	*Clemmys guttata*	Wetlands with shallow, permanent water bodies and emergent vegetation, and developed upland habitats	ST	C, S, W
Timber Rattlesnake	*Crotalus horridus*	Rocky, south-facing hillsides in wooded areas	SE	None
Wood Turtle	*Glyptemys insculpta*	Slow moving streams and channels with sandy bottoms	RFSS, SSC	N, C, S, W

Source: NHFG 2015; eBird 2014a, 2014b, 2014c; NHB 2014
Notes:
[a] No alpine habitats are crossed by the Project so this species is not expected to occur.
[b] The common gallinule, formerly considered to be the same species as the common moorhen of Eurasia, was recently reclassified as a different species.
[c] Whip-poor-will was split into the eastern whip-poor-will and Mexican whip-poor-will.
Underlined text indicates state listed threatened and endangered species.
Bold text indicates federally listed threatened and endangered species.
Underlined bold text indicates federal and state listed threatened and endangered species.

Conservation Status Key:
FE = Federally Endangered (USFWS)
FT = Federally Threatened (USFWS)
MIS = Management Indicator Species (USFS)
N = Not listed by the state of New Hampshire (NHFG)
RFSS = Regional Forester Sensitive Species (USFS)
SE = State Endangered (NHFG)
SGCN = Species of Greatest Conservation Need (NHFG)
SSC = Species of Special Concern (NHFG)
ST = State Threatened (NHFG)

Project Section Key:
N = Northern Section
C = Central Section
S = Southern Section
W = WMNF Section

3.1.11.2 General Wildlife

The study area contains habitat for several non-listed aquatic and terrestrial wildlife species, including: amphibians, birds, fish, insects, mammals, mussels, and reptiles. Based on a list of species known to occur in New Hampshire according to New Hampshire Fish and Game (NHFG), a total of approximately 483 wildlife species were considered to determine which species would be analyzed in detail. These include approximately 61 species of fish, 10 species of mussels, 22 species of amphibians, 304 species of birds, 10 species of insects, 58 species of mammals, and 18 species of reptiles.

Common wildlife game species hunted in New Hampshire include black bear, eastern cottontail rabbit, gray squirrel, moose, ring-necked pheasant, snowshoe hare, various waterfowl species, white-tailed deer, and wild turkey. Other game species hunted for fur include coyote, gray fox, fisher, mink, muskrat, Virginia opossum, raccoon, red fox, striped skunk, and weasel (NHFG 2014b). As of 2005 there were populations of approximately 77,000 white-tailed deer, 6,400 moose, and 5,100 black bear in New Hampshire (NHFG 2005a). Additionally, in 2004 there was a population of approximately 26,000 wild turkeys in the state. The

Eastern brook trout is listed as a New Hampshire species of greatest conservation need as that species is sensitive to habitat alteration. These species inhabit coldwater habitats throughout the state.

3.1.11.3 Habitat Connectivity

Habitat connectivity, for the purposes of this analysis, is generally defined as the degree to which the landscape facilitates animal movement, including wildlife corridors and migration routes. Habitat connectivity is an important factor in the health of many wildlife species because it facilitates gene flow between populations and allowing species to adapt to local changes in habitat availability. Habitat connectivity is high in undisturbed areas such as those present in the study area of the Northern Section. Developed areas in the study area of the Southern Section have lower levels of habitat connectivity. In order to characterize the degree of existing habitat connectivity in the study area, the New Hampshire Connectivity Model (developed by NH Fish and Game and the National Audubon Society) was used to calculate *percent resistance*. The model identifies connectivity corridors throughout the state, generally indicative of contiguous forest and undeveloped land. The higher the percent resistance, the more difficult it is for sensitive wildlife species to move across the landscape; the lower the percentage, the more freedom of movement wildlife have. The percent resistance for the study area in each geographic section is presented below in **Sections 3.2.11.3**, **3.3.11.3**, **3.4.11.3**, and **3.5.11.3.**

Migratory flyways or pathways are corridors that generally provide habitat for birds or insects to use for feeding and rest during migration. In addition, the National Audubon Society, in conjunction with BirdLife International, identifies and monitors areas which provide important bird habitats, known as Important Bird Areas (IBA) (Audubon 2017). In addition to the Atlantic migratory flyway, the following IBAs were considered in this analysis: Pondicherry Basin IBA, Pontook Reservoir IBA, High Elevation Spruce-Fir Forest (also known as White Mountains High Elevation IBA), Merrimack River Floodplain IBA, Pawtuckaway Highlands IBA, and Concord Airport Grasslands IBA.

3.1.12 VEGETATION

The study area for the vegetation analysis consists of the Project corridors for all alternatives. The affected environment for vegetation is discussed generally below and specifically by geographic section under **Sections 3.2.12**, **3.3.12**, **3.4.12**, and **3.5.12**. Within the Project corridors, the most common habitat types are general forest habitat, scrub-shrub, and/or wetlands. One federally-listed plant was identified by the New Hampshire Natural Heritage Bureau (NHB) as having potential for presence within the study area: the small whorled pogonia, a federally threatened species. No small whorled pogonia were observed in the study area during targeted floristic surveys during June 2013 within the predicted habitat types. No small whorled pogonia were observed in the study area during any of the 2013 or 2014 survey field seasons. There are 95 federally- and state-listed sensitive plant species that have the potential to be present in the study area. Project-specific field surveys conducted in 2013 and 2014 identified two state-listed species in the study area: wild lupine (state threatened) and beaked sedge (state endangered). In addition, the NHB data indicates five additional species that were previously identified within the study area of the various alternatives including: red threeawn (*Aristida longespica* var. *geniculata*), Wiegand's sedge (*Carex wiegandii*), clasping milkweed (*Asclepias amplexicaulis*), Allegheny vine (*Adlumia fungosa*), licorice goldenrod (*Solidago odora*), and satiny willow (*Salix pellita*). **Table 3-15** presents the federally- and state-listed species in New Hampshire that were identified as potentially occurring within the study area, and their potential occurrence within the geographic sections. Additional discussion regarding listed plants and methods of analysis are included in the **Vegetation Technical Report** prepared for the Project (http://www.northernpasseis.us/library/final-eis/technical-reports).

In addition to listed plants, the State of New Hampshire also defines "exemplary natural communities," as locations which represent the best remaining examples of New Hampshire's biological diversity (NHDFL 2015). These communities may also contain sensitive or regionally important vegetative communities. The exemplary natural communities located within the study area of various alternatives include: Appalachian oak—pine forest system, dry Appalachian oak forest, high-elevation spruce—fir forest system, high-gradient rocky riverbank system, medium level fen system, moderate-gradient sandy-cobbly riverbank system, pith pine—scrub oak woodland, and poor level fen/bog system. Two of these exemplary natural community types are located in the WMNF Section in the Bog Pond area (the fen systems), just east of Kinsman Ridge. The State of New Hampshire defines this area as a poor-level fen/bog system and a medium level fen system. These wetland systems contain unique vegetation resources, even though state or federally listed plants may not be present in the community types. In addition, the Kinsman Ridge area is considered the high elevation spruce-fir system, and the Wild Ammonoosuc River is considered a high-gradient rocky riverbank system. Additional discussion regarding the exemplary natural communities is included in the **Vegetation Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The State of New Hampshire has also developed a dataset that describes the highest ranked wildlife habitats by their ecological condition. This was done for the entire state to provide municipalities or resources agencies an indication of the general sensitivity of various portions of the state. The most ecologically diverse areas are defined as "Highest Ranked Habitat in the State," which represent unique or sensitive habitats. The dataset also includes a category for the "Highest Ranked Habitat in the Biological Region" based on their prevalence in the region. Lastly, the "Supporting Landscapes" category was used to define locations which provide important habitats to connect the more ecologically diverse areas. The study area crosses a number of Highest Ranked Habitat in the Biological Region, ranging from 124 acres for Alternative 4a to 559 acres for Alternative 3. For areas categorized as Highest Ranked Habitat in the Biological Region, Alternatives 4b and 4c cross 243 acres, whereas Alternative 3 crosses 799 acres. The Supporting Landscapes category had the maximum greatest extent within the study area, ranging from 186 acres in Alternative 4a to 1,367 acres in Alternative 2.

Table 3-15. Federally- and State-listed Plant Species Considered in this Analysis

Common Name	Scientific Name	Preferred Habitat[a]	Conservation Status[b]	Potential Occurrence in Section[c]
Allegheny-vine/ Climbing fumitory	*Adlumia fungosa*	Rich woods/rich rocky woods	SE	N, C, S, W
Green rockcress	*Arabis missouriensis*	Rich rocky woods	RFSS	C, S, W
Alpine manzanita	*Arctostaphylos alpina*	Dry to mesic alpine/subalpine	RFSS	N
Dragon's mouth	*Arethusa bulbosa*	Calcium rich wetlands	RFSS	N, C, S, W
Red threeawn/Spiked needle grass	*Aristida longespica* var. *geniculata*	Sandplain	SE	S
Arnica	*Arnica lanceolata*	Riverbanks/marshes	RFSS, ST	N, C
Clasping milkweed/Blunt-leaved milkweed	*Asclepias amplexicaulis*	Sandplain	ST	S
Robbin's milkvetch	*Astragalus robbinsii* var. *minor*	Cliffs/ridges/riverbanks	RFSS	N
Dwarf white birch	*Betula minor*	Alpine/mountain plateaus	RFSS	N, C, W
Northern neglected reed grass	*Calamagrostis stricta* ssp. *inexpansa*	Peatlands/marshes/ stream banks/cliffs	ST	N, C, W
Alpine bittercrest	*Cardamine concatenata*	Cold ravines/wet mossy rocks	RFSS	N, C, W
Golden-fruited sedge	*Carex aurea*	Riverbanks/calcar. Seeps	ST	N, C, W
Back's sedge	*Carex backii*	Rich rocky woods	SE	N, C, S, W
Bailey's sedge	*Carex baileyi*	Rich fens	RFSS, ST	N, C, W
Brown bog sedge	*Carex buxbaumii*	Rich fens	SE	N

Table 3-15. Federally- and State-listed Plant Species Considered in this Analysis

Common Name	Scientific Name	Preferred Habitat[a]	Conservation Status[b]	Potential Occurrence in Section[c]
Capitate sedge	*Carex capitata* ssp. *Arctogena*	Rocky slopes/summits	RFSS, ST	N, C, W
Rope-root sedge	*Carex chordorrhiza*	Peatlands	SE	N, C, S, W
Clustered sedge	*Carex cumulata*	Rocky slopes/woodlands/meadows/fields	RFSS, ST	N,C, S, W
Lesser tussock sedge	*Carex diandra*	Rich fens	ST	N
Meager sedge	*Carex exilis*	Peatlands	SE	N, S, W
Livid sedge	*Carex livida*	Rich fens	SE	N, C, S, W
Beaked sedge	*Carex rostrata*	Peatlands/meadow marshes	SE	N
Bulrush sedge	*Carex scripoidea*	Subalpine/high-pH bedrock	RFSS, ST	N, C, W
Sparse-flowered sedge	*Carex tenuiflora*	Rich fens	SE	N
Wiegand's sedge	*Carex wiegandii*	Peatlands	RFSS, SE	N. C, W
Fogg's goosefoot	*Chenopodium foggii*	Woodlands/outcrops/ high-pH bedrock	RFSS	N, C, W
Autumn coralroot	*Corallorhiza odontorhiza*	Forests	RFSS, SE	N, C, S, W
Faxon's hawthorn	*Crataegus faxonii*	Edges/early successional areas	SE	N, C, S, W
Slender rock-brake	*Cryptogramma stelleri*	Circumneutral cliffs	SE	N, C, W
Wild hound's-tongue	*Cynoglossum virginianum* ssp. *boreale*	Rich woods	SE	N, C, W
Greater yellow lady's-slipper	*Cypripedium parviflorum* var. *makasin*	Rich swamps/fens	RFSS, SE	N, C, W
Large yellow lady's-slipper	*Cypripedium parviflorum* var. *pubescens*	Rich woods/swamps/fens	ST	N, C, S, W
Showy lady's-slipper	*Cypripedium reginae*	Rich swamps/fens	SE	N, C, W
Diapensia	*Diapensia lapponica*	Alpine	ST	N, C, W
Canescent Whitlow-mustard	*Draba cana*	Circumneutral cliffs	SE	N, W
Male wood fern	*Dryopteris filix-mas* ssp. *brittonii*	Rich woods	SE	N
Fragrant wood fern	*Dryopteris fragrans*	Circumneutral cliffs	RFSS, ST	N
Goldie's woodfern	*Dryopteris goldiana*	Forests	RFSS, ST	N, C, W
Few-flowered spikesedge	*Eleocharis quinqueflora* ssp. *fernaldii*	Rich fens	SE	N, C, S, W
Oake's eyebright	*Euphrasia oakesii*	Ridges/ledges/alpine wetlands	RFSS, SE	N, C, W
Showy orchid	*Galearis spectabilis*	Rich woods	ST	N, C, W
Boreal bedstraw	*Galium kamtschaticum*	Forested seeps/riverbanks	RFSS	N, C, W
Northern comandra	*Geocaulon lividum*	Peatlands/bogs/fens/mountain summits	RFSS, ST	N, C, W
Carolina crane's-bill	*Geranium carolinianum*	Rocky ground	SE	N, C, S, W
Mountain avens	*Geum peckii*	Alpine ravines/cliffs/wetlands	RFSS, ST	N, C, W
American spurred-gentian	*Halenia deflexa*	Rich swamps/ peatlands/wet meadows	ST	N, C, W

Table 3-15. Federally- and State-listed Plant Species Considered in this Analysis

Common Name	Scientific Name	Preferred Habitat[a]	Conservation Status[b]	Potential Occurrence in Section[c]
Mossplant	*Harrimanella hypnoides*	Rocky ground/mountain summits	RFSS, ST	N, W
Robinson's hawkweed	*Hieracium robinsonii*	Calcareous riverbank outcrops	SE	N, W
Common mare's-tail	*Hippuris vulgaris*	Quiet streams and ponds	ST	N, W
Long-leaved bluet	*Houstonia longifolia*	Talus/sandplain/ dry forests	SE	N, S
Small whorled pogonia	***Isotria medeoloides***	**Mixed or deciduous woods, often near small streams**	**FT, ST**	**C, S, W**
Butternut	*Juglans cinerea*	Rich streambanks	RFSS	N, C, S, W
Moor rush	*Juncus stygius* ssp. *americanus*	Rich fens	SE	N, C, S, W
Loesel's wide-lipped orchid	*Liparis loeselii*	Riverbanks/calcareous seeps/rich fens	ST	N, C, S, W
Brook lobelia	*Lobelia kalmii*	Riverbanks/ calcareous seeps	ST	N, C, W
Wild lupine	*Lupinus perennis*	Sandplain	ST	S
Tufted yellow-loosestrife	*Lysimachia thyrsiflora*	Rich swamps	ST	N, S
Green adder's-mouth	*Malaxis unifolia*	Swamps/forests	ST	N, C, S, W
Auricled twayblade	*Neottia auriculata* – formerly *Listeria* sp.	Rich swamps/ sandy streambanks	RFSS, SE	N, W
Broad-leaved twayblade	*Neottia convallarioides*	River & stream, floodplains, swamps/peatlands	RFSS, ST	N,C, S, W
Heart-leaved twayblade	*Neottia cordata*	Forested swamps/peatlands, riverbanks	RFSS, ST	N, C, W
Prairie goldenrod	*Oligoneuron album*	Woodlands/cliffs/riverbanks	RFSS, SE	C, W
Alpine arctic cudweed	*Omalotheca supina*	Alpine summits/plateaus	RFSS, SE	N, C, W
Northern adder's-tongue fern	*Ophioglossum pusillum*	Marshes/ wet meadows	RFSS, SE	N, C, S, W
Mountain sweet-cicely	*Osmorhiza berteroi*	Rich woods	RFSS, SE	N, W
Mountain sorrel	*Oxyria digyna*	Alpine riverbanks	ST	N, W
American ginseng	*Panax quinquefolius*	Rich woods	RFSS, ST	N, C, S, W
Silvery nailwort	*Paronychia argyrocoma*	Thin soils of ridges/rocky slopes/riverbanks	RFSS, ST	N, C, W
Sweet colt's foot	*Petasites frigidua* var. *palmatus*	Fens/swamps	RFSS, SE	N, S
Jack pine	*Pinus banksiana*	Rocky ground	ST	N, C, W
Canada mountain ricegrass	*Piptatherum canadense*	Dry, sandy, rocky soils/rocky slopes/meadows	RFSS, SE	C, S, W
Wavy bluegrass	*Poa laxa* ssp. *fernaldiana*	Rocky slopes, mountain summits	RFSS, SE	N, C, W
Alpine meadow grass	*Poa pratensis* ssp. *alpigena*	Mountain summits/riverbanks/meadows	RFSS, SE	N, C, S, W
Douglas' knotweed	*Polygonum douglasii*	Woodlands/cliffs/ridges	RFSS, ST	N, C, W

Table 3-15. Federally- and State-listed Plant Species Considered in this Analysis

Common Name	Scientific Name	Preferred Habitat[a]	Conservation Status[b]	Potential Occurrence in Section[c]
Viviparous knotweed	*Polygonum viviparum*	High-elevation ravines/plateaus	RFSS, ST	N, W
Reddish pondweed	*Potamogeton alpinus*	Quiet streams and ponds	SE	N, C, W
Robbins' cinquefoil	*Potentilla robbinsiana*	Rocky ground	RFSS, SE	N, C, W
Boott's rattlesnake-root	*Prenanthes boottii*	Alpine ridges/ledes/rocky ground	RFSS, ST	N, C, W
Pink wintergreen	*Pyrola asarifolia*	Forests/swamps/riverbanks	RFSS, SE	N, C, S, W
Giant Rhododendron	*Rhododendron maximum*	Poor swamps	ST	N, C, S, W
Northern willow	*Salix argyrocarpa*	Rocky slopes/edges of wetlands	RFSS, ST	N
New England dwarf willow	*Salix herbacea*	Rocky slopes/mountain summits	RFSS, ST	N, C, W
Satiny willow	*Salix pellita*	Swamps/stream banks/ floodplain forests	SE	N, W
Large-fruited sanicle	*Sanicula trifoliata*	Rich woods	RFSS, ST	N, C, S, W
White Mountain saxifrage	*Saxifraga paniculata*	Mountain ledges/cliffs	RFSS	N, C, W
Alpine brook saxifrage	*Saxifraga rivularis*	Alpine	RFSS	N
Arizona cinqufoil	*Sibbaldia procumbens*	Alpine ravines	RFSS	N, C, W
Moss campion	*Silene acaulis* var. *exscapa*	Alpine summits/plateaus	RFSS	N
Licorice goldenrod	*Solidago odora*	Dry, open woods, sandy soils	ST	N, C, S
Case's ladies'-tresses	*Spiranthes casei*	Rich fens/ wet meadows	SE	N, W
Lindley's American-aster	*Symphyotrichum ciliolatum*	Rocky ground/dry forests/stream banks/forest edges and roadsides	ST	N, C, W
Nodding pogonia	*Triphora trianthophora*	Forested hollows/deep leaf litter/moist Beech forests	RFSS, ST	C, S
Northern blueberry	*Vaccinium boreale*	Mountain summits/ledges/rocky ground	RFSS, ST	N, C, S, W
Mountain hairgrass	*Vahlodea atropurpurea*	Riverbanks/Alpine ridges, ledges	RFSS, SE	N
Smooth cliff fern	*Woodsia glabella*	Circumneutral cliffs	SE	N, C, W

Source: NHB 2014 and USDA Forest Service 2012b
[a] Project does not cross alpine habitat
[b] FT = federally-threatened; RFSS = Regional Forester Sensitive Species; MIS = Management Indicator Species; SE = state-endangered; ST = state-threatened
[c] Geographic regions were identified using the USDA NRCS (2015a) and NHDFL 2014
Bold text indicates federally threatened and endangered species.
Project Section Key:
N = Northern Section
C = Central Section
S = Southern Section
W = WMNF Section

3.1.13 WATER RESOURCES

Lotic System

A system of flowing water, such as a river or stream.

Lentic System

A system of non-flowing or standing water, such as a lake or pond.

The study area for water resources consists of the Project corridors for all alternatives. Water resources within the study area are characterized as a range of lotic (flowing water) systems, primarily rivers, and medium-to-small headwater streams. Many of these lotic systems are streams in the north characterized by cobble, gravel, and sand substrates, whereas substrates in the south may be dominated by sands and organic matter, with some systems containing submerged aquatic vegetation (SAV). Lentic systems (non-flowing water) within the study area are primarily limited to ponds and wetland areas. The water resources affected environment specific to each geographic section is described in **Sections 3.2.13, 3.3.13, 3.4.13,** and **3.5.13**. Additional information regarding the methods of analysis is provided in the **Water Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Stream Order

Stream order is used to define the size of streams and rivers. A small headwater stream would be considered first order, while the Mississippi River is a tenth order river.

The study area crosses several large watersheds including the Upper Connecticut, Upper Androscoggin, Pemigewasset, Ammonoosuc, Gale, Mad, Merrimack, Ham Branch, Moosilauke Brook River watersheds. Major rivers that are crossed by the Project (fourth order or greater streams and rivers) including: the Connecticut River, a Designated River under the New Hampshire Rivers Management and Protection Act and an American Heritage River under the EPA's American Heritage River Protection Program; the Upper Ammonoosuc River; Otter Brook; the Israel River; and Halls Stream. For a total number of perennial streams crossed, public water supply (PWS) wells within 250 feet (76 m) of the Project corridor and the acreage of wetlands and floodplains crossed see **Table 3-16**. A PWS is defined as a piped water system having its own source of supply, serving 15 or more services or 25 or more people, for 60 or more days per year.

Other public water supply resources, such as source water protection areas (SWPAs) and wellhead protection areas (WHPAs) were obtained from the NHDES water supply database and are outlined within each geographic section. Impacts to these resources are considered generally in **Section 4.1.13**.

Table 3-16. Water Resources in the Study Area – Project-wide

Resource	Northern	Central	Southern	WMNF	Total
Perennial Streams	37	59	31	18	127
PWS Wells Within 250 feet (76 m)	8	93	21	1	122
Wetlands (acres)	420 (170 ha)	860 (348 ha)	521 (211 ha)	63 (25 ha)	1,801 (729 ha)
Floodplain (acres)	2,368 (958 ha)	6,885 (2,786 ha)	3,841 (2,768 ha)	520 (210 ha)	13,094 (6,512ha)

Table 3-16 also presents the acres of floodplain crossed by the Project. The majority of the acres represent the 500-year floodplain (Zone X). The 100-year floodplain (Zone A and AE) typically accounts for a small percentage of the total for each geographic section.[45]

[45] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

3.1.13.1 Law, Regulation, and Policy

U.S. Army Corps of Engineers Direction

The *U.S. Army Corps of Engineers Wetlands Delineation Manual*, hereinafter referred to as 1987 Manual, and the Regional Supplement, defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987a; Cowardin et al. 1979a; USACE 2012a). Wetlands generally include swamps, marshes, bogs, and similar areas. Activities within and near these areas, including tree removal, culvert installation, grading, and changes in runoff regimes may affect the ecological functions of wetland resources. Impacts to wetlands are regulated by Section 404 of the CWA, and such activities would require issuance of a permit from the USACE.

Executive Order 11990

Additional direction regarding wetlands management is provided by EO 11990 – Protection of Wetlands. EO 11990 requires federal agencies to avoid to the extent practicable, long- and short-term adverse impacts associated with the destruction or modification of wetlands. More specifically, the Order directs federal agencies to avoid new construction in wetlands unless there is no practicable alternative. The Order states further that where wetlands cannot be avoided, the Proposed Action must include all practicable measures to minimize harm to wetlands. As required by EO 11990 and the CWA, avoidance and minimization measures must be considered through the planning process.

Executive Order 11988

EO 11988 – Floodplain Management provides direction to federal agencies to avoid direct or indirect floodplain development, wherever there is a practicable alternative (42 FR 26951). Section 2(a)(1) of EO 11988 states:

> *"Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain--for major Federal actions significantly affecting the quality of the human environment, the evaluation required below will be included in any statement prepared under Section 102(2)(C) of the National Environmental Policy Act."*

On January 30, 2015, President Obama signed EO 13690 – Establishing a Federal Flood Risk Management Standard [FFRMS] and a Process for Further Soliciting and Considering Stakeholder Input. This EO amends EO 11988. The FFRMS will reduce the risk and cost of future flood disasters by ensuring that federal investments in and affecting floodplains are constructed to withstand the impacts of flooding.

3.1.13.2 Wetlands

Based on a combination of field surveys, National Wetland Inventory (NWI) mapping and Natural Resources Conservation Service (NRCS) data that maps poorly and very-poorly drained soil, the study area contains up to an estimated 737 acres (298 ha) of palustrine emergent wetland (PEM), palustrine forested wetland (PFO), and/or palustrine scrub-shrub wetland (PSS) wetlands.

Wetland Functions and Values

Wetlands are often described in terms of their functions and values. Functions refer to the ecological role or processes that a wetland performs. Values refer to the importance of these functions to the environment or to humans. However, these terms are interrelated and most often the distinction between functions versus values is not made. Wetland functions can be generally categorized into three major groups: hydrology, water quality, and habitat. Wetlands do not necessarily perform all functions nor do they perform all functions to the same degree. The location, vegetation, and hydrology of a wetland often determine which functions it performs.

The major functions that the wetlands within the study area provide are: hydrology functions—groundwater discharge, groundwater recharge, velocity reduction, erosion protection, and floodwater retention/peak flood reduction; water quality functions—sediment removal, nutrient retention and removal; and wildlife habitat functions. Throughout the study area, the value of wetlands varies based on numerous factors including the level of current development. For example, a wetland within a cleared transmission route could potentially have a lower value than a wetland in a less-disturbed area.

3.1.14 GEOLOGY AND SOILS

The study area for geology and soils consists of the Project corridors for all alternatives. Earthquake occurrences were analyzed within 25 miles (40 km) of the Project centerline (USGS 2005a; USGS 2014a). The affected environment for geology and soils specific to each geographic section is described in **Sections 3.2.14**, **3.3.14**, **3.4.14**, and **3.5.14**.

> **Hydric Soils**
>
> Soils that are sufficiently wet in the upper part to develop anaerobic conditions during the growing season.

The analysis considered surficial geology to include the unconsolidated sediment overlying bedrock; while soils include the unconsolidated mineral or organic material on the immediate surface of the Earth. Analysis of potential impacts on the geology and soils within the study area for all alternatives were determined by reviewing GIS data, maps, and reports that describe bedrock geology (including faults), surficial geology, soils, and hazards associated with geology and soils (earthquakes, faults, landslides, and erosion potential). Limiting properties of geology and soils in the study area, including peak ground acceleration and presence of hydric soils, were also identified.

Analysis included the quantification of existing geologic and soil resources of concern within the study area including:

- Fault Crossings (including number of locations)
- Landslides (susceptibility and incidence)
- Hydric soils and partially hydric soils
- Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance[46]

Additional information regarding the methods of analysis is provided in the **Geology and Soils Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The surficial geology crossed by the Project is predominantly glacial till, glaciofluvial, and fluvial deposits. These surficial deposits are the result of glaciation that began as alpine glaciation; however, the entirety of New Hampshire was covered during the Wisconsin Glacial Stage by continental ice sheets originating in eastern Canada. Other surficial geologic units include Pleistocene to Holocene stream terrace deposits and Holocene alluvium located along or near the Pemigewasset (in the study area of the Central Section) and Merrimack (in the study area of the Southern Section) River Valleys.

[46] Prime Farmlands are those that are used for the production of specific high value food and fiber crops (7 CFR § 657.5). Farmlands of Statewide Importance are those that are of statewide importance for the production of crops or have been designated for agriculture by state law (7 CFR § 657.5 (c)). Farmlands of Local Importance may not have national or statewide importance, but have local importance for the production of crops or have been designated for agriculture by local ordinance (7 CFR § 657.5 (d)).

Soils crossed by the Project have predominantly developed from glacial till and other deposits of glacial origin (including glaciofluvial, drumlins, glaciated uplands, and fluvial deposits). In general, the larger acreages of soils crossed are commonly fine sandy loams that are well-drained and in the study area of the Northern and Central Sections have a stony component. Slopes vary widely depending on location and topography, but in general are from 0 to 60 percent. Prime Farmland and Farmland of Statewide Importance are crossed, although larger acreages of Farmland of Local Importance also are crossed by the Project. In addition, hydric and partially hydric soils are relatively common within the study area.

While infrequent, seismicity does occur within the Project corridor; only seven earthquakes have been recorded within 25 miles (40 km) of the study area between 1810 and 1988. In general, the likelihood that an earthquake strong enough and close enough to the Project corridor to cause soil liquefaction (when saturated soil loses strength and stiffness in response to stressors such as shaking from an earthquake) is considered low, based on the low historical incidence of damaging earthquakes and an absence of any mapped active faults in New Hampshire (Boudette 1994a). In the unlikely event of a strong earthquake, it is also unlikely that the Project would be affected by soil liquefaction based on predominant soil characteristics found in the study area.

3.2 NORTHERN SECTION

3.2.1 VISUAL RESOURCES

Refer to **Section 3.1.1** for a general discussion of the affected environment common to all geographic sections.

The study area of the Northern Section—located in Coös County—is characterized by high forested hills, with 1 percent of the area in suburban and urban development and 4 percent in farmland. Indicators of the very low level of development include a population density of 18 people per square mile (7/km^2), and 0.2 mile (0.3 km) of primary and 0.6 mile (1.0 km) of secondary roads per square mile (per 2.6 km^2). The average intrinsic visual quality is "High" (4.0).

The study area for Alternatives 2, 3, 5a, 5b,5c, and 7 in the Northern Section includes forested areas and some residential lots. North of the existing PSNH transmission route, the area proposed for the new overhead transmission route in Clarksville and Stewartstown, NH, is forested and successional field parcels. The area proposed for burial under roads is adjacent to numerous large and moderate sized residential lots. Alternatives 2, 5a, 5b, 5c, and 7 would return to an overhead transmission line in Stewartstown, NH, just southwest of Coleman State Park. Continuing south through Dixville, Millsford, and Dummer, NH, the new cleared corridor for the overhead transmission line would pass through managed forest land before joining the existing PSNH transmission route.

Examples of areas of scenic concern close to the existing PSNH transmission route include the WMNF, Weeks and Dixville Notch State Parks, Coleman, Cape Horn, Percy and Nash Stream State Forests, Connecticut River National Byway, Moose Path Trail, Presidential Range Tour, White Mountain Trail Northern Loop, Pontook Reservoir, Lancaster Town Forest, and Kauffmann Forest.

The study area for Alternatives 4a, 4b, 4c, 6a,6b, and 7 in the Northern Section includes developed areas, residential areas, and forested areas along the roadway corridors.

3.2.1.1 Landscape Assessment

The existing PSNH transmission line currently has visual effects within portions of the Northern Section, south and west of Dummer, NH. Within the Northern Section, the transmission line's viewshed is about 20 square miles (52 km^2), or 3 percent of the total land area within 10 miles (16 km) on both sides of the centerline. The visual magnitude for over half (10 square miles [27 km^2]) of the viewshed is "None," or sufficiently small that the existing transmission line is likely to go unnoticed by a casual observer. For approximately 2.5 square miles (6.5 km²) of the viewshed, the visual magnitude of the existing structures is "High or Very High," indicating a dominant visual presence in those areas. The average visual magnitude is "Very Low to Low" (an index of 1.25).

There is 0.3 square mile (0.8 km²)—or 1.5 percent of the viewshed—with "High or Very High" scenic impact. The average scenic impact in the study area of the Northern Section is "Very Low to Low" (an index of 1.01). **Table 3-17** summarizes the landscape assessment affected environment in the study area of the Northern Section.

Table 3-17. Summary of the Landscape Assessment Affected Environment – Northern Section

Indicator	Value
Average Intrinsic Visual Quality *(The landscape's inherent potential for attractiveness)*	3.98 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Viewshed of Existing PSNH Transmission Line	20 square miles (52 km²)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	1.25 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Land Area of High or Very High Scenic Impact	0.3 square mile (0.8 km²)
Average Scenic Impact	1.01 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)

3.2.1.2 Roads-Based Analysis

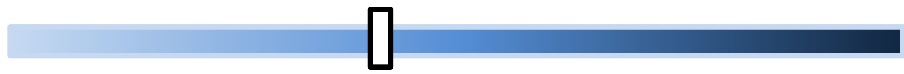
The existing PSNH transmission line is an important feature of the affected environment in the study area of Alternatives 2, 3, 5a, 5b,5c, and 7 in the Northern Section. Along its route, there are 19 publicly-accessible road crossings. In addition, there are 21 miles (34 km) of roads with visibility of the existing PSNH transmission line, or 11 percent of the length of roads within 1.5 miles (2 km) of the existing PSNH transmission route in the study area of the Northern Section.

The visual magnitude for 4 miles (6 km) of the roads in the viewshed is "None," or sufficiently small as to likely go unnoticed by a casual observer. For 4 miles (6 km) of the roads within the viewshed, the visual magnitude of the existing structures is "High or Very High." The average visual magnitude rating is "Low to Moderate" (2.16). This is almost twice that of the viewshed as a whole, indicating a substantially greater visual presence of existing PSNH transmission line structures from roads.

There are 6.84 miles (11 km) of designated scenic roads within the existing PSNH transmission line's viewshed. It is estimated that the vehicle exposure on national and state scenic highways is approximately 269 hours per day, with most of this occurring on the state-designated Presidential Range Tour (a network of roads through the Presidential Range with scenic and cultural interest).

Table 3-18 summarizes the roads-based analysis affected environment in the study area of the Northern Section.

Table 3-18. Summary of the Roads-Based Analysis Affected Environment – Northern Section

Metric	Value
Miles of Roads in Existing PSNH Transmission Line Viewshed	21 miles (34 km)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**2.16**  None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Miles of Designated Scenic Roads in Viewshed	6.84 miles (11 km)
Vehicle Exposure on Scenic Roads	269 hours per day

3.2.1.3 Viewpoint Assessment

As mentioned above, 22 simulation viewpoints were selected as KOPs to represent a range of existing and proposed visual conditions, and are included as **Appendix E**. Six of these KOPs are within the study area of the Northern Section:

- KOP CL-1 is taken from the Connecticut River National Scenic Byway (NH Route 145 in Clarksville, NH) looking west looking into a successional field, with forested mountains in the background. This location is well north of the existing PSNH transmission route. The existing visual character is of high quality. As a designated scenic resource, it has special scenic concern, but the daily vehicle exposure is low. The existing condition does not have a contrast-dominance rating because there is not any existing infrastructure at this location.
- KOP DU-1 is looking across Little Dummer Pond in Dummer, NH, to a forested hillside. Existing H-frame structures from the Granite Renewable Wind Project's generator lead line are just visible above the trees at the foot of the hill. The existing visual character is of high quality, even though the forested hillside is managed for timber production. Little Dummer Pond is not a designated scenic resource. The existing contrast-dominance rating is "Weak" (9).
- KOP LA-2 is a vista of the Presidential Range from an overlook in Weeks State Park in Lancaster, NH. The existing PSNH transmission line is visible across the lower portion of the view. The existing visual character is of high quality. Weeks State Park is a valued state resource that is visited throughout the year, and therefore has special scenic concern. The existing contrast-dominance rating is "Weak" (13).
- KOP SE-3 looks across Little Diamond Pond in Coleman State Park at a forested ridgeline. The existing visual character is of high quality. The park is open year-round, and therefore has special scenic concern. The existing condition does not have a contrast-dominance rating because there is not any existing infrastructure at this location.
- KOP ST-3 is an overlook located on a short trail spur off the Cohos Trail, just north of Christine Lake in Stark, NH. This location offers a scenic view of the White Mountains over Christine Lake to the south. It is also part of the Nash Stream Forest, owned by the state of New Hampshire. The existing view from this KOP is of high quality. The area is considered "low" use but, as part of the Nash Stream Forest trail system, it is a designated scenic resource and therefore has special scenic concern. The contrast-dominance rating for the existing PSNH line is "Weak" (14).
- KOP ST-4 is located on the Cohos Trail, approximately 1.3 miles east of Christine Lake in Stark, NH. The KOP is located in Nash Stream Forest and the PSNH corridor crosses the Cohos Trail at

this location. The existing view from this KOP is of medium quality. The area is considered medium to low use but, as part of the Cohos Trail system and the Nash Stream Forest, it has scenic concern. The contrast-dominance rating for the existing PSNH line is "Strong" (28.5).

3.2.2 SOCIOECONOMICS

Refer to **Section 3.1.2** for a general discussion of the affected environment common to all geographic sections.

3.2.2.1 Population

The study area of the Northern Section is within the boundaries of Coös County, NH. Coös County is among the more sparsely populated counties in the state (17 persons per square mile [7/km^2]). **Table 3-19** displays population statistics for the Northern Section, along with comparator regions.

Table 3-19. Population Statistics for the Northern Section and Comparator Regions, 2015

Region	Population	Annual Population Growth Rate (2010–2015)	Population Density (persons per square mile)
Coös County	31,870	-0.83%	17
Total – Potentially Affected Counties	627,878	0.12%	110
New Hampshire	1,324,201	0.12%	142
U.S.	316,515,021	0.63%	83

Source: U.S. Census Bureau 2015a and 2015 b

3.2.2.2 Employment

Within the Northern Section, employment in the "agriculture, forestry, fishing and hunting, and mining" and "arts, entertainment and recreation, and accommodation and food services" sectors accounted for a higher percentage of overall employment in 2015 than in New Hampshire or the U.S. as a whole. This reflects the rural, forested, and recreational character of this portion of the state. **Table 3-20** displays the distribution of employment by industry sector in the Northern Section (Coös County) compared with New Hampshire and the U.S.

Table 3-20. Employment by Industry Sector in the Northern Section and Comparator Regions, 2015

Industry Sector	Coös County	New Hampshire	U.S.
Agriculture, forestry, fishing and hunting, and mining	3%	1%	2%
Arts, entertainment, and recreation, and accommodation and food services	14%	8%	10%
Construction	7%	7%	6%
Educational services, and health care and social assistance	26%	22%	23%
Finance and insurance, and real estate and rental and leasing	4%	7%	7%
Information	1%	3%	2%
Manufacturing	9%	13%	10%
Other services, except public administration	5%	4%	5%
Professional, scientific, and management, and administrative and waste management services	6%	12%	11%

Table 3-20. Employment by Industry Sector in the Northern Section and Comparator Regions, 2015

Industry Sector	Coös County	New Hampshire	U.S.
Public administration	6%	4%	5%
Retail trade	13%	13%	12%
Transportation and warehousing, and utilities	5%	4%	5%
Wholesale trade	2%	4%	3%

Source: U.S. Census Bureau 2016d

As of April 2017, Coös County had the highest unemployment rate (4.6 percent) among the five counties potentially affected by the Project. In recent years, the unemployment rate in New Hampshire has been about 2 percentage points lower than the national average. **Table 3-21** displays unemployment statistics for the Northern Section and comparator regions.

Table 3-21. Unemployment Rates in the Northern Section and Comparator Regions, 2005, 2010, 2015, 2017

Region	2005	2010	2015	April 2017
Coös County	4.1%	7.2%	4.7%	4.6%
New Hampshire	3.6%	5.8%	3.4%	2.8%
U.S.	5.1%	9.6%	5.3%	4.4%

Source: BLS 2016b, BLS 2017a, NHES 2017a

3.2.2.3 Taxes

A description of statewide tax revenue and rates is provided in **Section 3.1.2.3**.

3.2.2.4 Tourism

The affected environment for tourism is discussed in **Section 3.1.2.4**.

3.2.2.5 Electricity System Infrastructure

A description of region-wide electricity rates, retail prices, and generation is provided in **Section 3.1.2.5**.

3.2.3 RECREATION

Refer to **Section 3.1.3** for a general discussion of the affected environment common to all geographic sections.

The study area of the Northern Section is rural and undeveloped. Within the study area of the Northern Section, there are opportunities for dispersed recreation of many kinds, such as hunting, hiking, cross-country skiing, and wildlife viewing. There are also many areas and trails on public and private lands that provide places to enjoy motorized recreation, such as riding OHVs in the summer and snowmobiles in the winter. The recreation experiences offered in the study area of the Northern Section vary, but tend to be characterized by low levels of development and high opportunities for solitude.

The existing PSNH transmission route currently affects the recreation experience within the study area of the Northern Section, south and west of Dummer, NH. Visual impacts occur to 7 recreational point sites, 1,542.5 acres (624 ha) within recreational sites with spatial area, and approximately 3.5 miles (5.5 km) of trails. Other modifications to the natural environment, such as roads and buildings also affect the recreation experience. The level of impact from these facilities is related to the overall level of development in the area and the distance from recreational resources to the transmission line. Because the level of development in the study area of the Northern Section is relatively low, the impact of these existing facilities is high for recreational resources that are proximate to them. The visual impact of the existing PSNH transmission line in the study area of the Northern Section is discussed in **Section 3.2.1**.

Within the Northern Section, the Project study area for all alternatives for short-term impacts includes 19 recreational sites, 5 eligible Wild and Scenic recreational rivers, and 1 recreational trail. The Project study area for all alternatives for long-term visual impacts includes 55 recreational sites and 11 recreational trails. The following recreational resources are located within the affected environment of the Northern Section.

Agnew State Forest
Amey, J. Conservation Easement
Ammonoosuc River
Aspnes Easement
Balsams Grand Resort Golf Club
Bean Conservation Easement
Beaver Trails Campground
Bradley Conservation Easement
Burns Lake Campground
Burns Pond Boat Launch
Bunnell Mountain
Cape Horn State Forest
Cherry Mtn Rte 115 Trail
Christie Conservation Easement
Cohos Trail
Coleman State Forest
Connecticut Lakes Headwaters
Corridor 12 Connector Snowmobile Trail
Dana Conservation Easement
Dixville Notch State Park
Farm and Ranch Lands Protection Program Lands
Forest Lake State Park
Fort Hill Wildlife Management Area
Fort Jefferson Campground
Frizzell*
Grasslands Reserve Program
Greason Conservation Easement
Groveton Fish & Game Club
Groveton School Playground
Groveton Water System Easement
Hurlburt Swamp Preserve
Israel River
Israel River Campground
Jahoda*
Kauffmann Forest
Kauffmann Forest Conservation Easements
Lake Francis
Lancaster Scenic Overlook
Lancaster School Field
Lancaster Town Forest
Little Diamond Pond Boat Launch
Little River
Livingstone Conservation Easement
Mill Brook Snowmobile Trail
Milan Town Forest
Nadeau*
Nash Stream Forest
Percy State Forest
Percy Summer Club
Phillips Brook
Pond of Safety*
Pondicherry Wildlife Refuge
Pontook Reservoir
Potter Conservation Easement
Randolph Community Forest
Rocky Pond Snowmobile Trail
Second College Grant*
Silvio O. Conte Refuge Conservation Easement
Smith*
Southworth*
Spruce Cone Camps Resort
Stratford Bog
Thayer Revocable Trust
Thirteen Mile Woods Scenic Easement
Twin Mountain Fish Hatchery
Umbagog State Park
Upper Ammonoosuc River
Vermont Land Trust Easement
Waumbek Country Club
Weeks Lancaster Trust
Weeks State Park
White Mountain National Forest
Whitefield Recreation Area
Unnamed Recreation Areas
Unnamed Trails

* Indicates uncertain classification of resource type due to data limitations. These areas could be recreational areas, public scenic easements, conservation easements, or park areas.

3.2.4 HEALTH AND SAFETY

Refer to **Section 3.1.4** for a general discussion of the affected environment common to all geographic sections.

3.2.4.1 Electric and Magnetic Fields

The study area of the Northern Section is characterized by remote areas and forests with few sources of EMFs. The baseline exposure levels before construction of the Project are produced by existing 115 kV (60 Hz) lines running along the existing PSNH transmission route. The existing PSNH transmission line between the towns of Groveton and Dummer, NH, produces a maximum of 98 mG AC magnetic field at ground level within the existing PSNH transmission route and that field attenuates quickly with distance from the lines with a maximum of 14 mG at the edge of the transmission route, and 1.0 mG at 300 feet (91 m) from centerline (Exponent, Inc. 2014a). The maximum AC electric field ranges from 1.2 kV/m within the transmission route to 0.19 kV/m at the edge of the transmission route to 0.01 kV/m at a distance of 300 feet (91 m) from the transmission route. These fields are produced by the existing transmission lines in the transmission route and all are AC (60 Hz) fields.

Additionally, there is an existing natural gas pipeline located along the existing PSNH transmission line.

3.2.4.2 Potentially Contaminated Soils and Groundwater

Within the study area of the Northern Section, five sites that currently have or historically could have had soil or groundwater contamination are within 250 feet (76 m) of Alternatives 2, 3, 5a, 5b, 5c, and 7 Project corridors. The PSNH Lost Nation Substation in Northumberland, NH, is within the Alternative 2 Project corridor. The distances from the Project corridor are approximate because the distance is usually from a single point at a facility and not necessarily the location where waste was stored or a spill occurred.

The study areas for Alternatives 4a, 4b, 4c, 6a, and 6b include numerous towns and, as a result, include over 100 sites with potential contamination within 250 feet (76 m) to the potential Project corridor. These include active and inactive gas stations and other facilities with underground storage tanks, and some brownfield sites. Potentially contaminated sites within 250 feet (76 m) of the Project corridors of each of the alternatives in the Northern Section are listed in the **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

3.2.4.3 Fire Hazards and Fire Response Services

See **Section 3.1.4.4** for a discussion of fire hazards in New Hampshire. The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the Fire Departments that are located within 5 miles (8 km) of the study area of the Northern Section.

3.2.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 3.1.5** for a general discussion of the affected environment common to all geographic sections.

The study area of the Northern Section is served by a network of federal, state, county, and local roadways. The study area near Alternatives 2, 3, 5a, 5b, 5c, and 7 is not consistently paralleled by any major federal, state, or county roads, but is crossed by several state routes. US Route 3 is the main north-south route in the study area near Alternatives 4a, 4b, 4c, 6a, and 6b, and US Route 2 provides the main west-east access near these alternatives. No major highways are present in the study area within Canaan, VT, and major roadways consist primarily of two-lane state highways. Average daily traffic volumes for reported roadways in New Hampshire ranged from 520 vehicles per day on NH Route 135 in Lancaster to 10,000 vehicles per day on US Route 2 in Lancaster, NH (NHDOT 2014a). Traffic volumes on roads in the town of Canaan, VT ranged from 240 to 2,500 vehicles per day (Vermont Agency of Transportation 2015).

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show the approximate distance of airports to the Project corridors; the Mount Washington Regional Airport and Lancaster Heliport were identified within 20,000 feet (6,096 m) of the Project corridors in the Northern Section.

3.2.6 LAND USE

Refer to **Section 3.1.6** for a general discussion of the affected environment common to all geographic sections.

3.2.6.1 Land Use and Land Cover

Municipalities

The study area of the Northern Section is bounded by the U.S./Canada border crossing in the north and by the Coös/Grafton county boundary in the south. In the study area of the Northern Section, the Project corridors intersect with 18 municipalities within Coös County. A full list of municipalities is included in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Land Use Overview

Land use within the Project corridors follows the same general land use character and ownership patterns found throughout the state, generally becoming less rural and more developed moving from northern to southern New Hampshire. The Northern Section of the study area is the most rural and least developed geographic section. The study area of the Northern Section is entirely within Coös County, which is the largest county in New Hampshire. Population densities are a strong indicator of land use patterns. Coös County contains nearly 20 percent of the total land area of New Hampshire—a total of 1,800 square miles (4,662 km^2)—but only 2.5 percent of the state's population. Coös County has the lowest population and housing unit density of any county in New Hampshire at 18 people per square mile (7/km^2) and 11 housing units per square mile (4/km^2). These population densities are indicative of the widely-dispersed population and very rural land use character found in Coös County when compared to the state average of 147 people per square mile (57/km^2) and 69 housing units per square mile (27/km^2) (U.S. Census Bureau 2010a).

The single most outstanding feature of the study area of the Northern Section landscape is the abundance of forests. The dominant forest type is northern hardwood, including maple, beech, and birch. The forests are a valuable economic resource and supply the raw material supporting thousands of jobs in Coös County. The forests also are the base for recreational pursuits. As a result, major industries include forestry and tourism, with the once-dominant paper-making industry in sharp decline in recent years. People began acquiring residential and second home property beginning in the late 1960s. Since that time, the demand for recreational space has increased. This second home ownership and preservation of land for recreation are both important facets of the land use and development patterns of Coös County (Coös County 2006a).

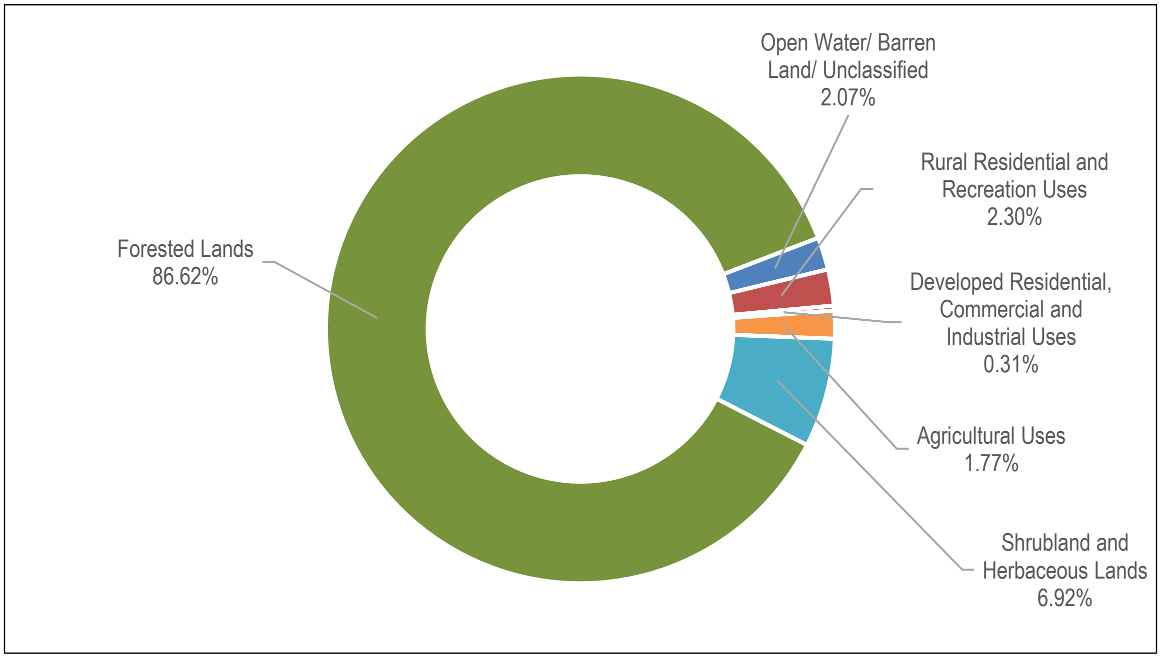
Villages and community centers, which constitute much of the built environment in the study area of the Northern Section, are nestled within the valleys of vast forested regions of the area. In general, these villages are rural population centers that follow the traditional development pattern common in most New England villages. Commercial and industrial development is found near or within these communities at a similarly small scale. Much of Coös County's mountainous area is reserved as national forest, wilderness, state parks and other public areas; these encompass most of the northern portion of the White Mountains.

Northern Section Land Cover

Overall Land Cover

As mentioned above, land cover in the Northern Section is dominated by Forested Lands and Shrubland/Herbaceous Lands, making up approximately 94 percent of all land. Developed uses make up less than 3 percent of all land in Coös County, with Developed Residential, Commercial and Industrial Uses making up approximately 0.3 percent of all land in the county. **Chart 3-16** illustrates the percent of land in the Northern Section by land cover type.

Chart 3-16. Land Cover in the Northern Section



Source: MRLC, 2013

Project Corridor Land Cover

According to the 2011 NLCD, the Northern Section of the Project corridors for Alternatives 2, 3, 5a, 5b, 5c, and 7 is dominated by Forested Lands and Shrubland/Herbaceous Lands, making up approximately 94 percent of the study area for these alternatives. The Developed, Open Space and Developed, Low Intensity land cover categories, which generally indicate Rural Residential, Recreational, or Corridor Uses make up less than 4 percent of the Project corridors. The Developed, Medium Intensity and Developed, High Intensity land cover categories, which generally indicate Developed Residential, Commercial, and Industrial Uses and often found in a town center or higher population area, make up less than 0.04 percent of the Project corridors. This land cover represents the remote nature of the Northern Section corridor for these alternatives, generally located away from town and population centers.

Under Alternatives 4a, 4b, 4c, 6a, and 6b, the Project would be mostly buried within existing roadway corridors. As a result, the land cover in the Project corridors for these alternatives reflects the developed nature of the roadways.[47]

The Project corridor for Alternatives 4a, 4b, 4c, 6a, and 6b is over 90 percent developed, encompassing primarily the Developed, Open Space; Developed, Low Intensity; and Developed, Medium Intensity land cover categories. For most of its length (74 percent) in the Northern Section, the Project corridor of these underground alternatives follows roadways surrounded by undeveloped land (for example a road passing

[47] NLCD data for some areas of the Project with underground transmission within a roadway corridor indicate undeveloped land in the Project corridor. As the alignment of the Project in these areas would be constructed underground in public roadway corridors, this is likely due to a mapping error as roadways are generally considered developed land (see the **Land Use Technical Report** http://www.northernpasseis.us/library/final-eis/technical-reports for more information). Nevertheless, these undeveloped lands are analyzed to ensure all potential impacts of the Project are considered.

through a forested area, a farm field, or a rural residential area). This is generally recorded as Developed, Open Space or Developed, Low Intensity. Approximately 17 percent of the Project corridor of these alternatives follows roadways where some more intensive residential, commercial, industrial, or other developed land use is occurring adjacent to the roadway. About 1 percent of the Project corridor for these underground alternatives passes through Agricultural Lands, while undeveloped Forested Lands constitutes about 7 percent of the corridor.

Land Cover Change

In general, the Project corridors within the Northern Section experienced minimal land cover change between 2001 and 2011. More than 94 percent of each Project corridor in the Northern Section remained unchanged during this ten-year period.

3.2.6.2 Conservation Lands

Table 3-22 identifies the amount of conserved land by alternative. These lands provide protection for visual resources, wildlife habitat, and wetlands and hydrologic resources, as well as providing for public recreation and public access to natural areas.

Table 3-22. Conservation Lands in the Northern Section

Alternatives	Conservation Land acres (ha)	National Forest Service Lands acres (ha)
2, 3, 5a, 5b, 5c, 7	176 (71)	13 (5)
4a, 4b, 6a, 6b	11 (4)	--
4c	7 (3)	--

3.2.6.3 Protected Rivers

There are no designated federal Wild and Scenic Rivers in the study area of the Northern Section. Phillips Brook, the Israel River, the Little River, the Upper Ammonoosuc River, and the Ammonoosuc River are eligible Wild and Scenic Rivers proximate to the Project in the study area of the Northern Section.

Two State-protected rivers under the Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]) are located within the Project corridor in the Northern Section: the northern reach of the Connecticut River and the northern reach of the Ammonoosuc River.

3.2.6.4 Rights-of-Way

New and Existing Transmission Routes

Approximately 47 percent of the Project corridor in the Northern Section for Alternatives 2, 3, 5a, 5b,5c, and 7 would be located within the existing PSNH transmission route. The remaining 53 percent of the Project corridor in the Northern Section would be located in a new transmission route. All but approximately 3 miles (5 km) of the Project corridor for Alternatives 4a, 4b, 4c, 6a, and 6b would be located within an existing roadway corridor in the Northern Section that is not an existing transmission route. **Table 3-23** shows the length of the Project corridors in new and existing transmission routes in the Northern Section.

Table 3-23. New and Existing Transmission Routes in the Northern Section

Alternatives	Miles (km) of Project Corridor in Existing Transmission Routes	Miles (km) of Project Corridor in New Transmission Routes
2, 3, 5a, 5b, 5c, 7	36 (58)	40 (64)
4a, 4b, 4c, 6a, 6b	0 (0)	70 (113)

Road Crossings

Table 3-24 demonstrates the number of aerial and underground road crossings in the Northern Section of the Project corridor.

Table 3-24. Aerial and Underground Road Crossings in the Northern Section

Alternatives	Aerial Crossings	Underground Crossings
2, 5a, 5b, 5c, 7	41	20
3	0	61
4a, 4b, 6a, 6b	0	232
4c	0	212

Public Roadway Corridors

Table 3-25 shows the length of the Project that would be buried within public roadway corridors in the study area of the Northern Section.

Table 3-25. Public Roadway Corridors where the Project would be Buried in the Northern Section

Alternatives	Miles (km) of Local Roads	Miles (km) of State Roads	Miles (km) of US Highway	Total Miles (km)*
2, 3, 5a, 5b, 5c, 7	6 (10)	0.2 (0.3)	0 (0)	6 (10)
4a, 4b, 6a, 6b	0 (0)	0 (0)	68 (109)	68 (109)
4c	0 (0)	4 (6)	57 (92)	61 (98)

* sum of road types may not equal total due to the fact that road types may coincide with one another for certain distances.

3.2.7 NOISE

Refer to **Section 3.1.7** for a general discussion of the affected environment common to all geographic sections.

The study area for Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Northern Section is mostly undeveloped forested land and agricultural land with towns increasing in size as the routes extend further south. The study area of Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Northern Section contains no hospitals, schools, churches, campgrounds, daycare centers, or libraries within 200 feet (61 m) of the disturbance areas; however, there are more than 40 residences within 50 feet (15 m) of the disturbance areas (see **Table 3-26**). In addition, the study area for Alternatives 2, 3, 5a, 5b, 5c, and 7 overlaps with the Silvio O. Conte National Fish and Wildlife Refuge for approximately 1 mile (2 km).

Table 3-26. Number of Residences Within 50 feet (15 m) of a Disturbance Area in the Northern Section by Alternative

Alternative										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
43	44	813	816	798	43	43	43	813	816	43

The Project, under Alternatives 4a, 4b, 4c, 6a, and 6b in the Northern Section, would generally follow the Connecticut River in roadway corridors and would pass through several towns. The routes would traverse within 50 feet (15 m) of approximately 800 single family homes on multiple acres and small towns where businesses and some homes line the roadways. The density of the population increases moving south through the study area.

3.2.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 3.1.8** for a general discussion of the affected environment common to all geographic sections. The **Cultural Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) contains additional information on the affected environment for this resource.

Pre-Contact period

Time periods before Native American societies had substantial contact with Europeans.

Post-Contact period

Time periods since significant contact between Native Americans and Europeans.

As an overall context for cultural resources in the study area of the Northern Section, previously identified Pre-Contact period archaeological sites provide evidence of use and settlement of the region. Over time, Pre-Contact period sites indicate changes in ranges or territories used during the various cultural periods, an overall increase in population density through time, increasingly regionalized and specialized resource procurement strategies, and increasingly distant trade networks. Pre-Contact period site distribution suggests that the Northern Section's mountainous terrain resulted in occupation associated primarily with the major watersheds in the region, which form natural corridors for travel by both people and the animals they relied on for food. Post-Contact historic period development (17th, 18th and early 19th centuries) of the Northern Section generally was associated with farming, lumbering, tourism, and recreation. Cultural resources (e.g., archaeological sites, buildings, and structures) reflect this development, and consist of residences, farmsteads or farm complexes, lumber camps, dams, railroads, hotels, motels, and recreational facilities such as ski areas.

3.2.8.1 Archaeological Resources

The number of archaeological resources identified during the Phase 1A investigations within the direct APE for alternatives in the Northern Section are provided in **Table 3-27**.

Table 3-27. Number of Archaeological Resources within the Direct APE in the Northern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
14	14	17	17	13	14	14	14	17	17	14

Source: Claesson et al. 2014a, 2015a,b; Freedman et al. 2015; Claesson and Peone 2016
Note: Includes WMNF archaeological resources

The number of archaeologically sensitive areas identified within the direct APE for alternatives in the Northern Section are provided in **Table 3-28**.

Table 3-28. Number of Archaeologically Sensitive Areas within the Direct APE in the Northern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
63	63	94	94	83	63	63	63	94	94	63

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016.
Note: Includes WMNF archaeologically sensitive areas

3.2.8.2 Architectural Resources

The number of architectural resources identified within the indirect APE for alternatives in the Northern Section are provided in **Table 3-29**.

Table 3-29. Number of Architectural Resources within the Indirect APE in the Northern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
108[a]	108	166	166	172	108[a]	108[a]	108[a]	166	166	108[a]

Source: Claesson et al. 2014b; 2015a; Higgins et al. 2015, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f; Dunham et al. 2017.
Note: Includes WMNF architectural resources
[a] Includes 67 architectural resources located in the indirect APE in Vermont.

3.2.9 ENVIRONMENTAL JUSTICE

The study area of the Northern Section is entirely within Coös County. Coös County has a lower percentage of minority populations than New Hampshire and the U.S. as a whole. The percentage of low-income populations (families living below the poverty level) in Coös County is highest in the state, but still below the national average. Median household income in Coös County is well below the state average. **Table 3-30** displays demographic characteristics for the Northern Section and comparator regions.

Table 3-30. Demographic Characteristics of the Northern Section and Comparator Regions, 2015

	Coös County	New Hampshire	U.S.
Total Population	31,212	1,330,608	321,418,820
Percent White	95.5%	91.0%	61.6
Percent Black or African American	0.7%	1.5%	13.3%
Percent American Indian and Alaska Native	0.5%	0.3%	1.2%
Percent Asian	0.5%	2.6%	5.6%
Percent Native Hawaiian and Other Pacific Islander	0.0%	0.0%	0.2%
Percent Other Race	0.3%	0.3%	0.2%
Percent 2 or More Races	1.5%	1.6%	2.6%
Percent Hispanic	1.6%	3.4%	17.6%
Total Percent Minority Population	*5.1%*	*9.7%*	*40.7%*
Percent Families below Poverty Level	9.9%	5.6%	11.3%
Median Household Income	$42,312	$66,779	$53,889

Source: U.S. Census Bureau 2017c,d

3.2.10 AIR QUALITY

Refer to **Section 3.1.10** for a general discussion of the affected environment common to all geographic sections.

The study area of the Northern Section is defined by Coös County and is characterized by rural areas where there are few air emission sources. Coös County is in attainment with all NAAQS.

3.2.11 WILDLIFE

Refer to **Section 3.1.11** for a general discussion of the affected environment common to all geographic sections.

3.2.11.1 Federally- and State-listed Wildlife Species

Table 3-14 in **Section 3.1.11** presents federally- and state-listed wildlife species that are known to occur in the state, as well as an indication of which species have the potential for occurrence in the study area of the Northern Section. A total of 79 state-listed (endangered, threatened, species of concern, or species of greatest conservation need) and 4 federally-listed threatened or endangered species have the potential to occur in the study area of the Northern Section (three of the federally-listed species are also listed as threatened or endangered by NHFG). The federally-listed species potentially present in the study area of the Northern Section include: the dwarf wedgemussel (endangered), Canada lynx (threatened), Indiana bat (endangered), and northern long-eared bat (threatened); two of these species were potentially detected in the Northern Section, the Indiana bat and the northern long-eared bat. The following state-listed species were observed during Project-specific field surveys: American marten, American kestrel, bald eagle, bobolink, Canada warbler, chimney swift, common loon, Eastern towhee, field sparrow, olive-sided flycatcher, purple finch, ruffed grouse, scarlet tanager, veery, and wood thrush. The state-listed northern harrier has also been recorded in the Northern Section (NHB 2014). Additional discussion regarding the methodology and results of the Project-specific surveys is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The dwarf wedgemussel lives in benthic (bottom) habitats of creeks and rivers of varying size, in areas of moderate to slow current, with little sediment deposition. Environmental threats to this species primarily result from habitat destruction. In 2013/14 a mussel assessment was conducted at 34 waterbodies that crossed the Project and were large enough to support mussel species. No dwarf wedgemussels were observed during the mussel assessment. Known populations of dwarf wedgemussels have been recorded in Coös County surrounding the Connecticut River and, therefore, are expected to occur within the Connecticut River and potentially other waterbodies in the Northern Section, downstream from the study area.

The Indiana bat was identified as potentially occurring in the study area of the Northern Section during passive acoustic monitoring surveys conducted in July 2013. The northern long-eared bat was not detected within the study area of the Northern Section during surveys; however, there are recent records of the species in Coös County (NHFG 2005a, USDA Forest Service 2015a).

Winter tracking surveys were conducted in 2013/14 that focused on habitat that may support the federally-listed threatened Canada lynx and state-listed threatened American marten. Surveys were targeted along the Project corridor of Alternatives 2 and 3, including portions of the Alternative 7 corridor within the Northern and Central Sections and were not conducted for other alternatives or geographic sections because they do not provide Canada lynx habitat. Canada lynx tracks and/or visual sighting were not identified in the study area of the Northern Section during those winter tracking surveys. However, previous Canada lynx track records exist around Whitefield, NH, located in the study area of the Northern Section in the existing PSNH transmission route (Normandeau Associates 2011a). In addition, known Canada lynx have been recorded in Coös County (NHFG 2005a). American marten tracks were observed in 12 areas in the study area of the Northern Section during the 2013/14 tracking surveys. The majority of these tracks were observed in Northern Hardwood Conifer Forest systems, with two observations in lowland spruce-fir forest community types. American marten tracks also were observed during a winter tracking survey conducted in 2011 in the existing PSNH transmission route in the study area of the Northern Section (Normandeau Associates 2011a).

3.2.11.2 General Wildlife

Aquatic Species

Aquatic habitats in the study area of the Northern Section are characterized as a range of lotic (flowing water) systems, primarily rivers and medium-to-small headwater streams. Many of these lotic systems are characteristic of glacial origin and contain a predominance of boulders and large cobbles. Lentic systems (non-flowing water) crossed by the Project corridors are limited to wetland habitats including vernal pools. See **Section 3.2.13** for a discussion of water resources and wetlands in the study area of the Northern Section. Aquatic habitat in the study area of the Northern Section could support freshwater mussels and other aquatic invertebrates, including the Eastern brook trout, which is a state species of greatest conservation need. Wetlands, waterbodies, and vernal pools in the study area provide habitat for reptiles and amphibians.

Field surveys captured a number of potential incidental reptile and amphibian sightings of the listed species in the study area of the Northern Section including 3 northern leopard frogs, 1 mink frog, 33 wood frogs, and 1 wood turtle. These species were observed during surveys for wetlands, waterbodies, and vernal pools.

Aquatic surveys were performed for freshwater mussels. A desktop analysis identified 54 waterbodies within the study area of the Northern Section that could potentially support mussel species; potentially suitable habitats were identified as occurring in larger streams and river with a low to moderate gradient. Of the 54 waterbodies, 18 had suitable hydrology to support mussel species. Survey results revealed no evidence of mussels (live, shells, or shell fragments) at 17 of the 18 sites, but one eastern pearlshell mussel was found in the Connecticut River at the location where the Alternative 2, 3, 5a, 5b, and 7 Project corridors would cross the river.

The 54 waterbodies may also contain other aquatic invertebrates such as freshwater crustaceans, freshwater snails, freshwater clams, aquatic worms, and aquatic insects.

Terrestrial Species

Terrestrial habitats in the study area of the Northern Section are characterized primarily by forestland (mixed hardwood, softwood, and deciduous stands), which provide interior forest habitat for many species of wildlife. Portions of the existing PSNH transmission route in the study area of the Northern Section also provide edge habitat which is used by many species. See **Section 3.2.12** for a discussion of vegetated cover types in the study area of the Northern Section.

A BBS conducted in the study area in 2013/14 recorded 2,322 detections of 2,552 bird individuals (97 species) across 85 breeding bird transects. The three most commonly recorded species were the white-throated sparrow, the common yellowthroat, and the chestnut-sided warbler.

The study area of the Northern Section overlaps the geographic range of nine bat species. To assess the potential presence and distribution of bats in the study area of the Northern Section, passive acoustical monitoring surveys were conducted in July 2013 and July 2014 (these surveys combined cover the study areas for all action alternatives, including Alternative 7). Detectors located in the study area of the Northern Section recorded 465 bat passes during the survey period and mean bat activity per detector night across all detectors in the study area of the Northern Section was 19.4 passes per detector night.[48] It is important to note that acoustical monitoring provides a general idea of bat activity, but the technology cannot discriminate distinct individuals to estimate populations (Kunz et al. 2007a). As such, the numbers of bat passes recorded by a given detector are used to infer relative abundance and do not necessarily represent the number of bats present, as a single bat could make several passes within a night. Based on the results of the acoustic monitoring survey, both cave and tree bats occur in the study area of the Northern Section during the summer season. There are no known bat hibernacula (e.g., caves or mines) present within the Project corridors or within 5 miles (8 km) of the Project corridors for any of the action alternatives in the Northern Section (NHB 2014).

[48] Detectors were located approximately every 10 miles (16 km) along the Project corridors.

3.2.11.3 Habitat Connectivity

The habitat surrounding the study area of the Northern Section is largely undeveloped and contiguous, providing connectivity for migrating wildlife. The undeveloped lands and commercial forestlands are interspersed with developed lands comprised of small residential lots and small towns.

The percent resistance (habitat connectivity) was calculated for the Project corridor for each alternative. For details on this analysis, see the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). Overall, wildlife movement is relatively free near the Project corridors of Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Northern Section. This area contains both undeveloped forest and portions of the existing PSNH transmission route, as well as limited rural residential development. The existing PSNH transmission route generally facilitates wildlife movement for larger species such as deer and coyotes; however, movement of small species such as salamanders and other amphibians is likely limited by this corridor. In contrast, wildlife movement is more limited near the Project corridors of Alternatives 4a, 4b, 4c, 6a, and 6b. These Project corridors generally follow roadway corridors through developed landscapes, including residential, commercial, and industrial land uses. Wildlife movement is interrupted by existing roadways and development. In general, east-west movements for terrestrial species are limited by the land use development patterns and past human settlement in the Connecticut River Valley as well as the Connecticut River itself.

Other migration routes in the study area include the Atlantic migratory flyway or pathway used by migratory birds or insects (USFWS 2012a). In the study area of the Northern Section, the Pondicherry Basin has been identified as an IBA, a critical area important for bird breeding, migration, or during winter. A portion of this IBA is within the boundaries of the Silvio O. Conte National Fish and Wildlife Refuge and would be located within the Project corridor for Alternatives 2, 3, 5a, 5b, 5c, and 7 in Whitefield, NH. The Pontook Reservoir IBA is also within the study area. Rivers also serve as migration corridors for fish and mussels, while spring vernal pools can serve as migration corridors for breeding amphibians (NHFG et al. 2008a).

3.2.12 VEGETATION

Refer to **Section 3.1.12** for a general discussion of the affected environment common to all geographic sections.

The study area for Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Northern Section is characterized by large expanses of contiguous forested community types. A portion of this area is commercial timberlands, and a portion is located within the existing PSNH transmission route. These forested communities include a number of coniferous and deciduous vegetation species. Coniferous species may include balsam fir, red spruce, black spruce, white pine, and eastern hemlock. Typical deciduous species include sugar maple, mountain maple, yellow birch, and American beech. Other vegetative communities prevalent throughout the study area of the Northern Section are represented by species inhabiting a range of wetland communities (emergent marsh, scrub-shrub, and forested), mowed ROW, scrub-shrub, and a very small section of grassland.

For the alternatives following roadway corridors (Alternatives 4a, 4b, 4c, 6a, and 6b), the primary land cover is developed and mowed ROW.

Table 3-15 in **Section 3.1.12** presents federally- and state-listed plant species that have the potential to occur within the study area, as well as an indication of which species have the potential for occurrence in the study area of the Northern Section. Desktop studies predicted several locations in the study area of the Northern Section that could provide suitable habitat for the federally threatened, small whorled pogonia. However, the Project-specific floristic field survey did not identify any small whorled pogonias. There are 86 state-listed plant species that have the potential to occur in the study area of the Northern Section. The only state-listed plant species identified during Project-specific field surveys in the Project study area of the Northern Section was the beaked sedge (state endangered). Beaked sedge was potentially found in Whitefield, NH, at the base of a slope in a scrub-shrub/emergent wetland.[49] In addition, the NHB dataset indicates the historic presence of the satiny willow, a state endangered species, in the Alternatives 4a, 4b, 4c, 6a, and 6b project corridors.

3.2.13 WATER RESOURCES

Refer to **Section 3.1.13** for a general discussion of the affected environment common to all geographic sections.

The Upper Connecticut aquifer underlies the study area of the Northern Section (USGS 2000a). This aquifer is primarily a stratified-drift aquifer with thickness of generally less than 100 feet (30 m) but up to greater than 260 feet (79 m) (Olimpio and Mullaney 1997a).

The study area of the Northern Section for all alternatives contains 8 PWS wells within 250 feet (76 m) of the Project in Coös County. There are 1,809 acres of SWPAs within 250 feet of the study area in the Northern Section. The SWPAs are Cheshire County Complex and Woodsville Water and Light. In the study area of the Northern Section, there are 128 acres of WHPAs within 250 feet of the study area.

The study area for the Northern Section of the Project is within Coös County, with the exception of Halls Stream, which is a tributary of the Connecticut River. Halls Stream runs north to south through Canaan, Vermont and flows into the Connecticut River at the state border with New Hampshire. The study area of the Northern Section contains multiple rivers and streams within the Upper Connecticut River and Upper Androscoggin watersheds, which include up to 37 perennial streams or stream segments and numerous intermittent and ephemeral streams, as well as ponds or marshes. The larger drainages contain more flow and suitable abiotic factors (e.g., temperature, dissolved oxygen content, substrate) to support fish and other aquatic biota. The Project study area of the Northern Section spans several fourth order or greater streams and rivers including: the Connecticut River, a Designated River under the New Hampshire Rivers Management and Protection Act and an American Heritage River under the EPA's American Heritage River Protection Program; the Upper Ammonoosuc River; Otter Brook; the Israel River; and Halls Stream. The study area of the Northern Section includes approximately 1,325 acres (536 ha) of stream watersheds, including Bog Brook, Dean Brook-Connecticut River, Israel River, Johns River, and the Upper Ammonoosuc River. Additionally, based on Federal Energy Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Coös County, there are up to 99 acres (40 ha) of 100-year floodplains within the study area of the Northern Section.

Based on a combination of field surveys and NWI mapping, the study area of the Northern Section contains an estimated 420 acres (170 ha) of PEM, PFO, and/or PSS wetlands. The majority of the wetlands observed in the study area of the Northern Section were in the towns of Northumberland and Lancaster, NH. Seven vernal pools were identified in the study area of the Northern Section.

3.2.14 GEOLOGY AND SOILS

Refer to **Section 3.1.14** for a general discussion of the affected environment common to all geographic sections.

The study area of the Northern Section is within the White Mountains Physiographic Province, which is characterized by rugged mountains and narrow valleys. Slopes vary widely, depending on location and topography but, in general, are from 3 to 35 percent. In general, the bedrock geology in the study area of

[49] This identification was not confirmed because researchers were not permitted to obtain a voucher specimen.

the Northern Section is predominantly metasedimentary rock, granodiorites, and pelitic schists of the Kinsman and Rangeley Formations. These units represent a geologic sequence of metamorphosed Paleozoic sedimentary and volcanic rocks that were penetrated by plutonic rocks. Sedimentary and volcanic rocks

represent an early marine geology that, during the Middle Paleozoic, was metamorphosed during mountain building. Plutonic rocks intruded during both geologic phases. The folded and faulted geology of New Hampshire represents a deeply eroded mountain system.

3.3 CENTRAL SECTION

3.3.1 VISUAL RESOURCES

Refer to **Section 3.1.1** for a general discussion of the affected environment common to all geographic sections.

The study area of the Central Section is bounded by the Coös/Grafton county boundary in the north and by the Belknap/Merrimack county boundary in the south. The study area of the Central Section is characterized by high forested hills, with 2 percent of the area in suburban and urban development and 4 percent in farmland. Indicators of the low level of development include a population density of 71 people per square mile (27/km²), and 0.5 mile (0.8 km) of primary and 2 miles (3 km) of secondary roads per square mile (per 2.6 km²). The average intrinsic visual quality is “High” (3.94).

The study area for Alternatives 2, 3, and portions of 5a, 5b, 5c, and 7 in the Central Section includes the existing PSNH transmission line. Examples of areas of scenic concern close to the existing PSNH transmission line include the WMNF, ANST, Franconia Notch and Blair State Parks, Livermore Falls, Scribner-Fellows and Fay State Forests, White Mountain Trail National Byway, River Heritage Tour, Presidential Range Tour, White Mountain Trail Southern Loop, Ammonoosuc River, Franklin Falls Reservoir, Sugar Hill Town Forest, Sahegenet Falls Recreation Area, and The Rocks.

For Alternatives 4a, 4b, 4c, 6a, 6b, and portions of 5a, 5b, 5c, and 7 where the Project would be buried in roadway corridors, the study area is characterized primarily by residential development and forested areas along these roadway corridors.

3.3.1.1 Landscape Assessment

The existing PSNH transmission line currently has visual effects within the study area of the Central Section for Alternatives 2, 3, and portions of 5a, 5b,5c, and 7. Within the study area of the Central Section, the existing PSNH transmission line’s viewshed is about 24 square miles (63 km²), or 2 percent of the total land area within 10 miles (16 km) on both sides of the centerline. The visual magnitude for about one-third (9 square miles [23 km²]) of the viewshed is “None,” or sufficiently small that the PSNH transmission line is likely to go unnoticed by a casual observer. For approximately 4 square miles (10 km²) of the viewshed, the visual magnitude of the existing structures is “High or Very High.” The average visual magnitude is “Very Low to Low” (an index of 1.69).

There are 2.9 square miles (7.5 km²)—or 12 percent of the viewshed—with “High or Very High” scenic impact. The average scenic impact in the study area of the Central Section is “Very Low to Low” (an index of 1.63).

Table 3-31 summarizes the landscape assessment affected environment in the study area of the Central Section.

Table 3-31. Summary of the Landscape Assessment Affected Environment – Central Section

Indicator	Value
Average Intrinsic Visual Quality *(The landscape's inherent potential for attractiveness)*	3.90 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Viewshed of Existing PSNH Transmission Line	24 square miles (63 km^2)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	1.69 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Land Area of High or Very High Scenic Impact	2.9 square miles (7.5 km^2)
Average Scenic Impact	1.63 None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)

3.3.1.2 Roads-Based Analysis

The existing PSNH transmission line is an important feature of the affected environment in the study area of Alternatives 2, 3, and portions of 5a, 5b, 5c, and 7 in the Central Section. Along its route, there are 66 publicly-accessible road crossings. In addition, there are 79 miles (127 km) of roads with visibility of the existing PSNH transmission line, or 15 percent of the length of roads within 1.5 miles (2 km) of the existing PSNH transmission route in the study area of the Central Section.

The visual magnitude for 15 miles (24 km) of the roads in the viewshed is "None," or sufficiently small as to likely go unnoticed by a casual observer. For 13 miles (21 km) of the roads within the viewshed, the visual magnitude of the existing structures is "High or Very High." The average visual magnitude rating is "Low to Moderate" (an index of 2.05).

There are 14.6 miles (23.5 km) of designated scenic roads within the existing PSNH transmission line's viewshed. It is estimated that the vehicle exposure on national and state scenic highways is approximately 243 hours per day, with most of this daily visual exposure from the state-designated Presidential Range Tour (a network of roads through the Presidential Range with scenic and cultural interest), and River Heritage Tour. Across the entire study area for all geographic sections, the majority of visual exposure from scenic roads to the existing PSNH transmission line is in the study area of the Central Section.

Table 3-32 summarizes the roads-based analysis affected environment in the study area of the Central Section.

Table 3-32. Summary of the Roads-Based Analysis Affected Environment – Central Section

Indicator	Value
Miles of Roads in Existing PSNH Transmission Line Viewshed	79 miles (127 km)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**2.05** None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Miles of Designated Scenic Roads in Viewshed	14.6 miles (23.5 km)
Vehicle Exposure on Scenic Roads	243 hours per day

3.3.1.3 Viewpoint Assessment

As mentioned above, 22 simulation viewpoints were selected as KOPs to represent a range of existing and proposed visual conditions, and are included as **Appendix E**. Six of these KOPs are within the study area of the Central Section (with an additional six KOPs reported in the WMNF Section also located in the Central Section, see **Section 3.5.1**):

- KOP BT-1 is on NH Route 302 at Rocks Edge Road in Bethlehem, NH, and is part of the Presidential Range Tour. The viewpoint is 500 feet (152 m) from the existing PSNH transmission route crossing the road and an open field. The existing visual character is of very common quality, without any special scenic character. However, as a designated scenic resource, it has special scenic concern and the visual exposure from vehicles is substantial. The existing contrast-dominance rating is "Moderate" (24).
- KOP BT-6 is located on Route 116 between Whitefield Road and Wing Road in Bethlehem, NH. The viewpoint is where the PSNH corridor crosses the Presidential Range Tour, a route recommended by NHDRED Division of Travel and Tourism Development. These existing character indicators suggest that the existing view from this KOP is of medium quality. However, as part of the Presidential Range Tour, it has scenic concern and the visual exposure from vehicles is substantial. The contrast-dominance rating is "Strong" (27) for the existing PSNH transmission line.
- KOP CA-1 is of a retail use in a rural setting on the River Heritage Tour (NH Route 49 in Campton, NH). The existing PSNH transmission line is clearly visible in the foreground among the trees on the hillside. The existing visual character is of low quality, without any special scenic character. However, as a designated scenic resource, it has special scenic concern and the visual exposure from vehicles is substantial. The existing contrast-dominance rating is "Moderate" (16).
- KOP NH-2 is located on I-93 northbound just south of mile marker 72 in New Hampton, NH. This viewpoint is from the White Mountain Trails Southern Loop, in a high-traffic area of I-93, and the visible structures are in proximity and run parallel to the interstate. The existing view from this KOP is of medium to low quality, without any special scenery interest or intrinsic character. However, as part of the White Mountain Trails Southern Loop, it has scenic concern and the visual exposure from vehicles is substantial. The contrast-dominance rating for the existing PSNH transmission line is "Moderate" (20).
- KOP NH-3 is located where the existing PSNH transmission corridor crosses over the Pemigewasset River in an area that is also within the Army Corps of Engineers' Franklin Falls Dam at the border between the towns of Hill and New Hampton, NH. It is accessible from both Franklin and Bristol, NH, for recreation purposes. For these reasons, it is considered a sensitive location. The existing view from this KOP is of high quality. The area is considered "low" use, but this part

of the Pemigewasset River is a designated scenic resource, and therefore has special scenic concern. The contrast-dominance rating for the existing PSNH transmission line is “Moderate” (26).

- KOP WD-3 is from I-93 North at I-93 mile marker 97.4 in Woodstock, NH. The existing PSNH transmission route with wooden H-frame structures in a shrubby corridor with visible rock outcrops rises up a hillside in the foreground; portions of the WMNF are also visible. The existing visual character is of common quality, without any special scenic character compared to nearby areas. While the viewpoint is not of scenic concern, visual exposure from vehicles is substantial. The existing contrast-dominance rating is “Moderate” (21).

3.3.2 SOCIOECONOMICS

Refer to **Section 3.1.2** for a general discussion of the affected environment common to all geographic sections.

3.3.2.1 Population

The study area of the Central Section is within the boundaries of Grafton and Belknap counties, NH. Grafton County is among the most sparsely populated in the state, with of 51 persons per square mile (20/km²), compared to a statewide figure of 142. Both Belknap and Grafton counties experienced slight population growth between 2010 and 2015 (0.08 percent and 0.09 percent, respectively). **Table 3-33** displays population statistics for the Central Section, along with comparator regions.

Table 3-33. Population Statistics for the Central Section and Comparator Regions, 2015

Region	Population	Annual Population Growth Rate (2010–2015)	Population Density (persons per square mile)
Belknap County	60,399	0.08%	129
Grafton County	89,341	0.09%	51
Total – Potentially Affected Counties	627,878	0.12%	110
New Hampshire	1,324,201	0.12%	142
U.S.	316,515,021	0.63%	83

Source: U.S. Census Bureau 2015a,b; 2016d

3.3.2.2 Employment

Employment percentages in Belknap County are similar to statewide and U.S. averages in most industry sectors. Grafton County had nearly 10 percentage points higher employment in the “educational services, health care, and social assistance” sectors in 2015 (the best available data at the time of analysis), when compared with the statewide average. This number reflects the location of both Dartmouth College and Plymouth State University in Grafton County. **Table 3-34** displays employment by industry sector in the Central Section.

Table 3-34. Employment by Industry Sector in the Central Section and Comparator Regions, 2015

Industry Sector	Belknap County	Grafton County	New Hampshire	United States
Agriculture, forestry, fishing and hunting, and mining	1%	2%	1%	2%
Arts, entertainment, and recreation, and accommodation and food services	9%	11%	9%	10%
Construction	10%	7%	7%	6%
Educational services, and health care and social assistance	25%	34%	25%	23%

Table 3-34. Employment by Industry Sector in the Central Section and Comparator Regions, 2015

Industry Sector	Belknap County	Grafton County	New Hampshire	United States
Finance and insurance, and real estate and rental and leasing	6%	3%	6%	7%
Information	2%	2%	2%	2%
Manufacturing	12%	10%	13%	10%
Other services, except public administration	4%	4%	4%	5%
Professional, scientific, and management, and administrative and waste management services	9%	9%	10%	11%
Public administration	5%	4%	4%	5%
Retail trade	13%	11%	12%	12%
Transportation and warehousing, and utilities	3%	3%	4%	5%
Wholesale trade	2%	2%	3%	3%

Source: U.S. Census Bureau 2016d

As of April 2017 Belknap and Grafton counties experienced unemployment rates comparable to the statewide rate and lower than the U.S. rate. Grafton County had the second lowest unemployment rate (2.4 percent) of any of the five counties potentially affected by the Project. **Table 3-35** displays unemployment statistics for the Central Section and some comparator regions.

Table 3-35. Unemployment Rates in the Central Section and Comparator Regions, 2005, 2010, 2015, 2017

Region	2005	2010	2015	April 2017
Belknap County	3.3%	6.4%	3.3%	2.8%
Grafton County	2.8%	4.9%	2.9%	2.4%
New Hampshire	3.6%	5.8%	3.4%	2.8%
U.S.	5.1%	9.6%	5.3%	4.4%

Source: BLS 2016b, 2107a; NHES 2017a

3.3.2.3 Taxes

A description of statewide tax revenue and rates is provided in **Section 3.1.2.3**.

3.3.2.4 Tourism

The affected environment for tourism is discussed in **Section 3.1.2.4**.

3.3.2.5 Electricity System Infrastructure

A description of region-wide electricity rates, retail prices, and generation is provided in **Section 3.1.2.5**.

3.3.3 RECREATION

Refer to **Section 3.1.3** for a general discussion of the affected environment common to all geographic sections.

The study area of the Central Section contains some of New Hampshire's most popular recreational resources and well-known features. Activities at these sites include hiking, dispersed and developed camping, backpacking, climbing, golfing (including the Owls Nest Resort and Golf Club), interpretation/wildlife viewing, photography, skiing (downhill and cross country), snowshoeing, and other activities that benefit from the natural forested landscape of this part of the state. The recreation experiences offered in the study area of the Central Section range from primitive to urban. Urban development, and thus, local parks and recreational areas are located in the towns of Lincoln, Plymouth, Ashland, New Hampton, and Bristol, NH.

The existing PSNH transmission route currently affect the recreation experience within the study area of the Central Section. Visual impacts occur to 24 recreational point sites, 3,893 acres (1,575 ha) within recreational sites with spatial area, and approximately 15 miles (24 km) of trails. Other modifications to the natural environment, such as roads and buildings also affect the recreation experience. The level of impact from these facilities is related to the overall level of development in the area and the distance from the recreational resource to the transmission route, roads, and buildings. Because the level of development in the study area of the Central Section is generally low, particularly north of Lincoln, NH, the impact of these existing facilities is relatively high for recreational resources that are proximate to them.

Within the Central Section, the study area for all alternatives for short-term impacts includes 5 eligible Wild and Scenic recreational rivers, 21 recreational sites and 19 recreational trails. The Project study area for all alternatives for long-term visual impacts includes 69 recreational sites and 42 recreational trails. The following recreational resources are located within the affected environment of the study area of the Central Section.

Ammonoosuc River
Badger Ski Trail
Baker River
Balance Rock Snowmobile Trail
Ballou Property
Beaver Brook Trail (ANST)
Benton Trail (ANST)
Berry Farm Snowmobile Trail
Bickford Ski Trail
Bog Pond Connector Snowmobile Trail
Branch Brook Campground
Butterhill Partners Conservation Easement
Cannon Mountain
Cascade Brook Trail (ANST)
Charles L. Bean Sanctuary
Church Hill Wildlife Mgt. Area
Clarks Trading Post
Coffin Pond
Cooley Hill Snowmobile Trail
Coppermine Trail
Den Brae Golf Course
Drew Conservation Easement
Edwin MacEwan Memorial Tennis Court
Elbow Pond Snowmobile Trail
Falling Waters Trail
Fay State Forest
Flume Slide Trail
Fobes Conservation Easement
Forest Place*
Foss Forest
Fox Hill Park
Franconia Elementary School Field
Franconia Inn Resort
Franconia Notch State Park
Franconia Ridge Trail/ANST
Franconia Skating Rink Arena
Franconia Snowmobile Trail
Franklin Falls Reservoir
Freeman*
Garfield Ridge Trail/ANST
Garfield Trail
Georgiana Falls Path
Giles*
Glaessel Conservation Easement
Glover Brook Snowmobile Trail
Gordon Pond Snowmobile Trail
Gordon Pond Trail
Gorge Brook Trail
Greenleaf Trail
Green Acres Woodlands
Hannah Conservation Easement
Hatt Conservation Easement
Haystack Connector Snowmobile Trail
Henderson Holdings/Sunset Hill Golf Course
Hi-cannon Trail
Holman Conservation Easement
Hubbard Brook Snowmobile Trail
Jericho Rd Trail
Kelley Park
Kilburn Crags/Ledge*
Kinsman Ridge Trail (ANST)
Knox Mt. Tree Farm
Langdon Park
Liberty Spring Trail/ANST

Littleton High School Gymnasium
Little East Pond Trail
Livermore Falls State Forest
Lonesome Lake Trail
Loon Lake Snowmobile Trail
Loon Mountain Ski Area
Lost River
Mad River
Mathey Conservation Easement
Meader*
Merriam Lot
Mike Burke Memorial Forest
Mildred Lakeway Elementary School Field
Mill Brook
Mount Moosilauke
Moosilauke Carriage Road
Mt Cilley Snowmobile Trail
Mt Eustis Ski Area
Mt Kinsman Trail
New Hampton-Bridgewater Scenic Easement
New Hampton-Bristol Scenic Easement
New Hampton Conservation Park
New Hampton Fish Hatchery
New Hampton School Field
Newfound Hills Campground
Newfound Marina Water Sports Area
North Branch Snowmobile Trail
Old Bridle Path Trail
Opera House*
Osseo Trail
Owl's Nest Resort & Golf Club
Parker Family Trust
Paved Recreation Trail
Pemigewasset River
Pemigewasset Wildlife Mgt. Area
Pinney Conservation Easement
Plymouth Area High School Field
Plymouth Elementary School Field
Plymouth State University Field
Plymouth Town Common
Powerline Snowmobile Trail
Prescott State Forest
Rasmussen*Reel Brook Trail
Remich Park
Rocks (C)/Russell Conservation Easement
Rocks (D)/Hill Conservation Easement
Russell Pond Snowmobile Trail
Sahegenet Falls Recreation Area
Scenic Easement
Scribner-Fellows State Forest
Skookumchuck
Stewart Farm
Stinson Mountain Preserve
Strawberry Hill State Forest
Sugar Hill State Forest
Sugar Hill Town Forest
Sunset Hill House
Swain Conservation Easement
The Dells*
The Rocks*
Tilton Island Park
Tilton School Field
Walter*
Welch Dickey Loop Trail
Wellington State Park
Welton Falls State Forest
White Mountain Motor Park
White Mountain National Forest
Wild Ammonoosuc River
Winnisquam Regional School
Woodstock Water Dept. Easement
Worthen Conservation Easement
Unnamed Recreation Areas
Unnamed Trails

* Indicates uncertain classification of resource type due to data limitations. These areas could be recreational areas, public scenic easements, conservation easements, or park areas.

3.3.4 HEALTH AND SAFETY

Refer to **Section 3.1.4** for a general discussion of the affected environment common to all geographic sections.

3.3.4.1 Electric and Magnetic Fields

An existing PSNH transmission line exists in Whitefield, NH, and through the WMNF within the study area of the Central Section. The existing PSNH transmission line in the study area of the Central Section produces a maximum of 98 mG (at 60 Hz) within the existing PSNH transmission route and that field attenuates quickly with a maximum of 15 mG at the edge of the transmission route, and 4.6 mG at 300 feet (91 m) from centerline (Exponent, Inc. 2014a).

3.3.4.2 Potentially Contaminated Soils and Groundwater

Types of potentially contaminated sites that are found in the study area of the Central Section include active and inactive gas stations and other facilities with underground storage tanks, landfills, and brownfields. The exact location of the sites is not known and should be verified before construction begins.

Circle Tri-Cleaners (located in Plymouth) is the only site identified in the study area that is on the EPA's Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list. This list contains data on potentially hazardous waste sites that have been reported to the EPA and are either proposed to be on, or are on, the National Priorities List (NPL), as well as sites which are in the screening and assessment phase for possible inclusion on the NPL. In 2012 the New Hampshire Department of Environmental Services (NHDES) evaluated air and soil gas data collected at this site as part of the EPA's investigation of previous solvent releases at this location. As a result of this evaluation, the State of New Hampshire recommended that the EPA take immediate action to reduce exposure of people occupying the building (NHDES 2012a).

EPA began work on the Circle Tri-Cleaners site in May 2012 and has performed three rounds of bio-based fluid injections to mitigate the source, as well as conducted multiple rounds of groundwater, indoor air, and sub slab soil gas sampling at the site. Sampling results showed that the levels of chemicals present at the site were above EPA's guidance levels. In 2014 EPA completed the most recent round of sampling and will continue to evaluate options for mitigating the source of contamination (EPA 2015b).

The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the over 90 potentially contaminated sites that are within 250 feet (76 m) of the Project corridor for all alternatives within the Central Section.

3.3.4.3 Fire Hazards and Fire Response Services

See **Section 3.1.4.4** for a discussion of fire hazards in New Hampshire. The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the Fire Departments that are located within 5 miles (8 km) of the Project corridor in the Central Section of the Project.

3.3.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 3.1.5** for a general discussion of the affected environment common to all geographic sections.

The study area (i.e., any road crossed by the Project for all alternatives) of the Central Section is served by a number of local roads and state routes. I-93 serves as the main north-south access route for much of the Central Section. US Route 3 parallels I-93 south of Franconia, NH. NH Route 116 and NH Route 112 also serve as main routes near Alternatives 4b, 4c, 5b, 5c, 6b, and 7.

Traffic volumes on I-93 over the past few years in the study area of the Central Section are approximately 18,000 vehicles per day near Holderness and Plymouth, NH (NHDOT 2014b). Traffic volumes in the study area of the Central Section were generally higher than those reported in the study area of the Northern Section. Average daily traffic volumes for reported roadways ranged from 220 vehicles per day on NH Route 141 in Franconia, NH, to 25,000 vehicles per day on US Route 3 in Tilton, NH (NHDOT 2014c).

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show the approximate distance of airports to the Project. Three airfields—Bradley Field, New Found Valley Airport, Franconia Airport, Spear Memorial Hospital, and Blue Light Heliport—were identified within 20,000 feet (6,096 m) of the Project.

3.3.6 LAND USE

Refer to **Section 3.1.6** for a general discussion of the affected environment common to all geographic sections.

3.3.6.1 Land Use and Land Cover

Municipalities

The Project study area of the Central Section is bounded by the Coös/Grafton county boundary in the north and by the Belknap/Merrimack county boundary in the south. In the Central Section, the Project corridors intersect with 17 municipalities within Grafton and Belknap counties. A full list of municipalities is included in the full **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Land Use Overview

Land use in the Central Section reflects the overall development pattern of the state, becoming slightly more developed than the Northern Section while retaining the generally rural land use character of small New England villages and towns. Population densities are a strong indicator of land use patterns. Grafton County comprises about 19 percent of the total land area of New Hampshire (1,709 square miles [4,426 km²]) and about 7 percent of the total population (89,118 residents). Belknap County makes up about 5 percent of both the total land area and the total population of the state (400 square miles [1,037 km²]; 60,088 residents). Grafton County has about 52 people per square mile (20/km²) and about 30 housing units per square mile (12/km²). Belknap County has about 150 people per square mile (58/km²) and about 94 housing units per square mile (36/km²). These population densities are indicative of the relatively dispersed population and rural land use character found in Grafton and Belknap counties when compared to the state average of 147 people per square mile (57/km²) and 69 housing units per square mile (27/km²) (U.S. Census Bureau 2010a).

Although more densely populated than Coös County, most of Grafton County is heavily rural with about half of its total land area in the WMNF. Grafton County is home to Dartmouth College and Plymouth State University, as well as Loon Mountain and Cannon Mountain ski resorts, all of which are within the top ten largest employers in the county. As a tourist destination for many residents of Boston and other New England population centers, Grafton County also includes Bretton Woods, Waterville Valley, and Attitash ski areas as well as the Maplewood Golf Club and the Bethlehem Country Club. Hundreds of miles of hiking, snowmobiling, and other trails cross the county and forests; mountains, lakes, rivers, ponds and streams provide ample outdoor tourism resources. As a result, tourism and second home ownership are an important part of the land use and development patterns of Grafton County (Grafton County Economic Development Council 2014a).

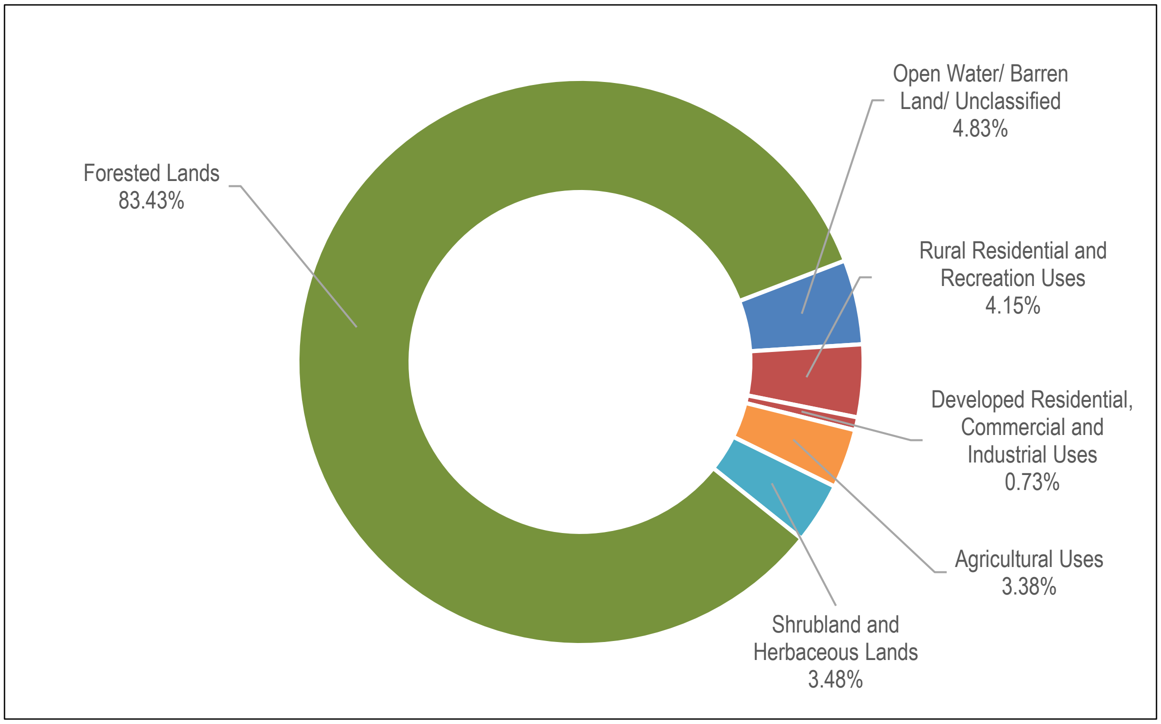
Belknap County is part of the Lakes Region of New Hampshire, with a large part of Lake Winnipesaukee, all of Lake Winnisquam, and many smaller lakes covering nearly one-sixth of the land area of the county. Tourism is somewhat less economically important in Belknap County than it is in Grafton and Coös counties, with Gunstock Recreation Area as the only tourism-related business in the top ten employers. Instead, the government, industrial, and manufacturing sectors are better represented, with Aavid Engineering Corp., NH Ball Bearings, Inc., Vutek, the Winnisquam Regional School District, the Gilford School District, and the Interlakes School System listed as the top employers in the county. For the past four decennial periods, population in Belknap County grew at or below the statewide rate of increase, indicating a relatively small amount of growth in the area (Belknap County 2009a).

Central Section Land Cover

Overall Land Cover

The Central Section is dominated by Forested Lands and Shrublands, which make up approximately 87 percent of all land in the two counties. Developed uses make up less than 5 percent of all land in Belknap and Grafton counties, with Developed Residential, Commercial, and Industrial Uses making up approximately 0.7 percent of all land in the county. **Chart 3-17** illustrates the percent of land in the Central Section by land cover type.

Chart 3-17. Land Cover in the Central Section



Source: MRLC 2013

Project Corridor Land Cover

According to the 2011 NLCD, the Project corridor in the Central Section for Alternatives 2, 3, 5a, 5b, 5c, and 7 is dominated by Forested Lands and Shrubland/Herbaceous Lands, making up between 50 and 85 percent of the study area for these alternatives. Although this land is recorded as containing undeveloped uses, the Project corridor for these alternatives are located entirely within the existing PSNH transmission route or existing roadway corridors. Approximately 7 percent of the corridor for Alternatives 2 and 3 are currently in one of the developed land cover categories. Under Alternatives 5a, 5b, and 5c the Project would be buried within existing roadway corridors in a portion of the study area of the Central Section. As a result, the land cover in the Project corridors for Alternatives 5a, 5b, 5c, and 7 differ slightly in the Central Section with about 12, 10, 19, and 9 percent of the corridors currently in the developed land cover categories, respectively. Agricultural Use in the Project corridors for Alternatives 2, 3, 5a, 5b, 5c, and 7 is between 5 and 8 percent. This land cover represents the relatively remote nature of the Central Section corridor for these alternatives, and the general land use pattern throughout the state, generally becoming more developed and less rural moving from northern to southern New Hampshire.

Under Alternatives 4a, 4b, 4c, 6a, and 6b the Project would be mostly buried within the existing roadway corridor. As a result, the land cover in the Project corridors for these alternatives reflects the developed nature of the roadways under which it would be buried. The Project corridors of Alternatives 4a, 4b, 4c, 6a, and 6b are between 93 and 96 percent developed. For most of its length (between 76 and 86 percent), the Project corridors of these underground alternatives follow roadways with relatively little adjacent impervious surfaces and is classified as Developed, Open Space or Developed, Low Intensity, which generally indicate Rural Residential, Recreational, or Corridor uses. Between 13 and 17 percent of the Project corridor of Alternatives 4a, 4b, 4c, 6a, and 6b follows roadways where some more intensive Residential, Commercial, Industrial, or other developed land use is occurring adjacent to the roadway. This is generally classified as Developed, Medium Intensity or Developed, High Intensity. Less than 1 percent of each of the Project corridors for these underground alternatives passes through agricultural lands, while undeveloped Forested Lands constitutes between 4 and 5 percent of the corridors.

Land Cover Change

The Central Section Project corridors experienced minimal land cover change between 2001 and 2011. More than 93 percent of each Project corridor in the Central Section remained unchanged during this ten-year period.

3.3.6.2 Conservation Lands

Table 3-36 identifies the amount of conserved land by alternative. These lands provide protection for visual resources, wildlife habitat, and wetlands and hydrologic resources, as well as providing for public recreation and public access to natural areas.

Table 3-36. Conservation Lands in the Central Section

Alternatives	Conservation Land acres (ha)	NFS Lands acres (ha)
2, 3	125 (51)	168 (68)
4a, 6a	17 (7)	9 (4)
4b, 6b	3 (1)	30 (12)
4c	3 (1)	22 (9)
5a	77 (31)	8 (3)
5b	128 (52)	52 (21)
5c	67 (27)	43 (17)
7	34 (14)	55 (22)

3.3.6.3 Protected Rivers

Wildcat Brook, which is a federally designated Wild and Scenic River, lies within the central part of New Hampshire, but this river is located over 15 miles (24 km) from the nearest alternative. The Pemigewasset River, Mill Brook, the Mad River, the Baker River, the Ammonoosuc River, and the Wild Ammonoosuc River, are eligible Wild and Scenic Rivers proximate to the Project in the Central Section.

Two State-protected rivers under the Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]) are located within the Project corridors in the Central Section: the Ammonoosuc River and the Pemigewasset River.

3.3.6.4 Rights-of-Way

New and Existing Transmission Routes

All of the Project corridors of Alternatives 2 and 3 would be located in the existing PSNH transmission route in the Central Section. About 68 percent of Alternative 5a, 81 percent of Alternative 5b, 63 percent of Alternative 5c, and 26 percent of Alternative 7 would be located in the existing PSNH transmission route, with the remainder of these Project corridors in new transmission routes (but existing roadway corridors). All of the Project corridors for Alternatives 4a, 4b, 4c, 6a, and 6b would be buried within an existing roadway corridor in the Central Section that is not an existing transmission route. **Table 3-37** shows the length of the Project corridors in new and existing transmission routes in the Central Section.

Table 3-37. New and Existing Transmission Routes in the Central Section

Alternatives	Miles (km) of Project Corridor in Existing Transmission Routes	Miles (km) of Project Corridor in New Transmission Routes
2, 3	65 (105)	0 (0)
4a, 6a	0 (0)	64 (103)
4b, 6b	0 (0)	79 (127)
4c	0 (0)	77 (124)
5a	43 (69)	20 (32)
5b	56 (90)	13 (21)
5c	44 (71)	25 (40)
7	18 (29)	52 (84)

Road Crossings

Table 3-38 demonstrates the number of aerial and underground road crossings in the study area of the Central Section.

Table 3-38. Aerial and Underground Road Crossings in the Central Section

Alternatives	Aerial Crossings	Underground Crossings
2	78	0
3	0	78
4a	0	100
4b	0	162
4c	0	254
5a	57	43
5b	73	18
5c	58	81
6a	0	103
6b	0	165
7	20	155

Public Roadway Corridors

Table 3-39 shows the length of the Project that would be buried under public roadway corridors in the study area of the Central Section.

Table 3-39. Public Roadway Corridors where the Project would be Buried in the Central Section

Alternatives	Miles (km) of Local Roads	Miles (km) of State Roads	Miles (km) of Interstate and US Highway	Total Miles (km)*
2, 3	0 (0)	0 (0)	0 (0)	0 (0)
4a	2 (3)	0.1 (0.2)	64 (103)	64 (103)
4b	1 (2)	26 (42)	53 (85)	79 (127)
4c	0.2 (0.3)	34 (55)	44 (71)	77 (124)
5a	2 (3)	1 (2)	21 (34)	21 (34)
5b	0 (0)	13 (21)	0 (0)	13 (21)
5c	0 (0)	24 (39)	1 (2)	25 (40)
6a	4 (6)	2 (3)	60 (97)	61 (98)
6b	1 (2)	28 (45)	48 (77)	76 (122)
7	0	27 (43)	26 (41)	53 (84)

* sum of road types may not equal total due to the fact that road types may coincide with one another for certain distances.

Franconia Notch State Park and I-93 Memorandum of Agreement

On November 18, 1977, October 14, 1983, and September 9, 2010, the Governor of New Hampshire, NHDOT, NHDRED, the Appalachian Mountain Club, and the Society for the Protection of New Hampshire Forests (SPNHF), entered into three Memorandums of Agreement (MOA) related to the maintenance of I-93 within Franconia Notch State Park.

The agreements call for unified planning between NHDOT and NHDRED to assure that Parkway design and State Park facility designs are consistent with each other. The agreements also require the State of New Hampshire to seek the input of the Appalachian Mountain Club and SPNHF on proposed construction projects in the I-93 corridor within Franconia Notch State Park in conjunction with the original MOAs and amendment. Alternatives 4a, 5a, and 6a would occur within the I-93 corridor within Franconia Notch State Park and would require the stipulations of the MOAs to be followed.

3.3.7 NOISE

Refer to **Section 3.1.7** for a general discussion of the affected environment common to all geographic sections.

The study area (i.e., 200 feet on either side of the Project corridors) of the Central Section is largely forested, but has larger towns and more development than is found in the study area of the Northern Section. Towns become larger and more urbanized moving south through the study area. Single family homes on multiple acres are found along the roadways between towns.

The study area of the Central Section associated with Alternatives 2, 3, 5a, 5b, and 5c would be within 120 feet (37 m) of the Watermelon Seeds Preschool and Learning Center in Campton, NH. Additionally, Alternative 5b would pass by a campground and Alternative 5c would pass within 200 feet (61 m) three campgrounds. Alternatives 2, 3, 5a, and 5b would be located within 50 feet (15 m) of 19 to 39 residences, while Alternative 5c would be located within 50 feet (15 m) of 401 residences (see **Table 3-40**). Alternative 7 diverges from Alternatives 2, 3, 5a, and 5b in Bethlehem, NH, and then follows the same corridor as Alternative 5c until North Woodstock, NH. Disturbance areas for Alternative 7 would be within 200 feet

(61 m) of three daycare centers, three campgrounds, and one church. There would be 657 residences within 50 feet (15 m) of disturbance areas associated with Alternative 7 (see **Table 3-40**).

Table 3-40. Number of Residences Within 50 feet (15 m) of a Disturbance Area in the Central Section by Alternative

Alternative										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
26	19	3	79	1,036	23	39	401	32	108	657

Alternatives 4a and 6a would follow the same corridor through Bethlehem, Franconia, Lincoln, Woodstock, Thornton, Campton, Plymouth, Ashland, Bridgewater, and New Hampton, NH. There would be 3 and 32 residences within 50 feet (15 m) of disturbance areas associated with Alternatives 4a and 6a, respectively (see **Table 3-40**).

Disturbance areas associated with Alternatives 4b and 6b would be located within 200 feet (61 m) of, campgrounds, and a library. There would be 79 to 108 residences within 50 feet (15 m) of disturbance areas associated with Alternatives 4b and 6b, respectively (see **Table 3-40**).

Disturbance areas for Alternative 4c would be located within 200 feet (61 m) of daycare centers, campgrounds, a church, a school, and a library. Over 1,000 residences would be within 50 feet (15 m) of disturbance areas associated with Alternative 4c (see **Table 3-40**).

3.3.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 3.1.8** for a general discussion of the affected environment common to all geographic sections. The **Cultural Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) contains additional information on the affected environment for this resource.

Pre-Contact Period

Time periods before Native American societies had substantial contact with Europeans.

Post-Contact Period

Time periods since significant contact between Native Americans and Europeans.

Within the study area of the Central Section, previously identified Pre-Contact period archaeological sites provide evidence for use and settlement of the region. These sites date to the Paleoindian, Archaic, and Woodland cultural periods. Post-Contact period sites are also present, consisting of habitation sites and specialized resource procurement sites such as quarries. Over time, Pre-Contact period sites indicate a continued, but relatively sparse, occupation of the WMNF portion of the Central Section, suggesting that the low intensity of use of this area may be associated with the relatively harsh terrain and physiographic features of this mountainous region. Despite this low site density, Pre-Contact period site distribution suggests that mountainous areas of the Central Section had an occupation pattern similar to that for the Northern Section associated primarily with the major watersheds in the region. Additionally, documentation from the Post-Contact period identifies a number of trails across the mountains of the Central Section.

In contrast to the mountainous portion of the Central Section, the area that is characterized by lakes contains a relatively rich record for Pre-Contact period use and settlement. This area contains previously identified sites dating to all Pre-Contact cultural periods, including sites occupied repeatedly over these periods, consisting of large and small habitation sites and specialized resources procurement sites. Pre-Contact period site distribution suggests that the Central Section's densest occupation was adjacent to lakes and rivers. Sites with evidence for multiple occupations within and between the various cultural periods and documentation from the Post-Contact period, during which European explorers and early settlers encountered and interacted with Native American groups, indicate that the lakes region was an area where major trails intersected, resulting in a regional center for occupation throughout the Pre-Contact period.

Post-Contact historic period development (late 18th and early 19th centuries) generally was associated with farming (usually sheep herding), the woolen industry, large-scale lumbering that led in part to the establishment of the WMNF, tourism, and recreation. Cultural resources (archaeological sites, buildings, and structures) reflect this development, and consist of residences, farmsteads or farm complexes, lumber camps, dams, railroads, hotels, motels, and recreational facilities such as ski areas. The general pattern of Post-Contact Euro-American settlement in the Central Section also consisted of the development of a village center, with nearby farmsteads and associated small-scale industry, linked by roads, railroads, and navigable waterways. Specific industries such as lumbering displayed a somewhat different pattern: the lumber industry was characterized by large tracts of unoccupied forestland with interspersed camps and trails facilitating movement of timber resources to milling facilities by water or rail. Unlike the Southern Section of the Project, large scale industry was not a predominant development pattern in mountainous areas of the Central Section.

Somewhat similar to the mountainous portion of the Central Section, the area that is characterized by lakes was also settled by Euro-Americans relatively later than other sections of the Project. Prior to the conclusion of the French and Indian War in 1763 the area was called the "Great Waste" by travelers, and European explorers and Euro-American trappers and settlers engaged in regular, and sometimes violent encounters with Native American groups. However, slow, but increasing settlement occurred in 1784 after the conclusion of the Revolutionary War. In general, settlement was associated with agriculture and the lumber industry, with growth centralized in areas with access to arable land and/or associated with powerful water sources. By the later 19th century, the remote and generally unaltered natural characteristics of the Central Section resulted in development associated with the tourism and recreation industries.

3.3.8.1 Archaeological Resources

The number of archaeological resources identified during the Phase 1A investigations within the direct APE for alternatives in the Central Section are provided in **Table 3-41**.

Table 3-41. Number of Archaeological Resources within the Direct APE for Project Alternatives in the Central Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
11	11	1	6	11	6	14	19	2	7	5

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016
Note: Includes WMNF archaeological resources

The number of archaeologically sensitive areas identified within the direct APE for alternatives in the Central Section are provided in **Table 3-42**.

Table 3-42. Number of Archaeologically Sensitive Areas within the Direct APE for Project Alternatives in the Central Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
93	93	11	53	118	72	91	112	16	59	147

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016
Note: Includes WMNF archaeologically sensitive areas

3.3.8.2 Architectural Resources

The number of architectural resources identified within the indirect APE for alternatives in the Central Section are provided in **Table 3-43**.

Table 3-43. Number of Architectural Resources within the Indirect APE for Project Alternatives in the Central Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
78	80	2	31	113	82	78	84	4	32	179

Source: Claesson et al. 2014b; 2015a; Higgins et al. 2015, 2016a,b,c,d,e,f; Dunham et al. 2017
Note: Includes WMNF architectural resources
Includes the Appalachian National Scenic Trail
ZVI analysis was not done for the two transition stations in the Central Section of Alternative 7, so it is assumed that they would be visible from all architectural resources within a 1-mile radius of their locations.

3.3.9 ENVIRONMENTAL JUSTICE

The study area of the Central Section includes Belknap and Grafton counties. Grafton County has approximately the same percentage of minority populations as the state. Belknap County has a lower percentage of minority populations than the state as a whole. However, both counties have a higher percentage of low-income populations (families living below the poverty level) than the state. Median household income in both counties is below the statewide average.

Table 3-44. Demographic Characteristics of the Central Section and Comparator Regions, 2015

	Belknap County	Grafton County	New Hampshire	United States
Total Population	60,641	89,320	1,330,608	321,418,820
Percent White	94.9%	91.0%	91.0%	61.6
Percent Black or African American	0.7%	1.1%	1.5%	13.3%
Percent American Indian and Alaska Native	0.3%	0.4%	0.3%	1.2%
Percent Asian	1.2%	3.6%	2.6%	5.6%
Percent Native Hawaiian and Other Pacific Islander	0.0%	0.0%	0.0%	0.2%
Percent Other Race	0.2%	0.3%	0.3%	0.2%
Percent 2 or More Races	1.4%	1.8%	1.6%	2.6%
Percent Hispanic	1.7%	2.3%	3.4%	17.6%
Total Percent Minority Population	*5.5%*	*9.5%*	*9.7%*	*40.7%*
Percent Families below Poverty Level	7.4%	6.3%	5.6%	11.3%
Median Household Income	$62,159	$55,762	$66,779	$53,889

Source: U.S. Census Bureau 2017c,d

3.3.10 AIR QUALITY

Refer to **Section 3.1.10** for a general discussion of the affected environment common to all geographic sections.

The study area for the Central Section is defined by Grafton and Belknap counties, and is characterized by rural areas where there are few air emission sources. Grafton and Belknap counties are in attainment with all NAAQS. A portion of the study area of the Central Section is within the WMNF, and within about 15 to 20 miles (24 to 32 km) of the Great Gulf Wilderness and the Presidential Range–Dry River Wilderness, both of which are Class I areas protected under the Regional Haze Rule.

3.3.11 WILDLIFE

Refer to **Section 3.1.11** for a general discussion of the affected environment common to all geographic sections.

3.3.11.1 Federally- and State-listed Wildlife Species

Table 3-14 in **Section 3.1.11** presents federally- and state-listed wildlife species that are known to occur in the state, as well as an indication of which species have the potential for occurrence in the study area of the Central Section. A total of 87 state-listed and 4 federally-listed threatened or endangered species have the potential to occur in the study area of the Central Section (two of the federally-listed species are also listed as threatened or endangered by NHFG). The federally-listed species potentially present in the study area of the Central Section include: dwarf wedgemussel (endangered), Canada lynx (threatened), Indiana bat (endangered), and northern long-eared bat (threatened). One federally listed species, the Indiana bat, was identified as potentially occurring in the Central Section during Project-specific field surveys. Twelve state-listed were detected during Project-specific field surveys. These were: the black-billed cuckoo, Canada warbler, chimney swift, Eastern towhee, field sparrow, northern goshawk, olive-sided flycatcher, prairie warbler, purple finch, ruffed grouse, scarlet tanager, and veery. Additional discussion regarding the methodology and results of the Project-specific surveys is provided in the **Wildlife Technical Report** prepared for the Project (http://www.northernpasseis.us/library/final-eis/technical-reports).

No dwarf wedgemussels were observed in ten waterbodies that were surveyed in the study area of the Central Section.

The Indiana bat was identified as potentially occurring in the study area of the Central Section during passive acoustic monitoring surveys conducted in July 2013. The northern long-eared bat was not detected within the study area of the Central Section during surveys; however, there are recent records of the species in Grafton County and the species has been detected in winter hibernacula located within 5 miles of the Project corridor in the Central Section (NHFG 2005a; NHB 2014).

Winter tracking surveys were conducted in 2013/14 that focused on habitat that may support the federally-listed threatened Canada lynx or state-listed threatened American marten. Surveys were targeted along the Project corridor of Alternatives 2 and 3 within the Northern and Central Sections and not the other alternatives or geographic sections because they do not provide suitable habitat for these species. Since most of the study area of the Central Section is a maintained transmission route or roadway corridor, mammals that utilize the area are species acclimatized to successional and edge habitats. The winter tracking survey targeting Canada lynx and American marten did not document any Canada lynx or American marten in the study area of the Central Section.

3.3.11.2 General Wildlife

Aquatic Species

Aquatic habitats in the study area of the Central Section are primarily characterized as a range of lotic systems, with many of the streams north of WMNF of glacial origin, with boulders and large cobbles, and streams south of WMNF characterized by cobble, gravel, and sand substrates. Lentic systems crossed by the Project corridor are predominately wetlands. Aquatic habitat in the study area of the Central Section could support fish, freshwater mussels, and other aquatic macroinvertebrates, including the Eastern brook trout, which is a state species of greatest conservation need. However, the larger waterbodies do contain suitable abiotic factors to support fish and other aquatic biota. Wetlands, waterbodies, and vernal pools in the study area provide habitat for reptiles and amphibians.

Several of the rivers within the study area of the Central Section contain freshwater mussel populations. In 2013 mussel surveys were conducted in 13 selected waterbodies based upon the desktop analysis; these waterbodies were determined to have suitable hydrology (larger streams and rivers with a low to moderate gradient); the following provides a summary from north to south. The Squam River contained 1 eastern pearlshell and 3 triangle floaters. The Pemigewasset River crossing in Ashland, NH, contained 1 eastern elliptio. The Pemigewasset River crossing in Ashland, NH, contained 1 eastern pearlshell, 9 triangle floaters, and 1 creeper. The Pemigewasset River crossing in New Hampton, NH, contained 9 eastern elliptios, 2 eastern lampmussels, and 3 triangle floaters. The crossing of the Pemigewasset River in Bristol, NH, contained 5 eastern elliptio, 37 eastern lampmussels, 1 triangle floater, and 53 eastern floaters. The Pemigewasset River crossing in Hill, NH, contained a high density of eastern elliptio and 1 triangle floater.

In addition to freshwater mussels, the rivers, streams, and wetlands present in the study area of the Central Section are expected to support other aquatic invertebrates such as freshwater crustaceans, freshwater snails, freshwater clams, aquatic worms, and aquatic insects.

In April and May 2014 targeted reptile and amphibian surveys were conducted for the eastern hog-nosed snake, northern black racer, Blanding's turtle, and spotted turtle at 16 locations within the study area of the Central Section. None of these species were observed in the study area of the Central Section. However, other species that were observed include green frogs, grey treefrogs, red-spotted newts, spotted salamanders, spring peepers, wood frogs, northern leopard frogs, mink frog, and wood turtle.

Terrestrial Species

Terrestrial habitats in the study area of the Central Section are characterized primarily by a maintained transmission route or roadway corridor. The area surrounding the Project corridors is generally forested (which provides interior forest habitat for many species of wildlife) and rural residential. The existing PSNH transmission route in the study area of the Central Section also provides edge and early successional habitat which is used by many species. See **Section 3.3.12** for a discussion of vegetated cover types in the study area of the Central Section.

The BBS conducted in the study area in 2013 recorded 1,682 detections of 1,973 bird individuals (95 species) across 106 breeding bird transects in the study area of the Central Section. The three most commonly detected species were the chestnut-sided warbler, the common yellowthroat, and the red-eyed vireo.

The study area of the Central Section overlaps the geographic range of nine bat species. To assess the potential presence and distribution of bats in the study area of the Central Section, acoustical monitoring surveys were conducted in July 2013. Detectors located in the study area of the Central Section recorded 2,826 bat passes during the survey period and mean bat activity per detector night across all detectors in the study area of the Central Section was 117.8 passes per detector night. In addition, bat activity was higher in the study area of the Central Section compared to the study area of the Northern Section, with six times more bat passes and mean nightly activity levels. Based on the results of the acoustic monitoring survey, both cave and tree bats occur in the study area of the Central Section during the summer season. No bat hibernacula (e.g., caves or mines) are present within the Project corridors for any action alternatives in the Central Section. However, there are three bat hibernacula located within 5 miles (8 km) of the Project corridor for Alternatives 2 and 3 (NHB 2014).

3.3.11.3 Habitat Connectivity

The study area of the Central Section overall is largely undeveloped and contiguous, providing connectivity for migrating wildlife. Also, a large portion of the area surrounding the Project corridors is within the boundaries of the WMNF. Development surrounding the WMNF boundary includes rural residential lots and small towns. A number of connectivity zones in the section provide contiguous habitat for large mammal movement across the landscape.

The percent resistance (habitat connectivity) was calculated for the Project corridor for each alternative. For details on this analysis, see the full **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). Throughout the study area of the Central Section, the presence of highways (particularly I-93) likely limits movement and incidence of some terrestrial wildlife species. Within the study area of the Central Section, the presence of roadways could particularly affect listed species such as Canada lynx and reptiles such as Blanding's turtle and spotted turtle. In addition to roadways, the landscape of the study area of the Central Section is relatively more developed when compared with the study area of the Northern Section, with more frequent rural villages and residential development. This human presence likely limits wildlife movement of some species.

Overall, wildlife movement is relatively free near the Project corridors of Alternatives 2 and 3 in the Central Section. The Project corridors for these alternatives would be located in the existing PSNH transmission route. The existing PSNH transmission route generally facilitates wildlife movement for larger species such as deer and coyotes; however, movement of small species such as salamanders and other amphibians is likely limited by this corridor. For portions of the Project corridor in the WMNF, vast areas of undeveloped land surrounding the Project corridors facilitate wildlife movement.

Wildlife movement is more limited near the Project corridors of Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7. These Project corridors generally follow roadway corridors through developed landscapes, including residential, commercial, and industrial land uses. Wildlife movement is interrupted by existing roadways and development in this area. However, as with the other alternatives, portions of the Project corridors within the WMNF would be surrounded by vast areas of undisturbed wildlife habitat which would facilitate movement.

Other migration corridors include the Atlantic migratory flyway used by migratory birds. The High Elevation Spruce-Fir IBA crosses the existing PSNH transmission route in the towns of Easton and Lincoln, NH, and is within the confines of the study area of the WMNF and Central Sections.

3.3.12 VEGETATION

Refer to **Section 3.1.12** for a general discussion of the affected environment common to all geographic sections.

The study area for Alternatives 2 and 3 in the Central Section is within the existing PSNH transmission route, and scrub-shrub communities are a dominant vegetation type. Typical vegetation species include red maple, gray birch, eastern hayscented fern, glossy buckthorn (an invasive species), western brackenfern, white meadowsweet, sugar maple, sweet birch, eastern teaberry, and jewelweed. Portions of the study area of Alternatives 5a, 5b, 5c, and 7 within the Central Section are within the existing PSNH transmission route and contain scrub-shrub communities. The primary land cover in the study area for the majority of the alternatives located in roadway corridors (Alternatives 4a, 4b, 4c, 6a, 6b, and portions of 5a, 5b, 5c, and 7) is developed and mowed ROW; Alternatives 5a, 5b, 5c, and 7 contain forestland and scrub-shrub as the primary land cover.

Other vegetative communities prevalent throughout the study area of the Central Section are represented by species inhabiting a range of forested (deciduous, coniferous, and mixed), wetland communities (emergent marsh, scrub-shrub, and forested), grassland, mowed ROW, scrub-shrub, and a very small section of grassland. Mowed and other maintained corridors or developed areas are prevalent for alternatives located in roadway corridors.

Table 3-15 in **Section 3.1.12** presents all federally- and state-listed plant species that have the potential to occur within the study area, as well as an indication of which species have the potential for occurrence in the study area of the Central Section. One federally-listed plant species potentially occurs within the study area of the Central Section, the small whorled pogonia, although it was not identified in Project-specific field surveys. In addition, 65 state-listed plant species have the potential to occur in the study area within the study area of the Central Section. No state-listed plant species were observed during field surveys in the study area of the Central Section. However, the NHB database indicates the historic presence of the Wiegand's sedge, a state listed endangered species.

3.3.13 WATER RESOURCES

Refer to **Section 3.1.13** for a general discussion of the affected environment common to all geographic sections.

Four aquifers underlie the study area of the Central Section: the Upper Connecticut, Middle Connecticut, Pemigewasset, and Upper Merrimack (USGS 2000a). Under the various alternatives, the study area of the Central Section contains 93 PWS wells within 250 feet (76 m) of the Project in Grafton, Merrimack, and/or Belknap counties. There are over 11,000 acres of SWPAs within 250 feet of the study area in the Central Section. The SWPAs are Pennichuck Water Works, Cheshire County Complex, and Woodsville Water and Light. In the study area of the Central Section, there are 1,216 acres of WHPAs within 250 feet of the study area.

The study area of the Central Section contains multiple rivers and streams within the Pemigewasset River Watershed, including multiple crossings of the Pemigewasset River. The study area contains up to 59 perennial streams. Large drainages contain more flow and suitable abiotic factors to support fish and other aquatic biota than small tributaries. The largest waterbodies in the study area of the Central Section include the Ammonoosuc, Gale, Mad, and Pemigewasset rivers.

FEMA FIRMs were reviewed for Grafton and Belknap counties. In addition, in Grafton County, the study area of the Central Section contains up to 316 acres (128 ha) of Zone A and Zone AE floodplains (i.e., land subject to a 1 percent chance of annual flooding) that are associated with 16 different water courses.

Based on a combination of field surveys and NWI mapping, the study area of the Central Section contains up to 860 acres (348 ha) of PEM, PFO, and PSS wetlands. Ten vernal pools were identified in the study area of the Central Section.

3.3.14 GEOLOGY AND SOILS

Refer to **Section 3.1.14** for a general discussion of the affected environment common to all geographic sections.

The study area of the Central Section is predominantly within the New England Upland Physiographic Province, with portions also within the White Mountain Physiographic Province. The New England Upland Physiographic Province is characterized by streams running in well-graded and rounded valleys, while the White Mountain Physiographic Province is characterized by rugged mountains and narrow valleys. The Project study area for all alternatives in the Central Section eventually run along the Pemigewasset River to the south. Slopes vary widely depending on location and topography, but in general are from 3 to 35 percent.

The bedrock geology in the study area of the Central Section consists of a variety of metamorphosed sedimentary and igneous rocks ranging in age from Late Ordovician to Late Devonian. In general, the bedrock geology crossed by the Project is predominantly granite, granodiorites, and pelitic schists of the Kinsman and Rangeley Formations. These units represent a geologic sequence of metamorphosed Paleozoic sedimentary and volcanic rocks that were penetrated by plutonic rocks. Sedimentary and volcanic rocks represent an early marine geology which, during the Middle Paleozoic, was metamorphosed during mountain building. Plutonic rocks intruded during both geologic phases. The folded and faulted geology of New Hampshire represents a deeply eroded mountain system.

3.4 SOUTHERN SECTION

3.4.1 VISUAL RESOURCES

Refer to **Section 3.1.1** for a general discussion of the affected environment common to all geographic sections.

The study area of the Southern Section—located in Merrimack and Rockingham counties—is characterized by low forested hills, with 8 percent of the area in suburban and urban development and 9 percent in farmland. Indicators of the moderate level of development include a population density of 271 people per square mile (per 2.6 km²), and 0.9 mile (1.4 km) of primary and 2.8 miles (4.5 km) of secondary roads people per square mile (per 2.6 km²). The average intrinsic visual quality is “Moderate” (an index of 3.14).

The study area for Alternatives 2, 3, 5a, 5b, 5c, and portions of 6a, 6b, and 7 includes the existing PSNH transmission line. Examples of areas of scenic concern close to the existing PSNH transmission line include Bear Brook and Pawtuckaway State Parks, Cilley, Merrimack River, Russell-Shea, White Farm and Wade State Forests, Franklin Falls Reservoir, Concord and Webster Lake Wildlife Management Areas, Merrimack and Lamprey Rivers, Canterbury Shaker Village Byway, Daniel Webster Birthplace, and Concord’s Broken Ground Area.

For Alternatives 4a, 4b, 4c, and portions of 6a and 6b where the Project would be buried in roadway corridors, the study area is characterized primarily by residential development and forested areas along these roadway corridors.

3.4.1.1 Landscape Assessment

The existing PSNH transmission line currently has visual effects within the study area of the Southern Section for Alternatives 2, 3, and portions of 6a, 6b and 7. Within the study area of the Southern Section, the existing PSNH transmission line’s viewshed is about 18 square miles (46 km²), or 2 percent of the total land area within 10 miles (16 km) on both sides of the centerline. The visual magnitude for nearly one-third (8.4 square miles [22 km²]) of the land area within the viewshed is “None,” or sufficiently small that the PSNH transmission line is likely to go unnoticed by a casual observer. For approximately 4 square miles (10 km²), the visual magnitude of the existing structures is “High or Very High.” The average visual magnitude is “Low” (an index of 1.97).

There are 0.3 square mile (0.8 km²) with “High or Very High” scenic impact. The average scenic impact in the study area of the Southern Section is “Low” (an index of 1.47). **Table 3-45** summarizes the landscape assessment affected environment in the study area of the Southern Section.

Table 3-45. Summary of the Landscape Assessment Affected Environment – Southern Section

Indicator	Value
Average Intrinsic Visual Quality *(The landscape's inherent potential for attractiveness)*	**3.14** None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Viewshed of Existing PSNH Transmission Line	18 square miles (46 km^2)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**1.97** None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Land Area of High or Very High Scenic Impact	0.3 square miles (0.8 km^2)
Average Scenic Impact	**1.47** None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)

3.4.1.2 Roads-Based Analysis

The existing PSNH transmission line is an important feature of the affected environment in the study area of Alternatives 2, 3, 5a, 5b, 5c, 7 and portions of 6a and 6b in the Southern Section. Along its route, there are 55 publicly-accessible road crossings. In addition, there are 39 miles (62 km) of roads with visibility of the existing PSNH transmission line, or 9 percent of the length of roads within 1.5 miles (2 km) of the existing PSNH transmission route in the study area of the Southern Section.

The visual magnitude for 6 miles (10 km) of the roads in the viewshed is "None," or sufficiently small as to likely go unnoticed by a casual observer. For 9 miles (14 km) of the roads in the viewshed, the visual magnitude of the existing structures is "High or Very High." The average visual magnitude rating is "Low to Moderate" (an index of 2.33).

There are 0.5 mile (0.8 km) of designated scenic roads within the existing PSNH transmission line's viewshed. It is estimated that the vehicle exposure on the state designated Canterbury Shaker Village Byway is approximately 4 hours per day. **Table 3-46** summarizes the roads-based analysis affected environment in the study area of the Southern Section.

Table 3-46. Summary of the Roads-Based Analysis Affected Environment – Southern Section

Metric	Value
Miles of Roads in Existing PSNH Transmission Line Viewshed	39 miles (62 km)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**2.33** None (0) Very Low (1) Low (2) Moderate (3) High (4) Very High (5)
Miles of Designated Scenic Roads in Viewshed	0.5 mile (0.8 km)
Vehicle Exposure on Scenic Roads	4 hours per day

3.4.1.3 Viewpoint Assessment

As mentioned above, 22 simulation viewpoints were selected as KOPs to represent a range of existing and proposed visual conditions, and are included as **Appendix E**. Four of these KOPs are within the study area of the Southern Section:

- KOP CO-1 is on Loudon Road (NH Route 9) looking at a retail shopping center in Concord, NH. Two existing transmission lines in the existing PSNH transmission route are very visible in the foreground. The existing visual character is of "Low" quality, without any special scenery interest or intrinsic character. This road is not a designated scenic resource, but the visual exposure from vehicles is substantial. The existing contrast-dominance rating is "Moderate" (22).
- KOP CO-4 is located at the NHFG boat access facility at Turtletown Pond, in Concord, NH. The view is across Turtletown Pond to the existing PSNH transmission line as it crosses through adjacent wetlands in the foreground. Four residences were visible from this location. The existing visual character is of "Moderate to High" quality. The view is not part of a designated scenic resource, though it is apparent that the area is locally valued. The existing contrast-dominance rating is "Moderate" (25).
- KOP DE-1 is of the existing PSNH transmission route as it crosses Nottingham Road in Deerfield, NH. The terrain is flat and three residences are visible from this location. The existing visual character is of "Moderate" quality, without any special scenic character other than the small pond. The existing contrast-dominance rating is "Strong" (28).
- KOP DE-2 is near the intersection of Church Street (also known as Old Center Road South) and Candia Road in the Deerfield Center Historic District, Deerfield, NH. The District includes 17 buildings, and is listed on the National Register of Historic Places. These existing character indicators suggest that the existing view from this KOP is of moderate to low quality. The District is an important historic resource that is near the Project corridor, and therefore has special scenic concern. The existing condition does not have a contrast-dominance rating because there is not any existing infrastructure visible at this location.

3.4.2 SOCIOECONOMICS

Refer to **Section 3.1.2** for a general discussion of the affected environment common to all geographic sections.

3.4.2.1 Population

The study area of the Southern Section is within Merrimack and Rockingham counties, NH. These counties are two of the more-densely populated counties in the state. Both experienced growth between 2010 and 2015, with Rockingham County well above the state average, at 0.26 percent. This reflects the more-developed, urban setting that characterizes the Southern Section. **Table 3-47** displays population statistics for the Southern Section, along with comparator regions.

Table 3-47. Population Statistics for the Southern Section and Comparator Regions, 2015

Region	Population	Annual Population Growth Rate (2010–2015)	Population Density (persons per square mile)
Merrimack County	147,262	0.07%	154
Rockingham County	299,006	0.26%	430
Total – Potentially Affected Counties	627,878	0.12%	110
New Hampshire	1,324,201	0.12%	142
U.S.	316,515,021	0.63%	83

Source: U.S. Census Bureau 2015a,b; 2016d

3.4.2.2 Employment

Employment percentages in both counties in the Southern Section hover around statewide and U.S. averages in most industry sectors. Merrimack County had above-average employment in "public administration" in 2015 (the best available data at the time of analysis), due to the location of Concord—the state capital—in the county. **Table 3-48** displays employment by industry sector in the Southern Section.

Table 3-48. Employment by Industry Sector in the Southern Section and Comparator Regions, 2015

Industry Sector	Merrimack County	Rockingham County	New Hampshire	United States
Agriculture, forestry, fishing and hunting, and mining	1%	1%	1%	2%
Arts, entertainment, and recreation, and accommodation and food services	8%	8%	9%	10%
Construction	7%	7%	7%	6%
Educational services, and health care and social assistance	27%	22%	25%	23%
Finance and insurance, and real estate and rental and leasing	6%	7%	6%	7%
Information	2%	3%	2%	2%
Manufacturing	10%	13%	13%	10%
Other services, except public administration	5%	4%	4%	5%
Professional, scientific, and management, and administrative and waste management services	10%	12%	10%	11%
Public administration	6%	4%	4%	5%
Retail trade	12%	13%	12%	12%
Transportation and warehousing, and utilities	3%	4%	4%	5%
Wholesale trade	3%	4%	3%	3%

Source: U.S. Census Bureau 2016d

As of April 2017, unemployment in Merrimack and Rockingham counties was near the statewide average of 3.4 percent. **Table 3-49** displays unemployment statistics for the Southern Section and some comparator regions.

Table 3-49. Unemployment Rates in the Southern Section and Comparator Regions, 2005, 2010, 2015, 2017

Region	2005	2010	2015	April 2017
Merrimack County	3.1%	5.3%	3.1%	2.3%
Rockingham County	4.1%	6.0%	3.6%	3.0%
New Hampshire	3.6%	5.8%	3.4%	2.8%
U.S.	5.1%	9.6%	5.3%	4.4%

Source: BLS 2016b, 2107a; NHES 2017a

3.4.2.3 Taxes

A description of statewide tax revenue and rates is provided in **Section 3.1.2.3**.

3.4.2.4 Tourism

The affected environment for tourism is discussed in **Section 3.1.2.4.**

3.4.2.5 Electricity System Infrastructure

A description of region-wide electricity rates, retail prices, and generation is provided in **Section 3.1.2.5**.

3.4.3 RECREATION

Refer to **Section 3.1.3** for a general discussion of the affected environment common to all geographic sections.

The recreation experience found within the study area of the Southern Section is indicative of the more developed, suburban land use pattern found in southern New Hampshire. Less-developed areas do exist within the study area of the Southern Section; however, many recreation resources take the form of fields, playgrounds, and city parks. The Southern Section provides a range of recreation experiences, with a tendency toward less primitive opportunities. The towns of Franklin, Tilton, Northfield, Boscawen, Concord, Allentown, and Deerfield, NH, are located in this section, each of which have their own portfolio of local parks, recreation, and trails resources.

The existing PSNH transmission route currently affects the recreation experience within the study area of the Southern Section. Visual impacts occur to 45 recreational point sites, 1,269 acres (514 ha) within recreational sites with spatial area, and approximately 2.7 miles (4 km) of trails. Other modifications to the natural environment, such as roads and buildings also affect the experience. The level of impact from these facilities is related to the overall level of development in the area and the distance from the recreational resource. Because the level of development in the study area of the Southern Section is generally high, the impact of these existing facilities on recreational resources is relatively low.

Within the Southern Section, the Project study area for all alternatives for short-term impacts includes 3 eligible Wild and Scenic recreational rivers, 17 recreational sites and 9 recreational trails. The Project study area for all alternatives for long-term visual impacts includes 114 recreational sites and 5 recreational trails. The following recreational resources are located within the affected environment of the study area of the Southern Section.

Allenstown Upper Elementary School Field
Alvah Chase Town Forest
Bachelder*
Bear Brook State Park
Beaver Meadow Golf Course
Bicentennial Square Park
Bishop Brady High School Field
G. & M. Blackman*
Blood-Agric. Pres. Rest.
Bock Easement
Booth Conservation Easement
Boscawen Town Park
Broken Ground Area
Burbank Easement
Candia Road
Canterbury Center Historic Site
Canterbury Shaker Village
Carter & Keller*
Chandler*
Cilley State Forest
Circle 9 Ranch Campground
Claremont-Concord RR Bed
Clark Road
Clifford Conservation Easement
Compensation Funds of New Hampshire*
Comte Easement
Conant School Field
Concord Historic District
Concord Wildlife Management Area
Conservation Commission Lands
Contoocook River Park
Corey Wildlife Management Area
Cornerstone Christian Academy
Cruikshank Conservation Easement
Cummings*
Curry Conservation Easement

Curtis*
Deerfield Black Gum Swamp
Dewey School Field
Doane/Schorr Easement
DOT-Epsom Scenic Easement
Doyen Park
Dowst-Cate Town Forest
Franklin Falls Reservoir
Franklin Middle School Field
Garrison Park
Garrison School Field
Gold Star Nursery and Sod Farm
Governor's Woods
Grappone Park
Great Bay National Wildlife Refuge
Hannah Dustin Historical Site
Heights Park
Hildreth-Agric. Pres. Rest.
Hirst/Brockway Marsh Wildlife Area
Hitchcock Clinic
Hough*
Jones*
Kimball Park
F., D., R., Kimball*
Kimball Playground
Kimball School Field
Lagace Beach
Lamontagne Wildlife Management Area
Laundry Field
Lebo Easement
Linden Conservation Area
Little League Field
Mckee Square
M.G. & T. Meeh*
Memorial Field
Memorial Junior High School Field
Manchester-Portsmouth RR Bed
Menard Conservation Easement
Merrimack River
Merrimack River State Forest
Mill Road
Mojalaki Country Club
Moore Park
North State Street Common
Northfield Park
Northfield School Field
Oak Hill
Odell Park
Old Chester Turnpike
Old RR Grade
Olsen/Villnave*
Outdoor Education Area
Pawtuckaway State Park
Pembroke Academy Field
Pembroke Park Historic Site
Pendleton Conservation Easement
Pines Community Center
Quimby*
Ragged Mountain Fish and Game Club
Randall Property
Reed Playground
Richards Community Forest
River Land Conservation Area
Rolfe Park
Rollins Park
Rosenfield/Mallette Easement
Ross Martin Park
Route 106 Race Park
Rumford School Field
Rundlett Jr High School Field
Russel-Shea State Forest
Sanborn-Agric. Pres. Rest.
Sanel Park
Scenic Easement
Scripture Conservation Easement
Schuett Conservation Area
Sewells Falls
Soucook River
Spaulding Youth Center Field
Spear Conservation Easement
SPNHF (Blood) Conservation Easement
Spofford Farm*
St Johns Regional School Field
St Pauls School Athletic Field
State Forest Nursery
Stone Park
Suncook River
Sunnycrest Farm Inc*
Townsend Training Farm
Turtle Pond
Turtle Pond Village
Upton-Morgan State Forest
Veterans Memorial Recreation Area
Turtle Pond Water Sports Area
Wal-Mart Stores, Inc.
Walker School Park
Webster Lake Wildlife Mgmt. Area
Webster Park
Weir Road Trail
Wells Town Forest
West Iron Works Road State Forest
West Stree Playlot

Wetlands Reserve Program
White Farm Site Natural Area
White Farm State Forest
White Park
Whittemore Town Forest
Wildlife Management Area
Wilson*
Woody Glen Ski Area
Unnamed Recreation Areas
Unnamed Trails

* Indicates uncertain classification of resource type due to data limitations. These areas could be recreational areas, public scenic easements, conservation easements, or park areas.

3.4.4 HEALTH AND SAFETY

Refer to **Section 3.1.4** for a general discussion of the affected environment common to all geographic sections.

3.4.4.1 Electric and Magnetic Fields

The study area of the Southern Section includes the existing PSNH transmission line. The existing 115 kV AC transmission line in the study area of the Southern Section produces a maximum of 100 mG within the existing PSNH transmission route and that field attenuates quickly with a maximum of 15 mG at the edge of the transmission route, and 1.5 mG at 300 feet (91 m) from centerline (Exponent, Inc. 2014a).

3.4.4.2 Potentially Contaminated Soils and Groundwater

Within the study area of the Southern Section, eight locations that currently or historically could have had soil or groundwater contamination are within 250 feet (76 m) of the disturbance area for Alternatives 2, 5a, 5b, 5c, 7. Alternative 3 has 10 potentially contaminated locations within 250 feet (76 m) of disturbance areas. Alternatives 4a, 4b, and 4c have over 40 sites within 250 feet (76 m) of proposed disturbance areas in the study area of the Southern Section. Alternatives 6a and 6b have over 30 sites within 250 feet (76 m) of proposed disturbance areas in the study area of the Southern Section. Detailed lists of sites are presented in the **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The former Guay's Garage, located at 601 South Main St. in Franklin, NH, is an example of a site that is located within the Project corridor of Alternatives 6a and 6b. The EPA performed a site inspection on December 20, 2010, at the request of the NHDES. The EPA concluded that an emergency cleanup was necessary to protect the public health and reduce the environmental threat because of the potential for a fire involving leaking drums that could create a plume, forcing road closures and evacuations. The site is about 800 feet (244 m) from the Merrimack River and is bordered by homes, an industrial park, and businesses. Wastes were shipped off site January 31, 2011 (EPA 2014a).

3.4.4.3 Fire Hazards and Fire Response Services

See **Section 3.1.4.4** for a discussion of fire hazards in New Hampshire. The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the Fire Departments that are located within 5 miles (8 km) of the study area of the Southern Section of the Project. Concord and surrounding towns and cities, including Allenstown, Concord, Epsom, Pembroke, and Salisbury, NH, are in the Capital Area Mutual Aid Compact. Hill, Franklin, and Northfield, NH, are part of the Lake Mutual Aid Association. Deerfield, NH, is in the Seacoast Chiefs Fire Net.

3.4.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 3.1.5** for a general discussion of the affected environment common to all geographic sections.

The study area of the Southern Section is served by a number of local roads and state routes. I-93 and US Route 3 are the main routes in the study area of the Southern Section. I-89 is another limited access divided highway providing east-west access to the west of Concord, NH. Local roads are concentrated in Concord, NH, and provide local access throughout the city. Additional state routes provide access near the Project east of Concord, NH.

Traffic volumes within the study area of the Southern Section varied, but were generally lowest north of Concord, NH, and highest near and within the city. I-93 and I-393 both had reported average daily traffic volumes of over 30,000 vehicles near Concord, NH (NHDOT 2014b).

Average daily traffic volumes for reported roadways ranged from 629 vehicles per day on Cross Country Road in Pembroke, NH, to 42,963 vehicles per day on I-93 in Concord, NH (NHDOT 2014b, NHDOT 2014d). **Table 3-3** and **Table 3-4** (refer to **Section 3.1.5**) show the approximate distance of airports to the Project; five airports and five airfields were identified within 20,000 feet (6,096 m) of the Project, including the Concord Airport.

3.4.6 LAND USE

Refer to **Section 3.1.6** for a general discussion of the affected environment common to all geographic sections.

3.4.6.1 Land Use and Land Cover

Municipalities

The Project study area of the Southern Section is bounded by the Belknap/Merrimack county boundary in the north and by the terminus of the Project at the Deerfield Substation in the south. In the Southern Section, the Project corridors intersect with ten municipalities within Merrimack and Rockingham counties. A full list of municipalities is included in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Land Use Overview

Consistent with the overall development pattern of New Hampshire, the study area of the Southern Section is the most developed portion of the study area for all geographic sections. While more developed than the Northern and Central Sections, the Southern Section is not "intensely developed" like the large metropolitan areas of Boston or New York City. Rather, the Southern Section is largely rural in character, interspersed with a few smaller cities and suburban areas. Population densities are a strong indicator of land use patterns. Merrimack County comprises about 10 percent of the of the total land area of New Hampshire (934 square miles [2,419 km^2]) and about 11 percent of the total population (146,445 residents). Rockingham County is more densely populated with about 8 percent of the of the total land area of New Hampshire (695 square miles [1,799 km^2]) and about 22 percent of the total population (395,223 residents). Merrimack County has about 157 people per square mile (61/km^2) and about 68 housing units per square mile (26/km^2). Rockingham County has about 425 people per square mile (164/km^2) and about 183 housing units per square mile (71/km^2). These population densities are indicative of the less dispersed population, particularly in Rockingham County, and of the less rural land use character found in Merrimack and Rockingham counties than in the more northern parts of the state (U.S. Census Bureau 2010a).

Merrimack County is less densely populated and generally more rural in character than Rockingham County. Merrimack County contains two small cities—Concord (population 42,695) and Franklin (population 8,477)—and 25 towns. In 2010 the center of population of New Hampshire was located in Merrimack County, in Pembroke. Concord, and greater Merrimack County, is home to a rapidly expanding high-tech, healthcare and manufacturing environment and serves as a center for health care and several insurance companies.

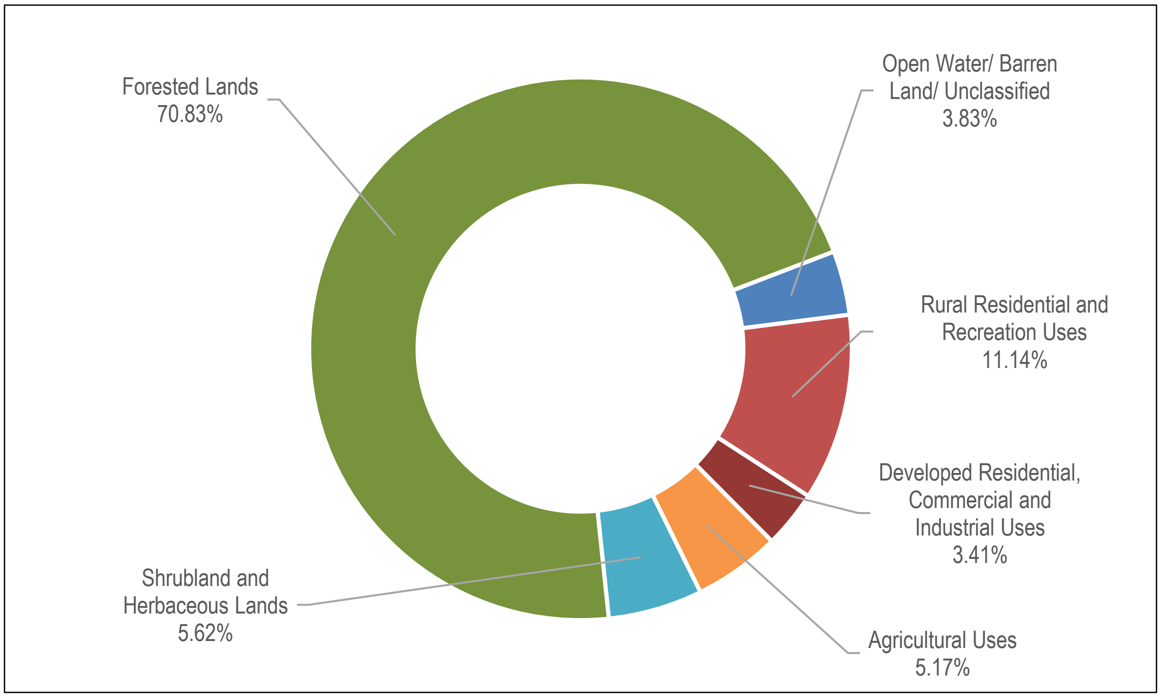
Rockingham County has a more suburban and urban development pattern than the other counties in the study area. There are 37 communities in Rockingham County—36 towns and Portsmouth. Portsmouth is the only city in the county, but the fourth-largest community. The largest towns in Rockingham County are both in the western part of the county; Derry with an approximate population of 36,500 and Salem with an approximate population of 30,000. Construction, electric, gas and sanitation services, retail trade, services, and manufacturing are important sectors of the Rockingham County economy.

Southern Section Land Cover

Overall Land Cover

The study area of the Southern Section is coterminous with Merrimack and Rockingham counties. Although more developed than the Northern and Central Sections, the Southern Section is still dominated by Forested Lands and Shrublands, making up over 76 percent of all land in the two counties. Developed uses make up more of the land in Merrimack and Rockingham counties than in Coös, Belknap, and Grafton counties, with approximately 15 percent of all land in the counties in a developed use. **Chart 3-18** illustrates the percent of land in the Southern Section by land cover type.

Chart 3-18. Land Cover in the Southern Section



Source: MRLC 2013

Project Corridor Land Cover

According to the 2011 NLCD, the Southern Section of the Project corridors for Alternatives 2, 3, 5a, 5b, 5c, and 7 is dominated by Forested Lands and Shrubland/Herbaceous Lands, making up about 84 percent of the study area for these alternatives. Although this land is recorded as containing undeveloped uses, the Project corridor for these alternatives is located entirely within the existing PSNH transmission route. Approximately 9 percent of the Project corridors for Alternatives 2, 5a, 5b, 5c, and 7 are currently in either the Developed, Open Space or Developed, Low Intensity land cover category, while approximately 10 percent of the Project corridor for Alternative 3 is in such a use. More intensely developed land cover categories account for about 2 percent of the Project corridors for Alternatives 2, 3, 5a, 5b, 5c, and 7.

Agricultural Use in the Project corridors for these alternatives is approximately 3 percent. This land cover represents the relatively remote nature of the Southern Section corridor for these alternatives.

Under Alternatives 4a, 4b, and 4c, the Project would be mostly buried within existing roadway corridors. As a result, the land cover in the Project corridors reflects the developed nature of the roadways under which it would be buried. The Project corridors of Alternatives 4a, 4b, and 4c are approximately 61 percent developed encompassing all developed land cover categories. Approximately 33 percent of the Project corridors for these alternatives is currently coded as undeveloped Forested Lands, although these forests include the highways under which the line would be buried. Less than 2 percent of each of the Project corridor for Alternatives 4a, 4b, and 4c characterized as Agricultural Lands, while undeveloped Shrubland and Herbaceous Lands constitutes another 4 percent of the corridors.

Under Alternatives 6a and 6b the Project would be located overhead in the existing PSNH transmission route. The Project corridors of Alternatives 6a and 6b are approximately 16 percent developed. Approximately 39 percent of the Project corridors for these alternatives is currently coded as Forested Lands, 4 percent is coded as Agricultural Uses, and 39 percent is coded as Shrubland and Herbaceous Lands.

Land Cover Change

The Southern Section Project corridors experienced minimal land cover change between 2001 and 2011. More than 96 percent of each Project corridor in the Southern Section remained unchanged during this ten-year period.

3.4.6.2 Conservation Lands

Table 3-50 identifies the amount of conserved land by alternative. These lands provide protection for visual resources, wildlife habitat, and wetlands and hydrologic resources, as well as providing for public recreation and public access to natural areas. There are no NFS lands in the Southern Section.

Table 3-50. Conservation Lands in the Southern Section

Alternatives	Conservation Land acres (ha)
2, 3, 5a, 5b, 5c, 7	114 (46)
4a, 4b, 4c	5 (2)
6a, 6b	29 (12)

3.4.6.3 Protected Rivers

The Lamprey River, which is a federally designated Wild and Scenic River, lies within the study area of the Southern Section. The federally designated reach is located over 7 miles (11 km) from the nearest alternative. The Merrimack River, Soucook River, and Suncook River are eligible Wild and Scenic Rivers proximate to the Project in the Southern Section.

Three State Protected rivers under the Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]) are located within the Project corridors in the Southern Section: the Lamprey River, the Merrimack River, and the Pemigewasset River.

3.4.6.4 Rights-of-Way

New and Existing Transmission Routes

All of the Project corridors of Alternatives 2, 3, 5a, 5b, 5c, and 7 would be located within the existing PSNH transmission route. Almost all of the Project corridor for Alternatives 4a, 4b, and 4c would be buried within an existing roadway corridor in the Southern Section that is not an existing transmission route. About 81 percent of Alternatives 6a and 6b would be located in the existing PSNH transmission route, with the remaining 19 percent of these Project corridors being located in existing roadway corridors (that are not currently transmission routes). **Table 3-51** shows the length of the Project corridors in new and existing transmission routes in the Southern Section.

Table 3-51. New and Existing Transmission Routes in the Southern Section

Alternatives	Miles (km) of Project Corridors in Existing Transmission Routes	Miles (km) of Project Corridors in New Transmission Routes
2, 3, 5a, 5b, 5c, 7	46 (73)	0 (0)
4a, 4b, 4c	0.4 (0.7)	41 (65)
6a, 6b	34 (54)	8 (12)

Road Crossings

Table 3-52 demonstrates the number of aerial and underground road crossings in the Southern Section.

Table 3-52. Aerial and Underground Road Crossings in the Southern Section

Alternatives	Aerial Crossings	Underground Crossings
2, 5a, 5b, 5c, 7	77	0
3	0	77
4a, 4b, 4c	0	139
6a, 6b	54	54

Public Roadway Corridors

Table 3-53 shows the length of the Project that would be buried under public roadway corridors in the Southern Section.

Table 3-53. Public Roadway Corridors where the Project would be Buried in the Southern Section

Alternatives	Miles (km) of Local Roads	Miles (km) of State Roads	Miles (km) of Interstate and US Highway	Total Miles (km)*
2, 3, 5a, 5b, 5c, 7	0 (0)	0 (0)	0 (0)	0 (0)
4a, 4b, 4c	3 (5)	7 (11)	36 (58)	41 (66)
6a, 6b	0 (0)	4 (6)	4 (6)	8 (13)

* sum of road types may not equal total due to the fact that road types may coincide with one another for certain distances.

3.4.7 NOISE

Refer to **Section 3.1.7** for a general discussion of the affected environment common to all geographic sections.

Although still heavily forested, the study area of the Southern Section is more urbanized than the study area of the Northern and Central Sections. It contains the largest city in the state, Concord, and industrial development is present along the Project corridors. Noise levels would generally be expected to be higher in more densely populated areas and in areas with greater commercial and industrial activity.

More than 20 residences would be within 50 feet (15 m) of the disturbance areas for Alternatives 2, 3, 5a, 5b, 5c, and 7 and over 300 residences would be within 50 feet (15 m) of disturbance areas of Alternatives 4a, 4b, 4c, 6a, and 6b (see **Table 3-54**).

Table 3-54. Number of Residences Within 50 feet (15 m) of a Disturbance Area in the Southern Section by Alternative

Alternative										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
50	27	325	325	325	50	50	50	335	335	50

Other than residences, no sensitive receptors would be located within 200 feet (61 m) of the disturbance areas of Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7. The Epsom Public Library is the only sensitive noise receptor within 200 feet of Alternatives 4a, 4b, and 4c. The distance is based on data that locate a facility directly adjacent to the street, while often the actual location of the facility is set back from the street.

No hospitals, libraries, schools, places of worship, campgrounds, wildlife refuges, or designated public use forests would be located within 200 feet (61 m) of the proposed Franklin Converter Station, alternate North Road Converter Station, or the Deerfield Substation. One residence would be located approximately 200 feet (61m) from the Franklin Converter Station fence line.

3.4.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 3.1.8** for a general discussion of the affected environment common to all geographic sections.

Pre-Contact Period

Time periods before Native American societies had substantial contact with Europeans.

Post-Contact Period

Time periods since significant contact between Native Americans and Europeans.

Within the study area of the Southern Section, previously identified Pre-Contact period archaeological sites located within areas characterized by lakes contain a relatively rich record for Pre-Contact period use and settlement. This area contains previously identified sites dating to all Pre-Contact cultural periods, including sites occupied repeatedly, consisting of large and small habitation sites, and specialized resources procurement sites. Pre-Contact period site distribution suggests that the Southern Section’s densest occupation was adjacent to lakes and rivers. Sites with evidence for multiple occupations within and between the various cultural periods and documentation from the Post-Contact period, during which European explorers and early settlers encountered and interacted with Native American groups, indicate that the lakes region was an area where major trails intersected, resulting in a regional center for occupation throughout the Pre-Contact period.

Similarly, the area of the Southern Section dominated by the Merrimack River Valley has a rich archaeological record for Pre-Contact settlement during all cultural periods. As one of the most prominent physiographic features in the state, including its wide variety of associated ponds, lakes, and tributaries, it was an area with rich resources that attracted and supported a substantial population base, as well as a roadway corridor between widely-differing physiographic regions. Evidence from Post-Contact period Native American sites is also present in this area, although by the 18th century, the majority of native groups has either died or moved north to Québec.

For the area of the Southern Section that is characterized by lakes, historical documentation, as well as previously identified Post-Contact archaeological sites and existing architectural resources located in this area, document that this area was settled by Euro-Americans relatively later than other sections of the analysis. Prior to the conclusion of the French and Indian War in 1763 the area, similar to the Central Section, was called the “Great Waste” by travelers, and European explorers and Euro-American trappers and settlers engaged in regular, and sometimes violent encounters with Native American groups. However, slow, but increasing settlement occurred in 1784 after the conclusion of the Revolutionary War. In general, settlement was associated with agriculture and the lumber industry, with growth centralized in areas with access to arable land and/or associated with powerful water sources.

By the later 19th century, the remote and generally unaltered natural characteristics of the Southern Section resulted in development associated with the tourism and recreation industries. In general, the pattern of settlement and economic development in this area was initially typified by a village center, surrounding farmsteads and associated small-scale industrial activity. However, as agricultural production decreased during the 19th century, populations shifted toward a more industrialized economic base. Towns with high-quality waterpower sources developed rapidly during the Industrial Revolution of the late 19th century, while those without significant water power remained largely agricultural. However, recreation and tourism became an important economic activity throughout this area, easing the impact of a declining manufacturing base in the early 20th century, and allowing rural areas to capitalize on their relative lack of industrial development.

Conversely, for the area of the Southern Section surrounding the Merrimack River Valley, historical documentation, along with Post-Contact archaeological sites and existing resources located in this, indicate that Euro-American settlement had occurred by the late 17th century, as a result of increasing colonial populations expanding inward from New Hampshire's seacoast settlement and associated maritime industry. Conflicts between Euro-Americans and Native American groups occurred from the late 17th through the mid-18th century as a result of this expansion, including various wars beginning with King Williams War (1688–1697) through the French and Indian War (1754–1763). Conflicts between Euro-American groups also occurred during this same time period, including disputes between the colonies of Massachusetts and New Hampshire for lands in the area of the Southern Section. In general, the pattern of settlement and economic development in this area was also typified by a village center, surrounding farmsteads and associated small-scale industrial activity. Post-Contact period resources tend to be located along transportation routes, water sources that powered industrial activity, and areas of exposed bedrock for quarrying, and would include evidence for farmsteads, small-scale industrial features, quarries, logging camps, and resources associated with tourism and recreation.

3.4.8.1 Archaeological Resources

The number of archaeological resources identified during the Phase 1A investigations within the direct APE for alternatives in the Southern Section are provided in **Table 3-55**.

Table 3-55. Number of Archaeological Resources within the Direct APE for Project Alternatives in the Southern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
30	30	18	18	18	30	30	30	23	23	30

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016.
Note: Includes six archaeological resources within the direct APE for the AC System Support Projects.

The number of archaeologically sensitive areas identified within the direct APE for alternatives in the Southern Section are provided in **Table 3-56**.

Table 3-56. Number of Archaeologically Sensitive Areas within the Direct APE for Project Alternatives in the Southern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
143	143	114	114	114	143	143	143	133	133	143

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016.
Note: Includes 45 archaeologically sensitive areas within the direct APE for the AC System Support Projects.

3.4.8.2 Architectural Resources

The number of architectural resources identified within the indirect APE for alternatives in the Southern Section are provided in **Table 3-57**.

Table 3-57. Number of Architectural Resources within the Indirect APE for Project Alternatives in the Southern Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
102	99	124	124	124	102	102	102	110	110	102

Source: Claesson et al. 2014b; 2015a; Higgins et al. 2015, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f; Dunham et al. 2017
Note: Includes 62 architectural resources within the indirect APE for the AC System Support Projects.

3.4.9 ENVIRONMENTAL JUSTICE

The study area for the Southern Section includes Merrimack and Rockingham counties. Both counties have a lower percentage of minority populations when compared to the state as a whole. The percentage of the population considered to be low-income (families living below the poverty level) is higher than the state average in Merrimack County, but lower than the state average in Rockingham County. Median household income in Southern Section counties was above the statewide average in Rockingham County, and lower in Merrimack County.

Table 3-58. Demographic Characteristics of the Southern Section and Comparator Regions, 2015

	Merrimack County	Rockingham County	New Hampshire	United States
Total Population	147,994	301,777	1,330,608	321,418,820
Percent White	93.4%	93.1%	91.0%	61.6
Percent Black or African American	1.4%	0.9%	1.5%	13.3%
Percent American Indian and Alaska Native	0.3%	0.2%	0.3%	1.2%
Percent Asian	1.9%	2.0%	2.6%	5.6%
Percent Native Hawaiian and Other Pacific Islander	0.0%	0.0%	0.0%	0.2%
Percent Other Race	0.2%	0.4%	0.3%	0.2%
Percent 2 or More Races	1.4%	1.4%	1.6%	2.6%
Percent Hispanic	1.9%	2.7%	3.4%	17.6%
Total Percent Minority Population	*7.1%*	*7.6%*	*9.7%*	*40.7%*
Percent Families below Poverty Level	6.1%	3.5%	5.6%	11.3%
Median Household Income	$65,983	$81,198	$66,779	$53,889

Source: U.S. Census Bureau 2017c,d

3.4.10 AIR QUALITY

Refer to **Section 3.1.10** for a general discussion of the affected environment common to all geographic sections.

The study area for the Southern Section is defined by Merrimack and Rockingham counties. The towns of Allenstown, Pembroke, and Concord, NH, in Merrimack County and Deerfield, NH, in Rockingham County have been designated as the Central New Hampshire area for air quality management, which is in nonattainment for the 2010 SO_2 NAAQS. Therefore, a General Conformity Rule applicability assessment is necessary for the area and SO_2 exemption thresholds apply.

3.4.11 WILDLIFE

Refer to **Section 3.1.11** for a general discussion of the affected environment common to all geographic sections.

3.4.11.1 Federally- and State-listed Wildlife Species

Table 3-14 in **Section 3.1.11** presents federally- and state-listed wildlife species that are known to occur in the state, as well as an indication of which species have the potential for occurrence in the study area of the Southern Section. A total of 106 state-listed and 4 federally-listed threatened or endangered species have the potential to occur in the study area of the Southern Section (one of the federally-listed species are also listed as threatened or endangered by New Hampshire). Two of the federally-listed bat species (the Indiana bat and the northern long-eared bat) were potentially detected during field surveys in the study area of the Southern Section. Twelve state-listed species were observed during Project-specific field surveys: the brook floater, wood turtle, brown thrasher, chimney swift, Eastern towhee, field sparrow, prairie warbler, purple finch, ruffed grouse, scarlet tanager, veery, and wood thrush. Additional discussion regarding the methodology and results of the Project-specific surveys is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

In 2013 a mussel assessment was conducted that determined that 11 waterbodies that crossed the study area of the Southern Section had the potential to provide suitable habitat for mussels. No dwarf wedgemussels (endangered) were observed during the mussel assessment and no records exist for Merrimack or Rockingham counties (NHFG 2005a).

The Indiana bat and northern long-eared bat were identified as potentially occurring in the study area of the Southern Section during passive acoustic monitoring surveys conducted in July 2013, within the Alternative 2, 3, and 7 Project corridors. The 2014 mobile acoustic bat survey did not identify any federally- or state-listed bat species within the alternative Project corridors (Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b). There is no bat hibernaculum present within the Alternatives 2, 3, and 7 Project corridors or within 5 miles of the Project corridors in the Southern Section (NHB 2014).

Winter tracking surveys for the Canada lynx or American marten were not completed in the study area of the Southern Section because the desktop evaluation determined that no suitable habitat for these species was identified within the study area of the Southern Section. The Southern Section is too far south to provide suitable habitat. The presence of any lynx in the Southern Section would be limited to short durations of transient individuals migrating to more suitable habitats in the Central or Northern Sections.

3.4.11.2 General Wildlife

Aquatic Species

Aquatic habitats in the study area of the Southern Section are primarily characterized as a range of lotic systems, with streams in the northern portion characterized by cobble, gravel, and sand substrates, whereas in the southern portion of this section, substrates may be dominated by sands and organic matter with some systems containing SAV. Lentic systems crossed by the Project corridor are predominately wetlands. Aquatic habitat in the study area of the Southern Section could support fish, freshwater mussels, and other aquatic macroinvertebrates including the Eastern brook trout, which is a state species of greatest conservation need. The larger drainages contain more flow and contain suitable habitat to support fish and other aquatic species. Wetlands, waterbodies, and vernal pools in the study area provide habitat for reptiles and amphibians.

Mussel surveys conducted in the study area of the Southern Section documented presence of mussels at three of the eleven locations surveyed. Nine brook floater mussels and five eastern pearlshell mussels were found at the Soucook River crossing. At the Merrimack River crossing, five brook floater mussels and six eastern pearlshell mussels were found. At the Suncook River crossing, eastern elliptio mussels and eastern lamp mussel were found. The federally-listed dwarf wedgemussel is not present within the Southern Section. The aquatic habitats in the Southern Section of the study area are expected to support other aquatic invertebrates such as freshwater crustaceans, freshwater snails, freshwater clams, aquatic worms, and aquatic insects.

There are a number of waterbodies that support fisheries in the study area of the Southern Section including the Pemigewasset, Merrimack, Soucook, Suncook, and Lamprey rivers. The Pemigewasset River in this section is a larger, lower gradient system, compared to the study area of the Central Section crossing containing both warmwater and coldwater fisheries including brown and rainbow trout, landlocked salmon, and smallmouth bass (NHFG 2009a). The Merrimack River contains both coldwater and warmwater fisheries including brook, brown, and rainbow trout; landlocked salmon; smallmouth and largemouth bass; pickerel; brown bullhead; white perch; walleye; black crappie; bluegill; and rock bass. The Soucook River supports a coldwater fishery containing brook, brown, and rainbow trout. The Suncook River also supports a warmwater and coldwater fishery containing species such as brook, brown, and rainbow trout; largemouth bass; pickerel; brown bullhead; black crappie; and bluegill. The Lamprey River supports warmwater and coldwater fisheries including brook, brown, and rainbow trout; smallmouth and largemouth bass; pickerel; brown bullhead; black crappie; and bluegill.

Terrestrial Species

Terrestrial habitats in the study area of the Southern Section are characterized primarily by a maintained transmission route or roadway corridor. The area surrounding the Project corridors is generally forested, with numerous rural residential areas, small communities, and developed lands within Concord, NH. The existing PSNH transmission route in the study area of the Southern Section provides edge and early successional habitat which is used by many species. See **Section 3.4.12** for a discussion of vegetated cover types in the study area of the Southern Section.

Surveys for the eastern hog-nosed snake, northern black racer, Blanding's turtle, and spotted turtle were conducted at 36 locations within the study area of the Southern Section. None of the target species were observed in the study area of the Southern Section. However, American toads, green frogs, grey treefrogs, red-backed salamanders, spotted salamanders, red-spotted newts, spring peepers, northern leopard frogs, and wood frogs were recorded. However, based upon habitat present, the species targeted for surveys are expected to occur within the study area of the Southern Section.

The BBS conducted in the study area in 2013 recorded 1,115 detections of 1,289 bird individuals (82 species) across 59 breeding bird transects in the study area of the Southern Section. The three most commonly recorded species were the prairie warbler, the common yellowthroat, and the chestnut-sided warbler.

The study area of the Southern Section overlaps the geographic range of nine bat species. Detectors located in the study area of the Southern Section recorded 4,856 bat passes during the survey period and mean bat activity per detector night across all detectors was 323.7 passes per detector night. Based on the results of the acoustic monitoring survey, both cave and tree bats are expected to occur in the study area of the Southern Section during the summer season. There are no known bat hibernacula (e.g., caves or mines) present within the Project corridors or within 5 miles (8 km) of the Project corridors of any alternative in the study area of the Southern Section (NHB 2014).

3.4.11.3 Habitat Connectivity

The habitat surrounding the study area in the study area of the Southern Section is more developed than the study area of the Northern and Central Sections, and includes the vicinity of Concord, NH.

The percent resistance (habitat connectivity) was calculated for the Project corridor for each alternative. For details on this analysis, see the full **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). Throughout the study area of the Southern Section, the presence of highways (particularly I-93 and I-393) likely limits movement and incidence of some terrestrial wildlife species. In general, the study area of the Southern Section contains less undisturbed, undeveloped habitat to facilitate wildlife movement when compared with the study area of the Northern and Central Sections. In addition to roadways, the landscape of the study area of the Southern Section is relatively more developed with denser residential, commercial, and industrial development. Concord, NH, in particular, is densely developed and populated. This human presence likely limits movement of some species.

Overall, wildlife movement is relatively free near the Project corridors of Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7 in the Central Section. The Project corridors for these alternatives would be primarily located in the existing PSNH transmission route (excluding some portions of Alternatives 6a and 6b which would be located underground in roadway corridors). The existing PSNH transmission route generally facilitates wildlife movement for larger species such as deer and coyotes; however, movement of small species such as salamanders and other amphibians is likely limited by this corridor.

Wildlife movement is more limited near the Project corridors of Alternatives 4a, 4b, and 4c. These Project corridors follow roadway corridors through developed landscapes, including residential, commercial, and industrial land uses. Wildlife movement is interrupted by existing roadways and development.

The study area is located in the Atlantic migratory flyway or pathway used by migratory birds or (USFWS 2012a). The Project corridors would intersect with the Merrimack River Floodplain IBA and the Pawtuckaway Highlands IBA. The Merrimack River Floodplain IBA supports a variety of birds, including the state-listed bald eagle and osprey. The Pawtuckaway Highlands IBA provides the only breeding habitat for the cerulean warbler in New Hampshire (New Hampshire Bird Records 2009a). The Concord Airport Grasslands IBA is located near the Concord Airport, but does not intersect with the Project corridors.

3.4.12 VEGETATION

Refer to **Section 3.1.12** for a general discussion of the affected environment common to all geographic sections.

The study area for Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Southern Section is within the existing PSNH transmission route through the entire section. Vegetation species are characterized by those species in the existing PSNH transmission route, with scrub-shrub communities being a dominant type. Typical vegetation species include red maple, gray birch, eastern hayscented fern, glossy buckthorn, eastern teaberry, common juniper, western brackenfern, and lowbush blueberry. For the alternatives following roadway corridors (Alternatives 4a, 4b, 4c), the primary land cover is scrub-shrub and mowed ROW. For Alternatives 6a and 6b, the primary land cover is scrub-shrub and mowed ROW.

Other vegetative communities prevalent throughout the study area of the Southern Section were represented by species inhabiting a range of forested (deciduous, coniferous, and mixed), wetland communities (emergent marsh, scrub-shrub, and forested), mowed ROW, scrub-shrub, and a very small section of grassland. Mowed and other maintained corridors or developed areas are prevalent for alternatives located within roadway corridors.

Table 3-15 in **Section 3.1.12** presents federally- and state-listed plant species that have the potential to occur within the study area, as well as an indication of which species have the potential for occurrence in the study area of the Southern Section. One federally-listed plant species potentially occurs within the study area of the Southern Section, the small whorled pogonia, although it was not identified in Project-specific field surveys. A total of 34 state-listed plant species have the potential to occur in the study area within the study area of the Southern Section. One state-listed species was identified during Project-specific surveys in the study area of the Southern Section: the wild lupine (state threatened). Wild lupine was found in a re-introduced location (based on signage in the areas) and another portion along the existing PSNH transmission route in Concord, NH. The NHB database indicates the historic presence of three additional species in the Southern Section including the red threeawn, clasping milkweed, and licorice goldenrod,

3.4.13 WATER RESOURCES

Refer to **Section 3.1.13** for a general discussion of the affected environment common to all geographic sections.

Two aquifers underlie the study area of the Southern Section: the Lamprey/Exeter/Oyster River and the Upper Merrimack (USGS 2000a). Under the various alternatives, the study area of the Southern Section contains 21 PWS wells within 250 feet (76 m) of the study area in Merrimack and Rockingham counties. There are 15,188 acres (6,146 ha) of SWPAs within 250 feet of the study area in the Southern Section. The SWPAs are Pennichuck Water Works, Manchester Water Works, Exeter Water Department, and University of New Hampshire (UNH)/Durham Water System. In the study area of the Southern Section, there are 1,973 acres (798 ha) of WHPAs within 250 feet of the study area.

The study area of the Southern Section contains multiple rivers and streams associated with the Merrimack River and Pemigewasset River watersheds. The study area of the Southern Section includes 31 perennial streams. Large drainages contain more flow and suitable abiotic factors to support fish and other aquatic biota than small tributaries.

FEMA FIRMs were reviewed for Merrimack and Rockingham counties. In addition, in Merrimack and Rockingham counties, the study area of the Southern Section contains 361 acres (146 ha) of Zone A and Zone AE floodplains (i.e., land subject to a 1 percent chance of annual flooding) that are associated with nine different water courses.

Based on a combination of field surveys and NWI mapping, the study area of the Southern Section contains up to approximately 521 acres (211 ha) of PEM and PSS wetlands. The majority of wetlands observed during field surveys were in Concord, NH. No vernal pools were identified within the study area of the Southern Section. Vernal pools are typically associated with PEM or PSS wetlands with some vegetation overstory.

3.4.14 GEOLOGY AND SOILS

Refer to **Section 3.1.14** for a general discussion of the affected environment common to all geographic sections.

The study area of the Southern Section is within the Eastern New England Upland Physiographic Province. Slopes vary widely depending on location and topography, but in general are from 0 to 25 percent. The Project study area of the Southern Section eventually runs along the Merrimack River Valley to Concord, NH, before turning east where the terrain becomes hilly.

The bedrock geology crossed by the Project consists of a variety of metamorphosed sedimentary and igneous rocks ranging in age from Late Proterozoic to Late Devonian. The bedrock geology is predominantly Devonian granite (Concord Granite) and Late Proterozoic migmatite, and Lower Silurian pelitic schist. The Project also crosses dune sand, alluvium, and stream terrace deposits as it runs along the Merrimack River Valley.

3.5 WHITE MOUNTAIN NATIONAL FOREST SECTION

The WMNF Section contains areas within both the Northern and Central Sections. All areas discussed in this section are therefore also discussed in the Northern and Central Sections, as appropriate. The affected environment within the WMNF is discussed separately here as an aid to readers and to help the USFS, a cooperating agency, to make an informed decision in response to a special use application.

3.5.1 VISUAL RESOURCES

Refer to **Section 3.1.1** for a general discussion of the affected environment common to all geographic sections.

The study area of the WMNF Section includes the 1,304 square miles (3,377 km²) overlapping with portions of the study area of the Northern and Central Sections. It is characterized by forested mountains, with almost no built development and 1 percent farmland. The average intrinsic visual quality is "High to Very High" (an index of 4.4).

The study area for Alternatives 2, 3, and portions of 5a, 5b,5c, and 7 in the WMNF Section includes the existing PSNH transmission line. Examples of areas of scenic concern close to the existing PSNH transmission line include the ANST, Gordon Pond Trail, Reel Brook Trail, Bog Pond, and the White Mountain Trail National Scenic Byway. Neither the existing PSNH transmission route, within which Alternatives 2 and 3 would be located, nor the Project corridor for any other alternative crosses through designated Wilderness areas or inventoried roadless areas.

3.5.1.1 Landscape Assessment

The existing PSNH transmission line currently has visual effects within the study area of the WMNF Section for Alternatives 2, 3, and portions of 5a, 5b,5c, and 7. Within the existing PSNH transmission line's viewshed is about 6 square miles (16 km²), or 1 percent of the total land area within 10 miles (16 km) on both sides of the centerline. The visual magnitude for about one-third (2.1 square miles [5.4 km²]) of the viewshed is "None," or sufficiently small that the PSNH transmission line is likely to go unnoticed by a casual observer. For approximately 0.8 square mile (2.1 km²) of the viewshed, the visual magnitude of the existing structures is "High or Very High." The average visual magnitude is "Low to Very Low" (an index of 1.77).

There are 2.5 square miles (6.3 km²)—or 41 percent of the viewshed—with "High or Very High" scenic impact. The average scenic impact in the WMNF Section is "Low to Moderate" (an index of 2.39). **Table 3-59** summarizes the landscape assessment affected environment in the study area of the WMNF Section.

Table 3-59. Summary of the Landscape Assessment Affected Environment – WMNF Section

Indicator	Value
Average Intrinsic Visual Quality *(The landscape's inherent potential for attractiveness)*	**4.44** — None (0), Very Low (1), Low (2), Moderate (3), High (4), Very High (5)
Viewshed of Existing PSNH Transmission Line	6 square miles (16 km^2)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**1.77** — None (0), Very Low (1), Low (2), Moderate (3), High (4), Very High (5)
Land Area of High or Very High Scenic Impact	2.5 square miles (6.3 km^2)
Average Scenic Impact	**2.39** — None (0), Very Low (1), Low (2), Moderate (3), High (4), Very High (5)

3.5.1.2 Roads-Based Analysis

The existing PSNH transmission line is an important feature of the affected environment in the study area of Alternatives 2, 3, and portions of 5a, 5b,5c, and 7 in the WMNF Section. Along its route, there are four publicly-accessible road crossings. In addition, there are 4 miles (6.4 km) of roads with visibility of the existing PSNH transmission line, or 8 percent of the length of roads within 1.5 miles (2 km) of the existing PSNH transmission route in the study area of the WMNF Section.

The visual magnitude for 1 mile (2 km) of the roads in the viewshed is "None," or sufficiently small as to likely go unnoticed by a casual observer. For 0.23 mile (0.6 km) of the roads within the viewshed, the visual magnitude of the existing structures is "High or Very High." The average visual magnitude rating is "Very Low to Low" (an index of 1.62).

There are 0.4 mile (0.6 km) of designated scenic roads within the existing PSNH transmission line's viewshed. It is estimated that the vehicle exposure on the River Heritage Tour is approximately 15 hours per day, and 1 hour per day on the White Mountain Trail Scenic Byway. **Table 3-60** summarizes the roads-based analysis affected environment in the study area of the WMNF Section.

Table 3-60. Summary of the Roads-Based Analysis Affected Environment – WMNF Section

Indicator	Value
Miles of Roads in Existing PSNH Transmission Line Viewshed	4 miles (6 km)
Average Visual Magnitude *(Presence of closer objects in the visual field)*	**1.62** — None (0), Very Low (1), Low (2), Moderate (3), High (4), Very High (5)
Miles of Designated Scenic Roads in Viewshed	0.4 mile (0.6 km)
Vehicle Exposure on Scenic Roads	16 hours per day

3.5.1.3 Viewpoint Assessment

As mentioned above, 22 simulation viewpoints were selected as KOPs to represent a range of existing and proposed visual conditions, and are included as **Appendix E**. Six of these KOPs are within the study area of the WMNF Section:

- KOP EA-3 is a view looking southeast along the existing PSNH transmission route as it crosses Easton Valley Road, which is part of the River Heritage Tour (NH Route 116 in Easton, NH). The terrain is relatively flat and the corridor is cleared to a forested edge. The existing visual character is of "Common" quality without any special scenic character. However, as a designated scenic resource, it has special scenic concern even though the visual exposure from vehicles is minor. The existing contrast-dominance rating is "Strong" (32).
- KOP FR-2 is a winter vista from the top of Mount Lafayette, on the ANST in Franconia, NH. The existing visual character is of "High to Very High" quality. The peak is regularly visited throughout the year, and as part of the ANST has special scenic concern. The existing contrast-dominance rating is "Negligible" (7).
- KOP LI-2 is a view of forested mountains from the White Mountain Trail National Scenic Byway (I-93 northbound in Lincoln, NH). While not in the WMNF, the existing PSNH transmission route is clearly visible as a notch on a ridgeline in the WMNF, about 2 miles (5 km) distant. The existing visual character is of "Common" quality, without any special scenic character compared to nearby areas. However, as a designated scenic resource with year-round visitation, it has special scenic concern, and visual exposure from vehicles is substantial. The existing contrast-dominance rating is "Weak" (10).
- KOP LI-4 is located on the ANST at the crossing with the existing PSNH transmission line. The existing transmission structures loom over this viewpoint, making it impossible for the full visual effect to be captured with a single photograph. Despite the visual impact of the existing PSNH transmission line, the visual character of the landscape is of "Moderate to High" quality. The ANST has special scenic concern. The existing contrast-dominance rating is "Severe" (36).
- KOP LI-5 is a vista located near the top of South Kinsman Mountain on the ANST looking down into the Bog Pond area. The existing PSNH transmission route is visible across most of the photograph. The existing visual character is of "Very High" quality. The ANST has special scenic concern. The existing contrast-dominance rating is "Moderate" (25).
- KOP WD-4 is a fall view from the Gordon Pond Trail looking down the existing PSNH transmission route. The cleared corridor is vegetated with low wood plants to a forest edge. Despite the visual impact of the existing PSNH transmission line, the visual character of the landscape is of "Moderate to High" quality. The existing contrast-dominance rating is "Strong" (28).

3.5.1.4 WMNF Scenery Management

The WMNF Forest Plan designates Scenic Integrity Objectives (SIOs) that establish the acceptable visual character of management actions. Portions of the Project corridors are under easements that may affect whether the SIOs apply to activities needed for the transmission of electricity. However, the visual effects are evaluated without reference to the easement conditions. In the study area, SIOs range from "Low" to "High-Very High."

The existing PSNH transmission route currently crosses the ANST between MP 90 and 100, near the Eliza Brook Shelter. The existing PSNH transmission line structures are wooden H-frames that received a contrast-dominance rating that is borderline "Severe" (an index of 36).

The Forest Plan establishes Management Area (MA) 8.3 around the ANST corridor and includes a Scenery Management Standard (S-2) that all activities must meet a SIO of "Very High" (Unaltered) or "High"

(Appears Unaltered). The existing PSNH transmission line does not meet either of these SIOs at the current ANST crossing as determined by the USFS and WMNF Forest Plan. However, the existing PSNH transmission line was constructed in 1948, prior to the creation of the Forest Plan and, in some places, prior to the land being part of the WMNF, so S-2 does not apply to the existing transmission route. Standards and guidelines within MA 8.3 call for impacts to the ANST to be mitigated to protect trail values, including co-location within existing transmission routes and limiting utility lines to a single crossing (USDA Forest Service 2005a).[50]

The existing PSNH transmission line is also visible from other locations on the ANST. Scenery Management Standard (S-1) for MA 8.3 Appalachian Trail states:

> *The AT is a Concern Level 1 Travelway, and middleground and background areas on National Forest lands seen from the AT must be managed for scenery in accordance with Scenic Integrity Objectives identified through the Scenery Management System.*

This SIO applies to the view of the existing PSNH transmission line from South Kinsman Mountain as it passes through Bog Pond at a distance of approximately 2 miles (5 km). The contrast-dominance rating in this location is borderline "Moderate" (an index of 24). This is also incompatible with the "High" (Appears Unaltered) SIO for the Bog Pond area (MA 6.3).

3.5.2 SOCIOECONOMICS

Refer to **Section 3.1.2** for a general discussion of the affected environment common to all geographic sections.

3.5.2.1 Population

The study area of the WMNF Section is contained within portions of both the study area of the Northern and Central Sections. Data regarding population in the WMNF Section are unavailable; therefore, see the Northern and Central Sections for descriptions of population characteristics (**Sections 3.2.2.1** and **3.3.2.1**, respectively).

3.5.2.2 Employment

The study area of the WMNF Section is contained within portions of both the study area of the Northern and Central Sections. Data regarding employment in the WMNF are unavailable; therefore, see the Northern and Central Sections for descriptions of employment characteristics (**Sections 3.2.2.2** and **3.3.2.2**, respectively).

3.5.2.3 Taxes

A description of statewide tax revenue and rates is provided in **Section 3.1.2.3**.

3.5.2.4 Tourism

The affected environment for tourism is discussed in **Section 3.1.2.4**.

[50] The existing PSNH transmission line would not meet existing SIO levels because a "Very High" scenic integrity refers to landscapes where the valued landscape character "is" intact with only minute if any deviations and a "High" scenic integrity refers to landscapes where the valued landscape "appears" intact; deviations may be present but must repeat the form, line, color, texture and pattern common to the landscape character so completely and at such scale that they are not evident (USDA Forest Service 1995a).

3.5.2.5 Electricity System Infrastructure

A description of region-wide electricity rates, retail prices, and generation is provided in **Section 3.1.2.5**.

3.5.3 RECREATION

Refer to **Section 3.1.3** for a general discussion of the affected environment common to all geographic sections.

The WMNF provides users with a variety of recreation experiences. Activities include hiking, dispersed and developed camping, backpacking, climbing, interpretation/wildlife viewing, photography, skiing (downhill and cross country), snowshoeing, and other activities that rely on a natural forested landscape. The WMNF offers a range of recreation experiences, from primitive areas to those that are highly modified but still exhibit characteristics of the natural landscape.

Generally, visitors to the WMNF expect a recreation experience characterized by scenery, opportunities for solitude, remoteness, and a natural-appearing landscape. Although modifications to the natural environment, such as roads, buildings, and the existing PSNH transmission route, are the exception to the norm in most areas of the WMNF, they still affect the recreation experience in the study area of the WMNF Section. Roads and buildings exist in certain locations within the WMNF. The level of impact from these facilities is related to the overall level of development in the area and the distance from the recreational resource to the facilities. Because the level of development in the study area of the WMNF Section is low, the impact of these facilities is high for recreational resources that are proximate to them.

The existing PSNH transmission route traverses the WMNF through Grafton County, west of Lincoln, NH, and Franconia Notch. Visual impacts occur to 3,002 acres (1,215 ha) within recreational sites with spatial area and approximately 12 miles (19 km) of trails.

The existing PSNH transmission line can currently be seen from approximately 3 miles of the ANST, and crosses it between mileposts 90 and 100, near the Eliza Brook Shelter. Within the WMNF, the recreation experience on the ANST varies, but is typically characterized by remoteness, opportunities for solitude and challenge, and few modifications to the natural environment. The existing PSNH transmission line towers are wooden and relatively small, but do affect the current experience on the trail because they are a human modification to the natural environment. Several roads also cross the ANST in the WMNF. I-93 crosses the ANST in Franconia Notch, and NH Route 116 crosses the ANST in Kinsman Notch. These road crossings also affect the experience along the ANST because they are a human modification to the natural environment.

The Forest Plan establishes MA 8.3 around the ANST corridor. This MA maintains the ANST experience, limiting the intensity of uses that may occur along the trail. Standards and guidelines within MA 8.3 prohibit new utility lines or ROWs "unless they represent the only feasible and prudent alternative to meet an overriding public need," and call for impacts to the ANST to be mitigated to protect trail values, including co-location within existing ROWs and limiting utility lines to a single crossing (USDA Forest Service 2005a).

The Forest Plan also identifies several relevant goals and objectives related to administration of the recreation program Forest-wide, including those relating to the Recreation Opportunity Spectrum (ROS). ROS characterizes land within the WMNF according to the setting and experience it offers. Forest Plan goals and objectives determine how the WMNF manages recreation on lands within its jurisdiction. Goals support providing a range of recreation opportunities and experiences, minimizing increased development levels in the backcountry and inconsistencies with ROS objectives, and protecting unmodified and undeveloped areas (USDA Forest Service 2005a).

Within the WMNF Section, the Project study area for all alternatives for short-term impacts includes 2 recreational rivers and 9 recreational trails, while the Project study area for all alternatives for long-term visual impacts includes 36 recreational trails, including the ANST. The affected environment includes each of the six ROS zones. The following recreational resources are located within the affected environment of the study area of the WMNF Section.

Ammonoosuc River
Badger Ski Trail
Beaver Brook Trail (ANST)
Benton Trail (ANST)
Berry Farm Snowmobile Trail
Bickford Ski Trail
Bog Pond Connector Snowmobile Trail
Cooley Hill Snowmobile Trail
Elbow Pond Snowmobile Trail
Falling Waters Trail
Flume Slide Trail
Franconia Notch State Park
Franconia Ridge Trail (ANST)
Franconia Snowmobile Trail
Garfield Ridge Trail (ANST)
Garfield Trail
Gordon Pond Snowmobile Trail
Gordon Pond Trail
Greenleaf Trail
Haystack Connector Snowmobile Trail
Hi-cannon Trail
Hubbard Brook Snowmobile Trail
Jericho Rd Trail
Kilkenny Snowmobile Trail
Kinsman Ridge Trail (ANST)
Liberty Spring Trail (ANST)
Little East Pond Trail
Lonesome Lake Trail
Loon Lake Snowmobile Trail
Lost River
Mount Moosilauke
Mt Kinsman Trail
Osseo Trail
Owls Head Trail
Pemigewasset River
Powerline Snowmobile Trail
Profile Recreational Trail
Reel Brook Trail
Rocky Pond Snowmobile Trail
Russell Pond
Russell Pond Snowmobile Trail
Skookumchuck Trail
Twenty-Five Dollar Snowmobile Trail
Welch Dickey Loop Trail
Wild Ammonoosuc River
Unnamed Trails

3.5.4 HEALTH AND SAFETY

Refer to **Section 3.1.4** for a general discussion of the affected environment common to all geographic sections.

3.5.4.1 Electric and Magnetic Fields

The PSNH transmission line is the only transmission line within the study area of the WMNF Section. The existing 115 kV AC transmission line in the study area of the WMNF Section produces a maximum of 98 mG within the existing PSNH transmission route and that field attenuates quickly with a maximum of 15 mG at the edge of the transmission route, and 1.0 mG at 300 feet (91 m) from centerline (Exponent, Inc. 2014a).

3.5.4.2 Potentially Contaminated Soils and Groundwater

No known locations that currently or historically could have had soil or groundwater contamination are within 250 feet (76 m) of the any of the disturbance areas for Alternatives 2, 3, and 4a. Disturbance areas of Alternatives 4b, 4c, 5b, 5c, 6b, and 7 would be within as little as 3 feet (1 m) of a historic automobile station located at 770 Lost River Road in North Woodstock, NH. Old transmission line poles currently on the ground in the existing transmission route are planned for removal by PSNH and some have already been removed. Although no contamination is known to be associated with this location, historic gas stations could have had leaking underground storage tanks and, therefore, residual soil contamination.

3.5.4.3 Fire Hazards and Fire Response Services

See **Section 3.1.4.4** for a discussion of fire hazards in New Hampshire. The **Health and Safety Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) lists the Fire Departments that are located within 5 miles (8 km) of the study area of the WMNF Section of the Project. The USFS has two Type 6 fire engines with 300-gallon water storage capability, two Type 7 fire engines with 100-gallon water storage capability, and a 4- to 20-person hand crew. The USFS firefighting efforts can be supplemented by air support, if necessary. Peak fire season is in the spring and fall (Marshall 2014a). The USFS has an umbrella agreement with the State of New Hampshire to respond to fires if they are ordered to do so by the state; however, if the WMNF is threatened they are able to respond without authorization from the state (Marshall 2014a).

3.5.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 3.1.5** for a general discussion of the affected environment common to all geographic sections.

The study area of the WMNF Section is served by few roadways. I-93 and US Route 3 are the main routes in the study area of the WMNF Section, and additional access is provided by NH Route 112 and NH Route 116 west of I-93. Few other roadways are in the study area outside towns located along I-93.

Average daily traffic volumes for reported roadways ranged from 220 vehicles per day on NH Route 141 in Franconia, NH, to 11,000 vehicles per day on I-93 in Woodstock, NH (NHDOT 2014b, NHDOT 2014c). **Table 3-3** and **Table 3-4** (in **Section 3.1.5**) show the approximate distance of airports and airfields to the Project; Bradley Field was identified within 20,000 feet (6,096 m) of Alternatives 2 and 5b.

3.5.6 LAND USE

Refer to **Section 3.1.6** for a general discussion of the affected environment common to all geographic sections.

3.5.6.1 Land Use and Land Cover

Municipalities

The study area of the WMNF Section is bounded by the borders of the WMNF. The study area of the WMNF Section overlaps with portions of the Northern and Central Sections, but the Project corridors on NFS lands are discussed separately in this section. A full list of municipalities is included in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Land Use Overview

Each national forest in the U.S. is governed by a land and resource management plan in accordance with the National Forest Management Act (NFMA). These plans outline management direction, including desired future conditions, suitable uses, monitoring requirements, goals and objectives, and standards and guidelines. Monitoring of conditions on a national forest ensures projects are done in accordance with plan direction and determines effects that might require a change in management direction. The NFMA and its implementing regulations specifies a detailed planning process and institutes numerous planning requirements, including public participation and periodic revision of land and resource management plans, which are intended to achieve multiple-use and sustained-yield of the national forests. Like traditional land use plans for communities, land and resource management plans create a vision for the future of the forest and set goals and objectives designed to achieve that vision. NFS lands are divided into distinct management areas that provide direction for various land uses, akin to zoning in traditional community plans. The Project study area includes management areas 2.1 General Forest Management, 6.1 Semi-Primitive Recreation, 6.2 Semi-Primitive Non-Motorized Recreation, 8.3 Appalachian National Scenic Trail.

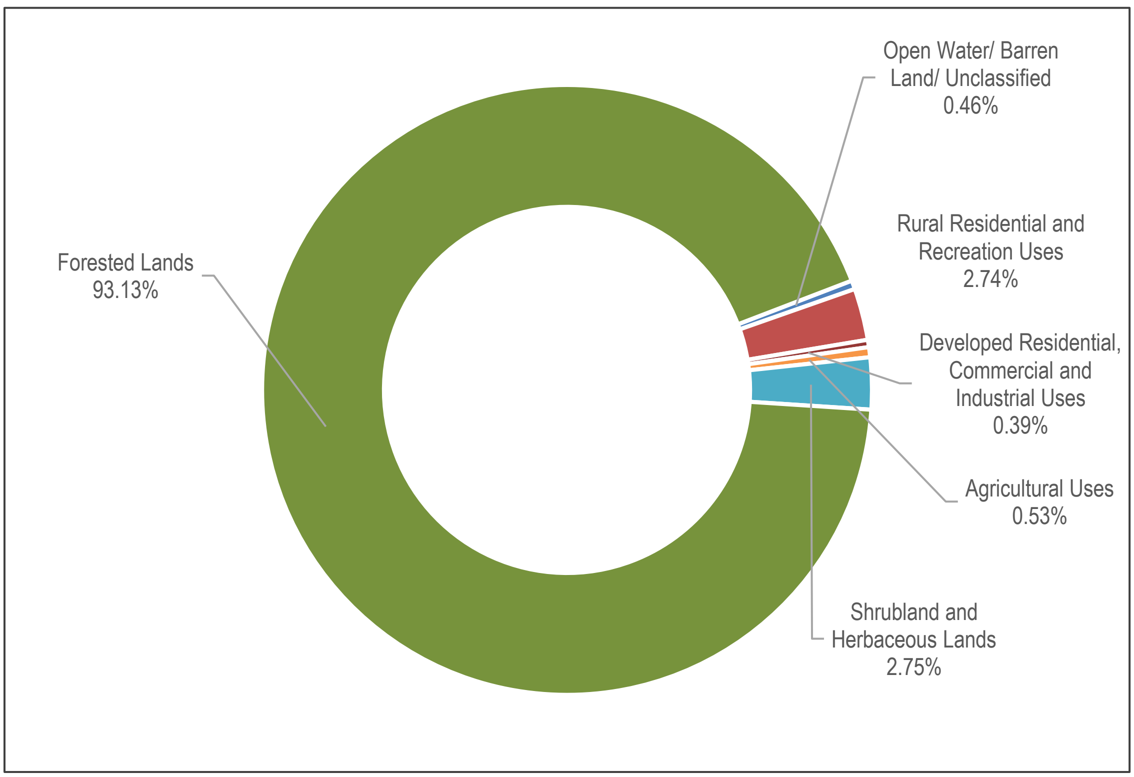
The Forest Plan is the current land and resource management planning document that guides uses and management on the WMNF. The Forest Plan sets forest-wide goals in the following areas: accessibility, air quality, alpine ski areas, conservation education, geologic and mineral resources, heritage resources, lands, Native American relationships, non-native invasive species, rare and unique features, recreation, riparian and aquatic habitats, scenery management, soil resources, transportation system, vegetation management, water resources, wild and scenic rivers, wildland fire, wildlife, and wilderness. The Forest Plan also identifies the eligible Wild and Scenic Rivers in the WMNF. The eligible rivers identified in the Forest Plan were combined with the national NRI dataset when considering Wild and Scenic Rivers in this analysis. Along with the Forest Plan, the USFS completed the White Mountain National Forest Final Environmental Impact Statement for the Proposed Land and Resource Management Plan to analyze management alternatives. Appendix C of the Forest Plan EIS includes evaluations of the IRAs identified on the WMNF during the most recent Forest Plan revision.

WMNF Section Land Cover

Overall Land Cover

Overall land cover values presented here include the land cover of the six municipalities with which the Project corridors intersect, but not all municipalities within the WMNF boundary. As might be expected, the WMNF Section is dominated by Forested Lands and Shrublands, making up approximately 96 percent of all land in the WMNF Section. All developed uses make up less than 4 percent of the land area, and Developed Residential, Commercial and Industrial Uses make up about 0.4 percent of the area in WMNF Section. **Chart 3-19** illustrates the percent of land in the WMNF Section by land cover type.

Chart 3-19. Land Cover in the WMNF Section



Source: MRLC 2013

Project Corridor Land Cover

According to the 2011 NLCD, the WMNF Section of the Project corridors for Alternatives 2 and 3 are completely dominated by Forested Lands and Shrubland/Herbaceous Lands, making up over 99 percent of the study area for these alternatives. Although this land is recorded as containing undeveloped uses, the Project corridor for these alternatives is located entirely within the existing PSNH transmission route. Conversely, Alternatives 4a, 4b, 4c, 6a, and 6b, which would be buried under roadway corridors for most of the WMNF Section, are dominated by developed land uses, making up between 82 and 92 percent of the corridors of these underground alternatives in the WMNF Section. This land use reflects the developed nature of the roadway under which the transmission line would be buried. Under Alternatives 5a, 5b, and 5c the Project would be buried within existing roadway corridors for a portion of the WMNF Section, and with the existing PSNH transmission route for the remainder of the WMNF Section. The Project corridors of Alternatives 5a, 5b, 5c, and 7 include a mix of developed and undeveloped land uses in the WMNF Section. The Alternative 5a Project corridor includes about 84 percent Forest and Shrublands and 16 percent developed uses, the Alternative 5b Project corridor includes about 69 percent Forest and Shrublands and 31 percent developed uses, the Alternative 5c Project corridor includes about 36 percent Forest and Shrublands and 64 percent developed uses, and the Alternative 7 corridor includes about 31 percent Forest and Shrublands and 69 percent developed uses. There is minimal (less than 0.5 percent) Open Water in the Project corridors for the WMNF Section and no Agricultural Uses or Barren Land.

Land Cover Change

The WMNF Section Project corridors experienced minimal land cover change between 2001 and 2011. More than 91 percent of each Project corridor in the WMNF Section remained unchanged during this ten-year period.

3.5.6.2 Conservation Lands

The study area of the WMNF Section of the Project is bounded by the borders of the WMNF and includes all of the Project corridors within the forest. As the study area of the WMNF Section includes only those Project corridors in the WMNF, this section is comprised of all conservation lands. It is important to note that the existing PSNH transmission route and roads through the WMNF are on existing easements or SUPs. NFS lands are protected with fee ownership by the federal government and managed by the USFS. No conservation lands other than NFS lands are located within this section. As the WMNF Section overlaps with portions of the Northern and Central Sections, the Project acres of NFS lands are discussed in this section as well as the discussion of the Northern and Central Sections. The acres within the WMNF of the Project corridor for each alternative is presented in **Table 3-61**.

Table 3-61. Conservation Lands Within WMNF Section

Alternatives	Project Corridor acres (ha)
2	181 (73)
3	181 (73)
4a	9 (4)
4b	30 (12)
4c	22 (9)
5a	21 (8)
5b	65 (26)
5c	56 (23)
6a	9 (4)
6b	30 (12)
7	68 (28)

3.5.6.3 Protected Rivers

Wildcat Book, which is a federally designated Wild and Scenic River, lies within the WMNF, but this river is located over 15 miles (24 km) from the nearest alternative. The Wild Ammonoosuc River and Pemigewasset River are eligible Wild and Scenic Rivers proximate to the Project in the WMNF Section. Alternatives 4b, 4c, 5b, 5c, 6b, and 7 would cross the Wild Ammonoosuc River. Alternatives 4a, 4b, 5a, 6a, and 6b would cross the Pemigewasset River in one location, while Alternatives 4a and 5a would pass within approximately 1,000 feet of the Pemigewasset River in another location.

There are no State-protected rivers under the Rivers Management and Protection Act of 1988 (N.H. Rev. Stat. Ann. § 483 [RSA 483]) located within the Project corridors in the WMNF Section.

3.5.6.4 Rights-of-Way

New and Existing Transmission Routes

All of the Project corridors of Alternatives 2 and 3 would be located within the existing PSNH transmission route in the WMNF Section. The majority of the Project corridors of Alternatives 5a, 5b, 5c, and 7 would be located within new transmission routes in the WMNF Section, while all of Alternatives 4a, 4b, 4c, 6a, and 6b would be located within new transmission routes in the WMNF Section. The Project corridors for Alternatives 4a, 4b, 4c, 6a, 6b, and portions of 5a, 5b, and 5c in the WMNF Section would be located within an existing roadway corridor that is not an existing transmission route. **Table 3-62** shows the length of the Project corridors in new and existing transmission routes in the WMNF Section.

Table 3-62. New and Existing Transmission Routes in the WMNF Section

Alternatives	Miles (km) of Project Corridors in Existing Transmission Routes	Miles (km) of Project Corridors in New Transmission Routes
2, 3	11 (17)	0 (0)
4a	0 (0)	10 (16)
4b	0 (0)	19 (31)
4c	0 (0)	10 (16)
5a	1 (2)	2 (3)
5b	3 (4)	10 (16)
5c	1 (2)	10 (16)
6a	0 (0)	10 (16)
6b	0 (0)	19 (31)
7	1 (2)	6 (10)

Road Crossings

Table 3-63 demonstrates the number of aerial and underground road crossings in the WMNF Section.

Table 3-63. Aerial and Underground Road Crossings in the WMNF Section

Alternatives	Aerial Crossings	Underground Crossings
2	8	0
3, 4a	0	8
4b	0	16
4c	0	9
5a	1	5
5b	7	8
5c	1	9
6a	0	8
6b	0	16
7	0	9

Public Roadway Corridors

All roads in the WMNF that would be part of a Project corridor are under state, federal, or local jurisdiction and are authorized through transportation easements to NHDOT, FHWA, or local entities. As discussed in **Section 3.5.6.5**, any other use of these roadway corridors through the WMNF (including for the Project), would require a new SUP for that specific use. Existing construction access routes for the existing PSNH transmission line on the WMNF are not considered "roads" per USFS easement criteria.

3.5.6.5 Forest Plan Management Direction

All actions carried out, or authorized by the USFS, on NFS lands must comply with management direction provided in the Forest Plan. Existing transmission route easements on the WMNF held by PSNH allow PSNH to erect, repair, maintain, rebuild, operate, and patrol electric transmission lines and distribution lines. Portions of the Project that are located on land authorized by these existing easements do not require USFS authorization or an application for a SUP. Portions of the Project that would be located on land controlled through an existing transmission SUP must, however, receive a separate SUP granting USFS authorization to have new transmission lines constructed or expanded. As a result, these portions of the Project must be in compliance with the management direction provided in the Forest Plan. In addition, alternatives buried in roadway corridors would require a SUP because existing NHDOT easements only include transportation uses. Any other use or occupancy of NFS land, even when located in a road easement area, would require a new SUP for that specific use.

The Project corridors within the WMNF must be located on land authorized by a new or existing transmission easement or within a new or existing transmission SUP area (portions of the Project in an existing transportation easement would require a new authorization for this use).[51] **Table 3-64** demonstrates the Project corridor area located on existing transmission easements, transmission SUPs, and transportation easements within the WMNF for each alternative.

[51] A map showing easements and SUP areas can be found in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 3-64. Project Corridor Located on Existing Easements and SUPs Within the WMNF

Alternatives	WMNF Project Corridor Located on Transmission Easements miles (km)	WMNF Project Corridor Located on Transmission SUPs miles (km)	WMNF Project Corridor Located on Transportation Easements[a] miles (km)
2	5 (8)	6 (10)	0 (0)
3	5 (8)	6 (10)	0 (0)
4a	0 (0)	0 (0)	10 (16)
4b	0 (0)	0 (0)	19 (31)
4c	0 (0)	0 (0)	10 (16)
5a	1 (2)	0 (0)	2 (3)
5b	2 (3)	1 (2)	10 (16)
5c	1 (2)	0 (0)	10 (16)
6a	0 (0)	0 (0)	10 (16)
6b	0 (0)	0 (0)	19 (31)
7	1 (2)	0 (0)	6 (10)

[a] Existing transportation easements were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use.

Inventoried Roadless Areas

No IRAs from the Roadless Area Conservation Rule or areas identified during Forest Plan revision as having roadless characteristics directly overlap the existing PSNH transmission route. The study area for Alternative 2 is in the Mount Wolf-Gordon Pond IRA. No alternative directly overlaps with any IRA. A detailed analysis of IRAs is provided in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

3.5.7 NOISE

Refer to **Section 3.1.7** for a general discussion of the affected environment common to all geographic sections.

Development in the study area of the WMNF Section is low as the WMNF Section is dominated by Forested Lands and Shrublands and the study area is served by few roadways. Typical sound levels for land use such as this would be 40 to 50 dBA during the daytime and 35 to 45 dBA during the nighttime (see **Table 3-6**). Activities in the WMNF include hiking, dispersed and developed camping, backpacking, climbing, interpretation/wildlife viewing, photography, skiing (downhill and cross country), snowshoeing, and other activities where a low level of noise is expected. Recreation resources within the study area of the WMNF Section are described in **Section 3.5.3**.

3.5.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 3.1.8** for a general discussion of the affected environment common to all geographic sections.

Pre-Contact Period

Time periods before Native American societies had substantial contact with Europeans.

Post-Contact Period

Time periods since significant contact between Native Americans and Europeans.

Within the study area of the WMNF Section, previously identified Pre-Contact period archaeological sites provide evidence for use and settlement of the region dating to the Paleoindian, Archaic, and Woodland cultural periods. Post-Contact period sites are also present, consisting of habitation sites and specialized resource procurement sites such as quarries. Over time, Pre-Contact period sites indicate a continued, but relatively sparse, occupation of the White Mountains, suggesting that the low intensity of use of this part of the WMNF Section may be associated with the relatively harsh terrains and physiographic features of this mountainous region. Despite this low site density, Pre-Contact period site distribution suggests that mountainous areas of the WMNF Section had an occupation pattern similar to that for the Central Section associated primarily with the major watersheds in the region. Additionally, documentation from the Post-Contact period identifies a number of trails across the mountains of the WMNF Section.

Historical documentation, along with previously identified Post-Contact archaeological sites and existing architectural resources located within the White Mountains, document use and settlement of the region generally dating to the late 18th and early 19th centuries, generally later than other sections of the Project due to the elevated and rugged terrain. Post-Contact historic period development of the WMNF Section generally was associated with farming (usually sheep herding), the woolen industry, large-scale lumbering that led in part to the establishment of the WMNF, tourism, and recreation. Cultural resources reflect this development and consist of residences, farmsteads or farm complexes, lumber camps, dams, railroads, hotels, motels, and recreational facilities such as ski resorts and trails. The general pattern of Post-Contact Euro-American settlement in the WMNF Section also consisted of the development of a village center, with nearby farmsteads and associated small-scale industry, linked by roads, railroads and navigable waterways. Specific industries such as lumbering displayed a somewhat different pattern: the lumber industry was characterized by large tracts of unoccupied forest land with interspersed camps and trails facilitating movement of timber resources to milling facilities by water or rail. Unlike the Southern Section of the Project, large scale industry was not a predominant development pattern in mountainous areas of the WMNF Section.

3.5.8.1 Archaeological Resources

The number of archaeological resources identified during the Phase 1A investigations within the direct APE for alternatives in the WMNF Section are provided in **Table 3-65**.

Table 3-65. Number of Archaeological Resources within the Direct APE for Project Alternatives in the WMNF Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
0	0	3	9	6	0	4	6	3	9	16

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016

The number of archaeologically sensitive areas identified within the direct APE for alternatives in the WMNF Section are provided in **Table 3-66**.

Table 3-66. Number of Archaeologically Sensitive Areas within the Direct APE for Project Alternatives in the WMNF Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
6	6	0	4	4	0	4	4	0	4	4

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015; Claesson and Peone 2016

3.5.8.2 Architectural Resources

The number of architectural resources identified within the indirect APE for alternatives in the WMNF Section are provided in **Table 3-67**.

Table 3-67. Number of Architectural Resources within the Indirect APE for Project Alternatives in the WMNF Section

Alternatives										
2	3	4a	4b	4c	5a	5b	5c	6a	6b	7
11	4	1	4	4	1	4	4	1	4	6

Source: Claesson et al. 2014b and 2015a; Higgins et al. 2015, 2016a,b,c,d,e,f; Dunham et al. 2017
Note: Includes the ANST

3.5.9 ENVIRONMENTAL JUSTICE

The study area of the WMNF Section is contained within portions of both the study area of the Northern and Central Sections. Therefore, see the Northern and Central Sections for environmental justice characteristics of the WMNF region (**Sections 3.2.9** and **3.3.9**, respectively).

3.5.10 AIR QUALITY

Refer to **Section 3.1.10** for a general discussion of the affected environment common to all geographic sections.

The Forest Plan (USDA Forest Service 2005a) has established air quality goals to ensure that WMNF ecosystems are not adversely affected by air pollution, and USFS management activities are conducted to protect or maintain air quality. The Great Gulf Wilderness and the Presidential Range–Dry River Wilderness within the WMNF are both Class I areas protected under the Regional Haze Rule.

3.5.11 WILDLIFE

Refer to **Section 3.1.11** for a general discussion of the affected environment common to all geographic sections.

3.5.11.1 Federally- and State-listed Wildlife Species

Table 3-14 in **Section 3.1.11** presents federally- and state-listed wildlife species that are known to occur in the state, as well as an indication of which species have the potential for occurrence in the study area of the WMNF Section. A total of 65 state-listed and 3 federally-listed threatened or endangered species have the potential to occur in the study area of the WMNF Section (one of the federally-listed species is also listed as threatened or endangered by the State of New Hampshire). The federally-listed species potentially present in the study area of the WMNF Section include: Canada lynx (threatened), Indiana bat (endangered), and northern long-eared bat (threatened). No federally listed species were observed during Project-specific surveys for Canada lynx; none of the bat acoustic sampling locations were within the WMNF Section. A total of 6 state-listed species were observed during Project-specific surveys: black-billed cuckoo, chimney swift, purple finch, ruffed grouse, scarlet tanager, and veery. Additional discussion regarding the methodology and results of the Project-specific surveys is provided in the **Wildlife Technical Report** prepared for the Project (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 3-14 in **Section 3.1.11** also includes Management Indicator Species (MIS) and Regional Forester Sensitive Species (RFSS) that were considered in this analysis. USFS currently recognizes five MIS within the WMNF boundaries, representing five different habitat types. Since 1992 the USFS has collected yearly data at permanent plots in the WMNF on these MIS to evaluate the effect of forest management activities on species populations and their breeding habitat. The MIS considered in this analysis include: Blackburnian warbler, chestnut-sided warbler, magnolia warbler, ruffed grouse, and scarlet tanager.

Fifteen species are included on the WMNF RFSS list. Species included on the RFSS list must occur on USFS land or within the proclamation boundary of the WMNF and meet at least one of the following criteria: 1) are a candidate for federal listing under ESA; 2) have been delisted under ESA within the last five years; 3) have a global (G), national (N), or trinomial (T) rank of 1, 2, or 3 from the Association of Biodiversity Information; or 4) are otherwise considered "at risk" on the WMNF, with rationale documented in a Risk Evaluation (USDA Forest Service 2005a). The RFSS considered in this analysis include: American peregrine falcon, Bicknell's thrush, common loon, eastern small-footed bat, northern bog lemming, timber rattlesnake, and wood turtle. Project-specific field surveys for birds, including the Bicknell's thrush, did not detect any of these bird species. A habitat survey for the eastern small-footed bat did detect potentially suitable roosting habitat near the Kinsman Ridge Trail (ANST) crossing of the study area. No Project-specific lemming or reptile surveys were conducted in the WMNF Section.

In 2013 a mussel assessment was conducted at 34 waterbodies that crossed the Project corridor and were large enough to support mussel species. No dwarf wedgemussels (endangered) were observed during the mussel assessment. Known populations of the dwarf wedgemussel located in the Johns River and the Connecticut River are far downstream from the Project; therefore, the absence of this species in waterbody crossings at the Project was anticipated.

Winter tracking surveys were conducted in 2013/14 that focused on habitat that may support the federally-listed threatened Canada lynx or state-listed threatened American marten. Surveys were targeted along the Project corridor of Alternatives 2 and 3 within the study area of the Northern and Central Sections, including approximately 11 miles (18 km) within the WMNF. Surveys were not conducted for other alternatives or geographic sections because they do not provide habitat for these species. The winter tracking survey did not document any Canada lynx or American marten in the study area of the WMNF Section.

The USFS has mapped Canada lynx habitat within established Lynx Analysis Units (LAU) that are used to manage Canada lynx in WMNF. The study area for all alternatives corridors cross some portion of LAUs 1, 8, 10, 12, 13 within the WMNF Section, ranging from 16 acres in the Alternative 4a corridor, to 179 acres in the Alternative 2 corridor.

3.5.11.2 General Wildlife

Aquatic Species

Aquatic habitats in the study area of the WMNF Section are characterized by small streams and freshwater wetlands; there are no large river crossings. The main stream crossings in WMNF from west to east include: Reel Brook, Eliza Brook, Bog Pond, Gordon Pond Brook, Boles Brook, Mt. Moosilauke Brook, and Pike Brook. Most of these stream crossings are high gradient systems, which likely preclude any sizeable fish populations. Bog Pond is a high elevation wetland complex headwater system, which does not have suitable hydrologic connections to allow for any migration of sizeable fish runs to the system. Due to the previously mentioned stream attributes, Project-specific fish surveys were not conducted, and no documentation regarding fish populations within the systems crossed by the Project was found. The fish species of primary concern in WMNF is the Eastern brook trout, which inhabits coldwater systems. This species is sensitive to disturbance and is easily outcompeted by other species such as the introduced rainbow trout or brown trout. Any of the coldwater species have the potential to be located in the larger lotic systems crossed by the Project. Wetlands, waterbodies, and vernal pools in the study area provide habitat for reptiles and amphibians.

One of the rivers in the study area of the WMNF Section was determined to have potentially suitable water velocity and substrate conditions to support freshwater mussel populations. The Mt. Moosilauke Brook was surveyed in late August of 2013. No evidence of mussels (live, shells, or shell fragments) was found in either survey location. Mussels were found outside the WMNF in Grafton County, NH.

In addition to freshwater mussels, the pond and streams present in the study area of the WMNF Section are expected to support other aquatic invertebrates such as freshwater crustaceans, freshwater snails, freshwater clams, aquatic worms, and aquatic insects.

Terrestrial Species

Terrestrial habitats in the study area of the WMNF Section are characterized primarily by a maintained transmission route or roadway corridor. The area surrounding the Project corridors is generally forested, which provides interior forest habitat for many species of wildlife. The existing PSNH transmission route in the study area of the WMNF Section also provides edge and early successional habitat which is used by many species. See **Section 3.5.12** for a discussion of vegetated cover types in the study area of the WMNF Section.

In April and May 2014 targeted surveys for the eastern hog-nosed snake, northern black racer, Blanding's turtle, and spotted turtle were conducted at two locations within the study area of the WMNF Section. These species were not observed in the study area of the WMNF Section. However, green frogs, red-spotted newts, and wood frogs were recorded incidentally in the study area of the WMNF Section during the survey. One northern leopard frog and one wood frog were also seen incidentally in the study area of the WMNF Section during the Project-specific wetland, waterbody, and vernal pool surveys.

The BBS conducted in the study area in 2013 recorded 194 detections of 292 bird individuals (51 species) across 17 breeding bird transects in the study area of the WMNF Section. The three most commonly recorded species were the common yellowthroat, white-throated sparrow, and red-eyed vireo.

The study area of the WMNF Section overlaps the geographic range of eight bat species (USDA Forest Service 2012a). These include the big brown bat, the eastern small-footed bat, hoary bat, little brown bat, northern long-eared bat, red bat, silver-haired bat, and tri-colored bat. Acoustical surveys were conducted at 21 detector locations in July 2013 for three consecutive nights at each location in the study area of the Northern and Central Sections. No acoustical monitoring survey sites were located in the WMNF; however, the WMNF surrounds detector sites 6 to 8, which are discussed in the Central Section. USFS bat acoustic data collected annually since 2009 from driving surveys indicate high-frequency bats (eastern small-footed bat, little brown bat, and northern long-eared bat) declined 89.2 percent on the WMNF over a four-year period (USDA Forest Service 2012a). This trend is likely due to regional population declines to cave bats from white-nose syndrome. There are no known bat hibernacula (e.g., caves or mines) present within the Project corridors or within 5 miles (8 km) of the Project corridors for any of the action alternatives in the WMNF Section (NHB 2014). However, there are known bat hibernacula located in the study area outside the WMNF as discussed in the Central Section (refer to **Section 3.3.11.2**).

3.5.11.3 Habitat Connectivity

The habitat in the study area of the WMNF Section is largely undeveloped including forestlands and interior forest type habitats. The forest is managed for timber supply, maintaining a sustainable and diverse wildlife community, and supporting a range of recreational activities.

The percent resistance (habitat connectivity) was calculated for the Project corridor for each alternative. For details on this analysis, see the full **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). Throughout the study area of the WMNF Section, the presence of highways (particularly I-93) likely limits movement and incidence of some terrestrial wildlife species. In the study area of the WMNF Section, the presence of roadways could particularly affect listed species such as Canada lynx and reptiles such as Blanding's turtle and spotted turtle. While there is some rural residential development in the vicinity of the WMNF Section, the majority of the land in this section is undeveloped forestland providing interior forest habitat and facilitating wildlife movement.

Overall, wildlife movement is relatively free near the Project corridors of Alternatives 2 and 3 in the WMNF Section. The Project corridors for these alternatives would be located in the existing PSNH transmission route. The existing PSNH transmission route generally facilitates wildlife movement for larger species such as deer and coyotes; however, movement of small species such as salamanders and other amphibians is likely limited by this corridor. Vast areas of undeveloped land surrounding the Project corridors facilitate wildlife movement.

Wildlife movement is more limited near the Project corridors of Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7. These Project corridors generally follow roadway corridors through developed landscapes, including residential, commercial, and industrial land uses. Wildlife movement is interrupted by existing roadways and development in this area. Vast areas of undisturbed wildlife habitat surrounding the Project corridors would facilitate movement.

The Project would be located in the Atlantic migratory flyway or pathway used by migratory birds (USFWS 2012a). The High Elevation Spruce-Fir Forest IBA is located within the confines of the WMNF and supports peregrine falcon and Bicknell's thrush nesting and breeding habitat (New Hampshire Bird Records 2009a). This IBA intersects portions of the Alternative 2 and 3 corridors (approximately 9 acres for each alternative) within the confines of the WMNF and Central Sections.

3.5.12 VEGETATION

Refer to **Section 3.1.12** for a general discussion of the affected environment common to all geographic sections.

The study area for Alternatives 2 and 3 in the WMNF Section is within the existing PSNH transmission route through the entire section. Vegetation species are characterized by those species in the existing PSNH transmission route, with scrub-shrub communities being a dominant type. Typical vegetation species include red maple, gray birch, eastern hayscented fern, glossy buckthorn (an invasive species), western brackenfern, white meadowsweet, sugar maple, sweet birch, eastern teaberry, and jewelweed. For the alternatives following roadway corridors (Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7), the primary land cover is developed and mowed ROW.

Other vegetative communities prevalent throughout the study area of the WMNF Section were represented by species inhabiting a range of forested (deciduous, coniferous, and mixed), wetland communities (emergent marsh, scrub-shrub, and forested), mowed ROW, scrub-shrub, and a small section of grassland. Two exemplary natural community types (the medium level fen system, and the poor level fen/bog system) are located in the WMNF Section in the Bog Pond area, just east of Kinsman Ridge. In addition, the Kinsman Ridge area is within the high elevation spruce-fir system, and the Wild Ammonoosuc River is considered a high-gradient rocky riverbank system. Mowed and similarly maintained corridors are also prevalent in the study areas of alternatives utilizing roadway corridors through portions of the WMNF.

Table 3-15 in **Section 3.1.12** presents federally- and state-listed plant species that have the potential to occur within the study area, as well as an indication of which species have the potential for occurrence in the study area of the WMNF Section. A total of 51 RFSS species were considered in this analysis. One federally-listed plant species potentially occurs within the study area of the WMNF Section, the small whorled pogonia, although it was not identified in Project-specific field surveys. In addition, 74 state-listed plant species have the potential to occur in the study area of the WMNF Section. No state-listed species were observed during Project-specific surveys on the WMNF during 2013 or 2014. However, the NHB database indicates the historic presence of the Wiegand's sedge within the WMNF Section.

3.5.13 WATER RESOURCES

Refer to **Section 3.1.13** for a general discussion of the affected environment common to all geographic sections.

Several aquifers underlie the study area of the WMNF Section. These aquifers are a combination of both stratified-drift and alluvial composites.

One PWS well was identified within 250 feet (76 m) of the Project in Grafton County; seven are located in Woodstock, NH; one is located in Franconia, NH; and one is located in Bethlehem, NH. There are 76,666 acres of SWPAs within 250 feet of the study area in the WMNF Section. The SWPAs are Pennichuck Water Works, Cheshire County Complex, and Woodsville Water and Light. There are no WHPAs within the study area in the WMNF Section.

The study area of the WMNF Section includes 18 perennial rivers and streams within the Pemigewasset River, Ham Branch, and Moosilauke Brook watersheds. Large drainages contain more flow and suitable abiotic factors to support fish and other aquatic biota than small tributaries. The largest waterbodies in the study area of the WMNF Section include the Pemigewasset River, the Ham Branch (which is 12 miles [19 km] long), and the Moosilauke River (which is a tributary of the Pemigewasset River within the Merrimack River Watershed). All waters on the WMNF are designated as Outstanding Resource Waters (ORW) by USFS because of their exceptional water quality, ecological, cultural, or recreational significance.

FEMA FIRMs were reviewed for Coös and Grafton counties. In Coös County, the study area contains no floodplains within the WMNF. In Grafton County, the study area would contain up to 101 acres (41 ha) of floodplains that are associated with multiple different water courses. All land on the WMNF is captured in FEMA mapping, but a large portion is classified as "undesignated," indicating that it is not identified as a floodplain.

Based on a combination of field surveys and NWI mapping, the study area of the WMNF Section contains up to 63 acres (25 ha) of PEM and PSS wetlands. No vernal pools were identified within the study area of the WMNF Section. Vernal pools are typically associated with PEM or PSS wetlands with some vegetation overstory.

3.5.14 GEOLOGY AND SOILS

Refer to **Section 3.1.14** for a general discussion of the affected environment common to all geographic sections.

The study area of the WMNF Section is within the White Mountains Physiographic Province, which is described in **Section 3.2.14**. Slopes vary widely depending on location and topography, but in general are from 0 to 60 percent.

The bedrock geology in the study area of the WMNF Section consists of a variety of metamorphosed sedimentary and igneous rocks ranging in age from Early Silurian to Late Jurassic. The bedrock geology is predominantly Late Ordovician and Early Devonian granite and granodiorite.

CHAPTER 4
ENVIRONMENTAL IMPACTS

4 ENVIRONMENTAL IMPACTS

This chapter includes an analysis of reasonably foreseeable environmental impacts associated with the Project. The environmental consequences for visual resources, socioeconomics (including tourism), and recreation are addressed first because they were the most frequently expressed areas of concern during public scoping. Following the discussion of those resources, the final EIS addresses the environmental impacts for the human and built environment followed by the physical and biological environment.

Changes have been made to Chapter 4 between the draft and final EIS in response to comments received during the draft EIS public review period (see **Section 1.5.3**). Refer to **Appendix L**, Section 1 for a discussion of changes made to the EIS.

This chapter presents a summary of detailed information contained in Technical Resource Reports, which were prepared for each resource area evaluated. These reports were prepared by independent experts at the direction of DOE, and are available for review on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports).

> **About Chapter 4**
>
> **Appendix B** provides more information on the specific issues analyzed within this chapter. Issues analyzed within this chapter were raised during the public scoping period, as described in **Chapter 1, Section 1.5.2**.
>
> Refer to **Chapter 1, Section 1.8** for a discussion of the structure of this document, as well as the "Reader's Guide."
>
> **Chapter 2, Section 2.5** provides a summary comparison of potential environmental impacts organized by resource subject for all alternatives considered in detail and discussed in this chapter.

The Project is divided into three geographic sections: Northern, Central, and Southern. This division is based on county boundaries, as described in **Section 2.2**. In addition, the final EIS addresses potential impacts to the WMNF (which contains areas within both the Northern and Central Sections) as a separate section as an aid to readers.

This chapter provides a description of potential environmental impacts in five sections:

- **Section 4.1** presents a discussion of general environmental impacts that may occur Project-wide, or are common among all geographic sections
- **Section 4.2** describes impacts in the Northern Section
- **Section 4.3** describes impacts in the Central Section
- **Section 4.4** describes impacts in the Southern Section
- **Section 4.5** describes impacts in the WMNF Section

The potential environmental impacts are discussed for each alternative considered in detail in this analysis (see **Chapter 2 – Proposed Action and Alternatives**).

As part of this NEPA process, Northern Pass identified a number of APMs that it would undertake to reduce or avoid environmental impacts during construction and operation of the Project. The Applicant has committed to implementing the APMs for its Proposed Action (Alternative 7) as well as any other Project alternative that may be selected or approved for construction and operation, as applicable. Therefore, these measures are anticipated to be requisite elements of the Project, and have been considered in the analysis of potential environmental impacts as presented in this chapter. A listing of specific APMs considered within this final EIS is provided in **Appendix H**. As noted in this appendix, the APMs incorporate common best management practices (BMPs), and are designed to meet applicable federal, state, and local requirements, as well as to be consistent with the Forest Plan.

4.1 GENERAL ENVIRONMENTAL IMPACTS

Section 4.1 provides a description of Project-wide environmental impacts organized by resource and a discussion of the types of impacts that are common across each geographic section. Potential impacts presented in **Section 4.1** are common to all alternatives, unless otherwise specified.

All resources are analyzed at both the Project-wide and geographic section scale. The information provided varies depending on the spatial scale of the analysis. For resources with larger study areas, such as Socioeconomics, the majority of environmental consequences information is provided in **Section 4.1**. In contrast, the study area for Recreation is more specific to each geographic section; thus, more information is provided in **Sections 4.2**, **4.3**, **4.4**, and **4.5** and less information is in **Section 4.1**.

Impacts from Construction

Short-term: Impacts that would occur during construction but would stop when construction was complete (assumed duration of three years). Construction activities resulting in short-term impacts include: operation of construction equipment and ground disturbance related to installation of Project elements (structures, buried cable, roads, laydown areas, etc.).

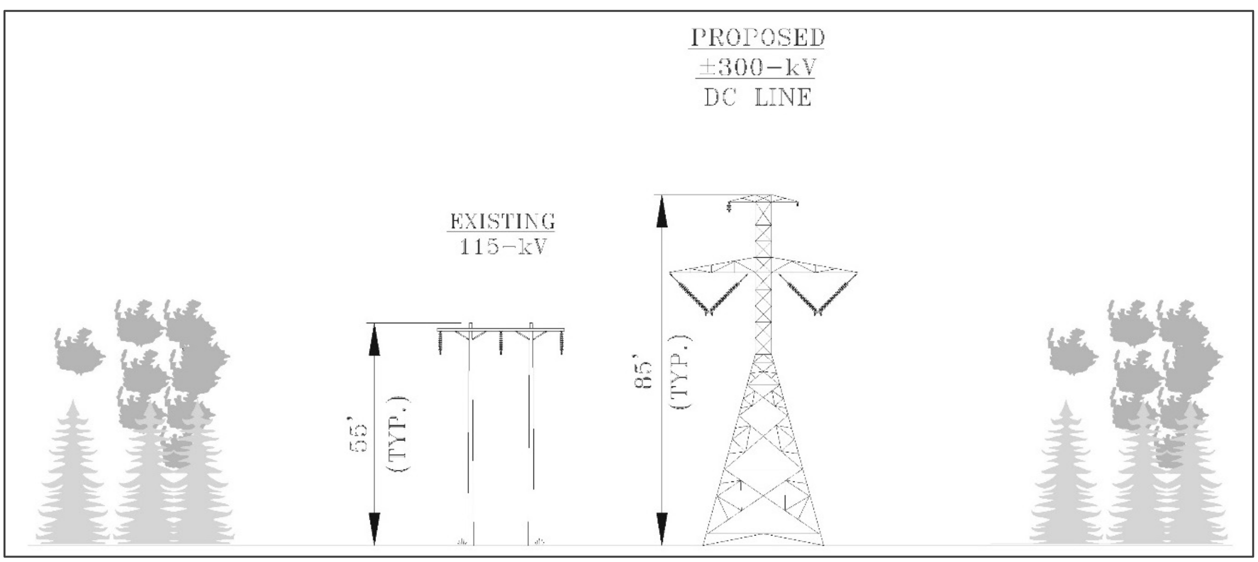
Long-term: Impacts that would occur during construction and continue for the life of the Project. Construction activities resulting in long-term impacts include: overstory vegetation removal; installation of aboveground structures and facilities; permanent roads, laydown areas; and rock blasting or drilling.

Resource impacts are discussed in terms of impacts related to construction, and impacts related to operation, maintenance, and emergency repairs. The analysis further differentiates the duration of impacts, between short-term and long-term.

4.1.1 VISUAL RESOURCES

The Project would result in short-term and long-term impacts to New Hampshire's visual resources related to construction, operation, maintenance, and emergency repairs. Existing visual impacts from the existing PSNH transmission line would continue under all alternatives. The majority of existing overhead support towers for the existing PSNH transmission line are between approximately 45 feet and 60 feet (14 m to 18 m) tall, while the majority of proposed overhead support towers would be between approximately 75 feet and 105 feet (23 m to 32 m) tall. A typical tower for the proposed line would be approximately 85 feet (26 m) tall. The difference in typical existing and proposed tower heights is shown in **Figure 4-1**. Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1**.

Figure 4-1 Typical Cross-Section View of Transmission Route



It is assumed that an observer cannot distinguish visual impacts beyond 10 miles (16 km). Therefore, based on an assumed maximum visibility distance of 10 miles (16 km), the size of the viewshed of the Project would vary under each alternative. See **Section 3.1.1** for a discussion of the viewshed and the methods of the visual impact assessment. The overall size of the viewshed under each alternative, as well as the percent increase of the viewshed associated with each alternative relative to the viewshed of the existing PSNH transmission line (which is shown under Alternative 1) is provided in **Table 4-1**.

Table 4-1. Area of Viewshed by Alternative

Alternatives	Area of Viewshed square miles (km^2)	Percent Increase Over Area of Existing PSNH Transmission Line
1 (No Action)	62 (160)	0%
2	105 (271)	69%
3	62 (160)	0%
4a	62 (160)	0%
4b	62 (160)	0%
4c	62 (160)	0%
5a	104 (270)	68%
5b	105 (271)	69%
5c	104 (270)	68%
6a	65 (168)	5%
6b	65 (168)	5%
7 (Proposed Action)	102 (264)	65%

Table 4-2 summarizes impacts to visual resources for all alternatives.

Table 4-2. Summary of Potential Impacts to Visual Resources

Alternative	Net Change in Aggregate Scenic Impact	Aggregate Scenic Impact	Net Change in Miles (km) of Road with Visibility
1 (No Action)	0	85.9	0
2	68.7	154.7	48 (77)
3	0	85.9	0.3 (0.5)
4a	0	85.9	0.2 (0.3)
4b	0	85.9	0.2 (0.3)
4c	0	85.9	0.2 (0.3)
5a	63.7	149.6	45 (72)
5b	67.5	153.4	41 (66)
5c	65.4	151.4	45 (72)
6a	4.7	90.7	6 (10)
6b	4.7	90.7	6 (10)
7 (Proposed Action)	58.4	144.3	40 (64)

Note: The net change in visual resources is measured in comparison with the existing condition, or Alternative 1, which includes the existing PSNH transmission line. The existing condition has a visual magnitude rating of 1.63 (Very Low to Low), and a scenic impact rating of 1.39 (Very Low to Low). The existing PSNH transmission line crosses 144 publicly accessible roadways as an overhead line and is visible from approximately 139 miles (224 km) of roads.
Refer to the Glossary for a definition of "scenic impact."
Aggregate scenic impact is calculated by multiplying the average scenic impact value with the total area of the viewshed in order to consider the change in viewshed area as well as the value of the scenic impact variable.

As stated in **Appendix H**, "In the final project design, Northern Pass may make additional changes in structure design to minimize impacts on historic resources and address other visual impacts in sensitive areas." This final EIS relies upon information provided by the Applicant in the further amended Presidential permit application (August 2015), as well as information gathered by DOE about other alternatives. Thus, while the final design of the Project could change during the siting process in response to numerous factors, the best available information was used to simulate the possible future visual impact of the Project.

4.1.1.1 Impacts from Construction

Transmission Route

As used within this document, "transmission route" specifically refers to the corridor of land upon which a transmission system (including line/cable and associated facilities) may be located. This term is used to refer to the land currently occupied by the existing PSNH transmission line, as well as other corridors identified in the alternatives analyzed. Land use authority for the construction and operation of the Project is, or may be, granted to the Applicant via a combination of rights which may include: fee simple ownership, long-term lease agreement, rights-of-way (granted by easement), or SUP (authorized by the USFS).

The operation of construction equipment and installation of Project elements would result in short-term, localized impacts due to the visual presence of construction activities (including equipment, personnel, etc.). In particular, the use of helicopters during construction would result in a short-term impact to visual resources. Small amounts of overstory vegetation removal (beyond that which would be maintained after construction), underground rock blasting, and ground disturbance during construction would result in long-term impacts to visual resources. These construction-related effects would impact the visual character of the area from various nearby viewpoints.

While the initial impact of overstory vegetation removal in the transmission route under all alternatives—including the new transmission route in portions of Coös County under Alternatives 2, 3, 5a, 5b, 5c, and 7—and tower installation would occur during construction, these are analyzed as operational impacts for visual resources because this condition would be maintained throughout the operation of the Project and would be perpetuated through periodic vegetation management.

4.1.1.2 Impacts from Operations, Maintenance, and Emergency Repairs

Overstory Vegetation

The upper layer of vegetation in a forest (i.e., trees).

The operation of equipment as necessary for repairs and line inspection would result in short-term, localized impacts due to the visual presence of maintenance and repair activities (including equipment, personnel, etc.). This would impact the visual character of the area from various viewpoints.

For overhead portions of the Project, overstory vegetation removal and the visibility of aboveground structures and facilities would result in long-term impacts to visual resources. The visibility of large industrial-appearing lattice structures that have high form and color contrast with existing transmission structures and the surrounding environment, along with vegetation clearing and the construction of a new transmission route contribute to this impact. Additionally, other permanent facilities, such as the converter station and transition stations, would alter the visual character of the landscape. Ongoing vegetation management throughout the operation of the Project would cause these impacts to persist.

In contrast, underground portions of the Project would have long-term visual impacts resulting from limited vegetation removal and ongoing vegetation management required for portions of underground cable, including those located in roadway corridors. Transition stations, substations, and converter stations would be the only visible aboveground facilities.

A GIS Landscape Assessment, a GIS Roads-Based Analysis, and a Viewpoint Assessment (including visual simulations) was completed for overhead portions of the Project (see **Section 3.1.1** for more information on these analyses). As underground portions of the Project would not involve substantial aboveground structures or vegetation clearing, these analyses were not completed for these areas.

A total of 73 visual simulations were produced that depict the variety of potential visual impacts of the Project. These visual simulations depict the existing condition of the landscape as well as the long-term operational impacts related to overstory vegetation removal and aboveground and underground facility installation. Twenty-two of the visual simulation locations were identified as KOPs that represent the range of impacts that would occur if the Project is constructed. The potential visual impacts for each KOP are described in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1**. Visual simulations from the KOPs are contained in **Appendix E**. All 73 visual simulations are available for review in the **Visual Impact Assessment** (i.e., the Visual Resources Technical Report), located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports).

4.1.2 SOCIOECONOMICS

This section provides a detailed discussion of impacts to socioeconomic resources that are best addressed at statewide and regional scales rather than by geographic section. Potential impacts to socioeconomic resources include those to property tax revenue, economic activity, property values, tourism, and electricity system infrastructure. Short-term impacts due to construction could affect economic activity, property values, and tourism. The short-term analysis assumes construction would begin in 2017 and last for approximately three years. Long-term impacts resulting from ongoing operation of the Project could affect property tax revenue, economic activity, property values, and electricity system infrastructure. For purposes of this analysis, the operations phase is assumed to begin in 2020 and was specifically analyzed through 2030.[52] The operation of the Project would continue well beyond 2030.[53] The operations phase would result in impacts throughout New England, as power provided by the Project would affect wholesale electricity prices both within and outside of New Hampshire.

As discussed in **Chapter 1**, this final EIS, prepared by the DOE, is also intended to provide the analysis necessary to support a USFS decision on whether to issue a SUP allowing the Proposed Action (or alternative) to cross the WMNF. To satisfy USFS requirements for its decision under NEPA, this socioeconomic section provides additional detail and analysis which may not typically be found within a DOE EIS. **Table 4-3** and **Table 4-4** summarize the socioeconomic impacts of the construction and operation of the Project under each alternative.

[52] The operations phase is analyzed through 2030 as a requirement of the modeling and forecasting tools used. Ten years is considered a reasonable and typical timeframe for this type of forecast.

[53] This evaluation, and the economic modeling conducted, assumes an operational in-service date of 2020, if approved. This date was selected for the analysis as being a reasonable assumption and is entirely independent of any other in-service dates or projections which may have been stated or published by the Applicant.

Table 4-3. Summary of Potential Impacts to Socioeconomic Resources – Construction

Alternative	Total Construction Costs ($ billion)	Economic Impacts from Construction ($ million)		Annual FTE Construction Jobs (over three years)	Reduction of Taxable Assessed Property Values ($ million)	Reduction in Annual Residential Property Tax Payments ($)
		Direct	Total			
1 (No Action)	--	--	--	--	--	--
2	$1.087	$328.5	$570.4	5,233	$11.8	$320,000
3	$2.128	$643.9	$1,116.1	10,240	--	--
4a	$2.034	$616.2	$1,070.4	9,816	--	--
4b	$2.163	$654.0	$1,134.8	10,411	--	--
4c	$2.094	$634.0	$1,101.3	10,100	--	--
5a	$1.180	$355.7	$615.9	5,655	$10.7	$290,000
5b	$1.252	$376.9	$652.3	5,991	$11.4	$310,000
5c	$1.227	$369.3	$639.1	5,869	$10.8	$290,000
6a	$1.876	$567.5	$988.4	9,062	$5.1	$140,000
6b	$2.002	$604.6	$1,051.5	9,645	$5.1	$140,000
7 (Proposed Action)	$1.410	$424.4	$734.6	6,747	$8.7	$240,000

Table 4-4. Summary of Potential Impacts to Socioeconomic Resources – Operation, Maintenance, and Emergency Repairs

Alternative	Annual Economic Impacts ($ million)		Permanent FTE Jobs	Annual Reduction in Wholesale Electricity Costs – ISO-NE ($ million)	Annual Reduction in Wholesale Electricity Costs – NH ($ million)	Increase in Statewide Property Tax Annual Collections ($ million)	Percent Increase in Net Imported Electricity*
	Direct	Total					
1 (No Action)	--	--	--	--	--	--	--
2	$45.7	$112.1	760	$32.8	$10.1	$29.8	25.5%
3	$72.3	$194.0	1,333	$23.2	$8.6	$57.9	23.1%
4a	$70.9	$189.7	1,303	$23.2	$8.6	$56.5	23.1%
4b	$73.5	$197.5	1,357	$23.2	$8.6	$59.1	23.1%
4c	$72.3	$194.1	1,334	$23.2	$8.6	$58.0	23.1%
5a	$45.7	$114.5	782	$23.2	$8.6	$31.3	23.1%
5b	$48.7	$121.3	823	$32.8	$10.1	$32.9	25.5%
5c	$46.6	$117.2	801	$23.2	$8.6	$32.2	23.1%
6a	$66.9	$177.8	1,221	$23.2	$8.6	$52.5	23.1%
6b	$69.4	$185.4	1,274	$23.2	$8.6	$55.0	23.1%
7 (Proposed Action)	$51.4	$131.5	901	$23.2	$8.6	$37.0	23.1%

*Net imported electricity includes electricity delivered by the Project as well as other lines into ISO-NE from Canada.

4.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur. The effects of implementing the No Action Alternative are the baseline for consideration of the action alternatives and therefore incorporated into the analysis for those alternatives.

4.1.2.2 Alternative 2

Property Taxes

The Project would increase the property tax base in the New Hampshire communities through which it would traverse due to the property valuation of installed components. The amount of the increase in tax base in each community would depend on assessed values of the segments of the transmission line and the various ancillary facilities, such as the converter station.[54]

The potential increase in tax base was calculated for each town in which an element of the Project would be located, based on detailed construction cost estimates developed specifically for this analysis.[55] Total construction cost estimates are approximately $1.087 billion for Alternative 2. Current property tax rates for municipal, local, county, and state jurisdictions were obtained from the NHDRA (NHDRA 2016).

Statewide property tax collections are anticipated to increase by approximately $29.8 million annually. The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For the purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project. If New Hampshire jurisdictions were to change the tax rates, then tax revenues could be different from those presented. Furthermore, this analysis assumes that assessed values within each jurisdiction would remain at these levels throughout the operating life of the Project. To the extent that any changes in the assessed values occur, tax revenues from the Project could be different.

In addition, the Project could result in a decline in assessed values (and thereby tax revenues) for properties located near the aboveground segments, due to adverse visual impacts. This issue is addressed in the Property Values section, below.

Calculations of annual tax revenues are based on estimates of total construction costs developed for the analysis of the Project, which assumes an operational in-service date of 2020, if approved. To the extent that some New Hampshire jurisdictions could levy property taxes on elements of the Project as they are completed, rather than waiting until the entire Project is operational, there could be additional revenues generated during the construction phase, assumed for purposes of analysis to occur from 2017 through 2019, if approved. Based on anticipated

> **Economic Output**
>
> **Economic Output** is the value of the goods and services produced in an economy and is also commonly referred to as "gross domestic product."

[54] The Project could have additional impacts on tax collections in New Hampshire due to potential increases in property values associated with the economic activity generated by the Project during the construction and operation phases. For example, increased business activity due to lower wholesale electricity prices could increase the value of certain commercial properties within the state. Potential increases in property tax revenues due to these secondary impacts are not calculated here.

[55] In consultation with an independent consulting transmission engineer, detailed construction cost estimates were developed for each of the Project alternatives. These estimates exclude some costs that are not directly related to specific facilities, such as overhead expenses, real estate purchases, property tax payments, and financing costs. Additional information provided in Appendix 9 of the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

construction phasing provided by Northern Pass, approximately 13 percent of costs would be incurred by the end of the first year of the construction period, 50 percent by the end of the second year, and 100 percent by the end of the third year. Using these figures, estimates of additional property tax collections during the construction phase were incorporated into the analysis of impacts on employment and economic output in New Hampshire.

Economic Activity

Impacts from Construction

Under Alternative 2, New Hampshire would experience an increase in economic activity during the construction phase of the Project due to spending by Northern Pass across a variety of sectors, including hiring new workers. This new spending within the state, including spending by out-of-state workers temporarily residing in New Hampshire as well as tax payments by Northern Pass, is termed the "direct impact" of the Project. Additional economic activity, called the "indirect impact," would be generated when Project vendors purchase other goods and services within New Hampshire. Government agencies would generate additional indirect impacts as their budgets increase due to the property tax revenues paid by the Project. Finally, there would be further economic activity generated as employees of Northern Pass and its vendors who reside within the state use their earnings to purchase local goods and services. This is known as the "induced impact."

Direct economic impacts during the construction phase were calculated based on estimates of Project construction costs and property tax payments from 2017 through 2019, as described in the Property Taxes section, above. The proportion of spending within New Hampshire was estimated to assess the fraction of total construction costs which would be expended within the state. Additional direct impacts were calculated for spending by workers based outside of New Hampshire who would be located within the state temporarily during the construction phase. Employment generated by the Project, that would remain outside of New Hampshire due to lower electricity prices throughout the ISO-NE region, could not be evaluated. Finally, direct impacts were calculated for spending by New Hampshire jurisdictions which would collect property tax payments on completed portions of the Project during the construction phase. **Table 4-5** shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be \$328.5 million under Alternative 2.[56]

Table 4-5. Direct Economic Impacts in NH during Construction ($ million) – Alternative 2

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$35.7	$99.2	$136.8	$271.6
Visiting Workers	$4.9	$11.4	$15.2	$31.5
Government	$1.5	$7.1	$16.9	$25.5
Total	**$42.0**	**$117.7**	**$168.8**	**$328.5**

[56] This analysis assumes that most of Northern Pass's expenditures on construction materials would flow to businesses outside of New Hampshire, generating economic impacts in the regions where those businesses are located. The Applicant estimates that major vendors for the Project most likely will not be located within New Hampshire. For this analysis, conservative estimates were made on the percentage of construction material expenditures that would remain in New Hampshire. For example, total construction costs for Alternative 2 are estimated to be $1.087 billion, of which approximately $815 million would be expected flow to out-of-state businesses for the procurement of supplies, equipment and materials. This analysis does not evaluate the economic impacts outside New Hampshire associated with construction of the Project.

Indirect and induced impacts of the Project associated with expenditures during the construction phase were estimated using economic modeling techniques.[57] **Table 4-6** summarizes the results for total employment and output within New Hampshire. In summary, the Project would generate $570.4 million of additional economic output within New Hampshire over a three-year period, under Alternative 2. Employment impacts during the construction phase would be about 5,233 annual full-time-equivalent (FTE) positions over the three-year construction period. These jobs would exist only during the construction phase.

Table 4-6. Total Economic Impacts in NH during Construction – Alternative 2

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	680	1,881	2,672	5,233
Output ($ million)	$70.0	$201.8	$298.7	$570.4

Impacts from Operations, Maintenance, and Emergency Repairs

The Project would generate economic activity during the operation phase throughout New England due to its impact on wholesale electricity prices. The overall economic impact of this factor is evaluated for New Hampshire residents and businesses.

Table 4-7 shows projections of the impact of Alternative 2 on wholesale electricity prices and total payments for energy for 2020 through 2026.[58] Due to the nature of the ISO-NE system, the addition of a source of electricity into a location within New Hampshire—like the Project—would have the effect of lowering the cost of wholesale power throughout the region, including New Hampshire itself.[59] It is estimated that the Project would cause a decline in wholesale costs of about 0.3 percent across ISO-NE, with a total reduction in spending for wholesale electricity of about $33 million per year across ISO-NE. The corresponding figures for New Hampshire are 1.5 percent, and $10 million per year. On a percentage basis, New Hampshire residents and businesses would be impacted by the Project in the form of reduced overall expenditures on wholesale electricity in somewhat larger proportion relative to New England as a whole.[60]

Table 4-7. Impact on ISO-NE Wholesale Electricity Prices in 2020–2026 Average

	No Action	Alternative 2	% Change from No Action
Load-Weighted Wholesale Spot Price ($/MWh)			
ISO-NE	$49.69	$49.54	-0.3%
NH	$49.27	$48.53	-1.5%
Total Wholesale Load Payments ($ million)			
ISO-NE	$7,425.6	$7,392.94	-0.4%
NH	$605.0	$594.9	-1.7%

[57] Regional Economic Models, Inc. developed the Policy Insight model, which incorporates input-output analysis and multiple statistical and theory-based components to provide estimates of regional economic impacts associated with local changes in employment or spending. See the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for a more-detailed description of the models used for this analysis.

[58] The averages for these years are presented as representative for the entire period of operation. Results for individual years show some variation, as shown in the Appendices to the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

[59] One cannot trace the specific units of power provided by each source within ISO-NE to each customer. However, the addition of a supply in a particular location would have the effect of lowering prices to every customer in the region, subject to the limited circumstances of any fully utilized transmission lines between sub-regions within ISO-NE.

[60] Across the network, and at key interfaces, transmission constraints and congestion cause some level of line loss resulting in price divergence.

The Project would generate additional economic impacts in New Hampshire due to its ongoing tax payments (see Property Taxes section above). The Project would generate economic activity within the state via direct spending on operation and maintenance activities, estimated to be approximately $5.7 million per year. Combined with the impact due to reduced spending on electricity, these elements represent the direct impact of the Project during the operation phase. **Table 4-8** shows the key data components for the analysis of direct impacts during the period 2020–2026, the first seven years of operation, as evaluated. As shown here, total direct impacts in New Hampshire are projected to be $45.7 million annually under Alternative 2.

Table 4-8. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 2

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$10.1	$5.7	$29.8	$45.7

As in the analysis of the construction phase, economic modeling was used to calculate indirect and induced impacts during the operation phase. **Table 4-9** summarizes the results for total employment and output within New Hampshire during the 2020–2026 period. Under Alternative 2, the Project would generate additional output within New Hampshire of $112.1 million annually. Employment impacts would be 760 FTE positions. Total economic impacts during operation in **Table 4-9** include direct, indirect, and induced impacts.

Table 4-9. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 2

Total FTE Jobs	Output ($ million)
760	$112.1

As described above, the Project would be expected to reduce wholesale electricity costs throughout ISO-NE. Approximately 69 percent of those reductions (measured in dollars per year rather than percent) would occur outside New Hampshire, primarily in Massachusetts, Connecticut, Rhode Island, Vermont, and Maine.[61] Those savings would generate additional economic impacts across the region. Under Alternative 2, the New England region would experience a reduction in spending for wholesale electricity of $32.8 million annually during the period 2020–2026. When combined with Northern Pass's expenditures on operation, maintenance, and property taxes, the total direct economic impacts across New England would be $68.3 million annually—approximately 1.5 times greater than the direct impacts within New Hampshire alone ($45.7 million, as shown in **Table 4-8**). The increase in employment and economic output across New England would be commensurately higher—approximately 1,140 FTE jobs and $168 million in economic output annually.[62]

Property Values

Under certain circumstances, high-voltage transmission lines constructed aboveground may have an adverse impact on the value of adjacent and nearby properties. The underlying reasons for such impacts include the potential for a perception of health hazards resulting from proximity to high-voltage transmission lines and the potential for adverse aesthetic impact due to the visibility of the transmission lines and support structures.

[61] Electricity consumption is proportionate to population. New Hampshire represents a small percentage of the total population served by ISO-NE.

[62] These estimates are based on the total economic impacts estimated for New Hampshire, multiplied by the ratio between direct impacts in New England and New Hampshire of approximately 1.5.

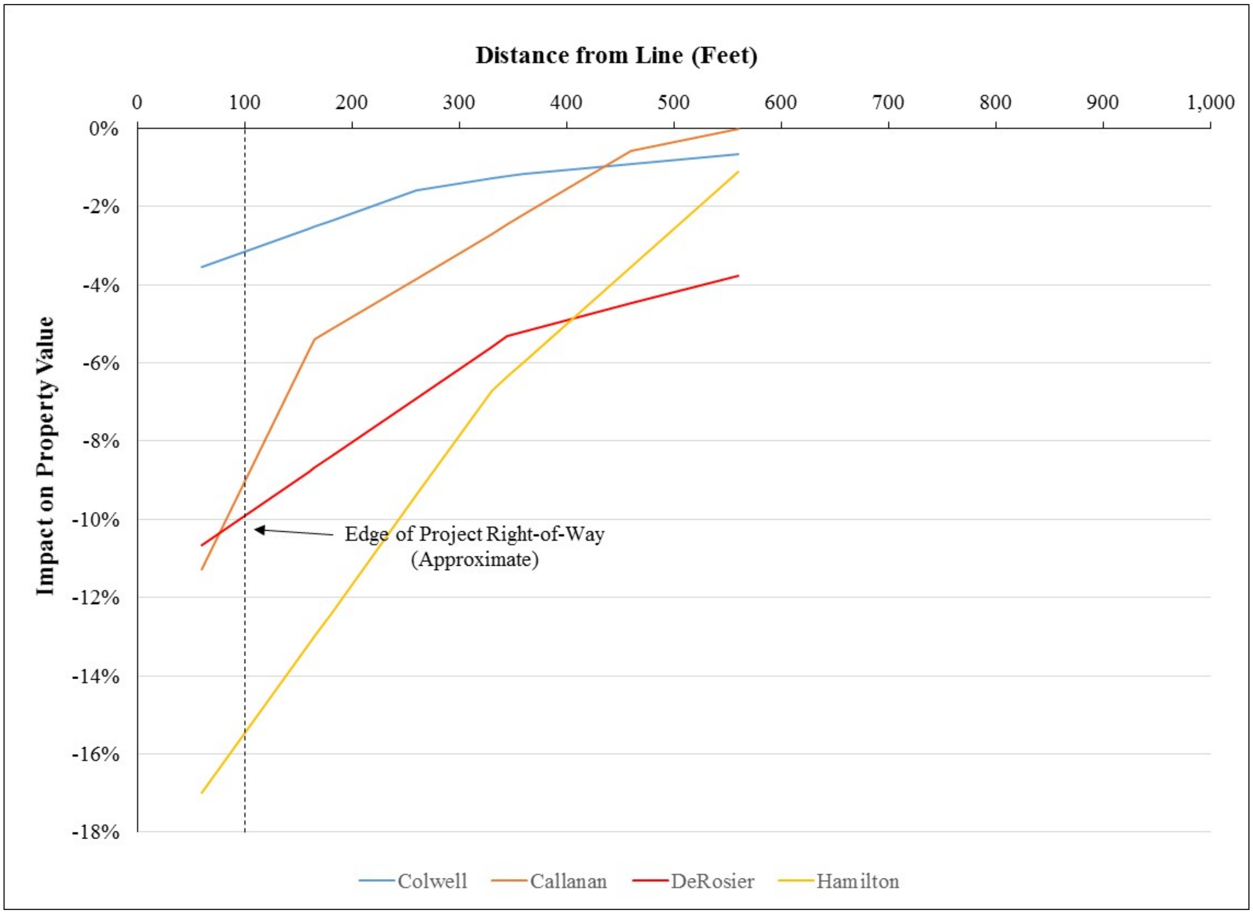
There is extensive academic literature on this subject, some of which provides quantitative measures of the impact of high-voltage transmission lines on the value of nearby real estate. Most of the literature focuses on residential real estate—as opposed to commercial, industrial, or agricultural properties.[63]

To identify potential impacts of the Project, this analysis focuses on peer-reviewed studies which employed multiple regression analysis, as this method is increasingly recognized as the most reliable technique for isolating the potential impact of high-voltage transmission lines on real estate values. Among the available studies using this technique, four were identified that have been cited by multiple academic researchers in surveys of the literature, and which provide results which can be directly applied to this analysis. These studies provided estimates of impacts based on distance to an aboveground high-voltage transmission line: Callanan and Hargreaves (1995a), Colwell (1990a), Des Rosiers (2002a), and Hamilton and Schwann (1995a). The referenced studies analyzed the impact of high-voltage transmission lines in New England, Illinois, Montreal, Canada, and Wellington, New Zealand. These studies generally found that overhead transmission lines may reduce the value of nearby properties by up to approximately 5 to 10 percent for properties within the range of 50 to 100 feet (15 to 30 m) from a transmission line (the approximate distance to the edge of the transmission route for the Project, based on Project specifications) and that the degree of impact declines with distance, reaching zero at approximately 500 feet (152 m) from the transmission line.[64] The results of these studies are summarized in **Chart 4-1**.

[63] See, for example, Chalmers (2012a), Brown (1976a), and Rigdon (1991a). Also, see Jackson and Pitts (2010a) for a recent survey of the literature.
The research presented in these studies utilizes several methodologies to assess the potential impacts of high-voltage transmission lines, including: a) surveys of market participants concerning their perceptions and opinions of impacts on real estate values; b) statistical analyses, such as multiple regression, analyzing a large number of home sales while controlling for a variety of factors that affect home values including proximity to a high-voltage transmission line; c) analysis of "paired sales" (i.e., comparison of sales prices for similar properties distinguished only by proximity to a high-voltage transmission line); and d) retrospective appraisals of the same properties before and after a high-voltage transmission line was built nearby.

[64] Callanan and Hargreaves (1995a) found an impact as large as 27.3 percent within 33 feet (10 m) of a tower (a support structure), while finding smaller impacts for only the conductor. **Chart 4-1** includes those authors' results for the impact of a support structure.

Chart 4-1. Adverse Impact of an HVDC Line on Residential Property Values, Results from the Literature



Source: Callanan and Hargreaves (1995a), Des Rosiers (2002a), Hamilton and Schwann (1995a), and Colwell (1990a)

Other studies were identified and reviewed whose results, while in general agreement with the ones cited above, were not included here because they did not employ multiple regression techniques, were sponsored by interested parties (generally a utility), or were presented in a format that made them difficult to use in this context (for example, they did not control for distance to the line).[65]

To quantify the potential impact of the Project on property values, the amount of land within 500 feet (152 m) (not owned by the Applicant) and the average value of residential property per square mile (2.6 square km) were calculated in order to obtain an estimate of residential property values. This value was escalated to 2019 and the total value of potentially impacted residential real estate was determined. This value was multiplied by 4.7 percent (based on the findings in the literature) to calculate the average impact for residential properties.

Additional detail on the methodology used to quantify the potential adverse impacts of the Project on property values, based on findings from the above studies, is included in the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

As described above, the Project would generate increases in property tax revenues due to the assessed value of the transmission line and other facilities constructed by Northern Pass. There may be additional positive

[65] See, for example, Haider and Haroun (2000a); Bottemiller and Wolverton (2013a); Cowger, Bottemiller, and Cahill (1996a); Wolverton and Bottemiller (2003a); and Chalmers and Voorvardt (2009a).

impacts on property values due to the effect of increased economic activity on New Hampshire, generally. A potential reduction in taxable assessed residential property values could partially offset these increases. Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 2, could result in a reduction in taxable assessed residential property values of approximately $11.8 million. This could result in a reduction of residential property tax payments of approximately $320,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

A qualitative, macro-level assessment of potential impacts of the Project to tourism was conducted. The analysis indicates macro level economic factors such as consumer confidence, the unemployment rate, and gasoline prices have historically had the greatest impact on tourism in New Hampshire. Weather also impacts tourism, as shown with the correlation between snow cover and downhill snowsports visits (see **Section 3.1.2.4** and **Chart 3-2** in that section). Other factors that could cause volatility in tourism at the macro level might be population growth and the demographics of that population growth, climate change, natural disasters, and crime/terrorism, while at the micro level, competition, value, and the relative attractiveness of New Hampshire as a destination are factors of influence.

No authoritative, peer-reviewed studies were identified that address impacts to tourism as a result of the implementation of transmission lines, and DOE did not attempt to develop such a study. An in-depth study of this nature would require pre- and post-evaluation of similar projects located in similar settings over a multi-year period in order to document the potential impacts of transmission lines on tourism. Additionally, as discussed above, tourism is primarily responsive to macroeconomic conditions such as the stability of the national economy or gasoline prices. Inclement weather also affects tourism on a broad scale. As a result, these conditions could skew any impacts identified in a transmission line tourism study, were one to be designed. For these reasons, a specific study of this topic, for this project, was determined to be impractical. Thus, this analysis is based on anecdotal evidence only.

Alternate Evaluations of Tourism

As detailed above, specific methods of quantifying potential impacts to tourism were not available for this analysis. Three additional areas of study were evaluated in an effort to better understand the potential for the Project to impact tourism within New Hampshire. The following sections regarding; other EIS reports, substitution effect, and the Old Man of the Mountain are provided to assist the reader in generally understanding the potential for the Project to impact tourism.

Other EIS Documents Involving Transmission Lines

A review of academic and EIS documents yielded only very general results about the impact of transmission lines on tourism. Other EISs for transmission line projects were reviewed, including the Susquehanna-Roseland Line (NPS, Pennsylvania/New Jersey) (NPS 2012), Gateway West Transmission Line Project (Wyoming/Idaho) (BLM 2013a), North Steens Transmission Line Project (Oregon/Washington) (BLM 2011a), SunZia Southwest Transmission Project (New Mexico) (BLM 2013b), and Bemidji-Grand Rapids Transmission Line (Minnesota) (Minnesota Department of Commerce et al. 2010).

The general types of impacts on tourism gathered from these other EIS studies include:

Potential impacts

- Impacts to scenic resources that may affect the attractiveness of the landscape and affect visitation
- Impacts to natural areas that may affect their attractiveness to visitors

- Impacts to water and forest resources used for recreation that may affect their inherent attractiveness to visitors
- Temporary increases in noise levels during construction that may deter visitors or lessen their experience
- Encouragement of OHV use by opening a new transmission route which may lessen visitation by non-motorized users

DOE expects that implementation of the Project would have similar types of impacts.

Substitution Effect

While the potential exists for the Project to have a negative effect on tourism for specific individual sites, it is also possible that a loss in tourism in one area would result in a gain in another part of the state. For example, a visitor might have a preferred hiking trail in the vicinity of the Project. If this trail were subject to visual impacts from the Project, this visitor could find another suitable hiking trail in another unaffected part of the state. While tourism in the affected area may experience some unquantifiable level of decline, visitation to the state as a whole would not specifically be affected.

Old Man of the Mountain Case Study

To evaluate the extent to which a specific change in the tourism landscape could affect tourism, the collapse of New Hampshire's Old Man of the Mountain site was considered. The Old Man of the Mountain was one of New Hampshire's most iconic landmarks and is the emblem on the state seal, license plates, and the millennial quarter coin. In this case study, the Old Man of the Mountain serves as a proxy for scenic vistas within New Hampshire as a tourist attraction.

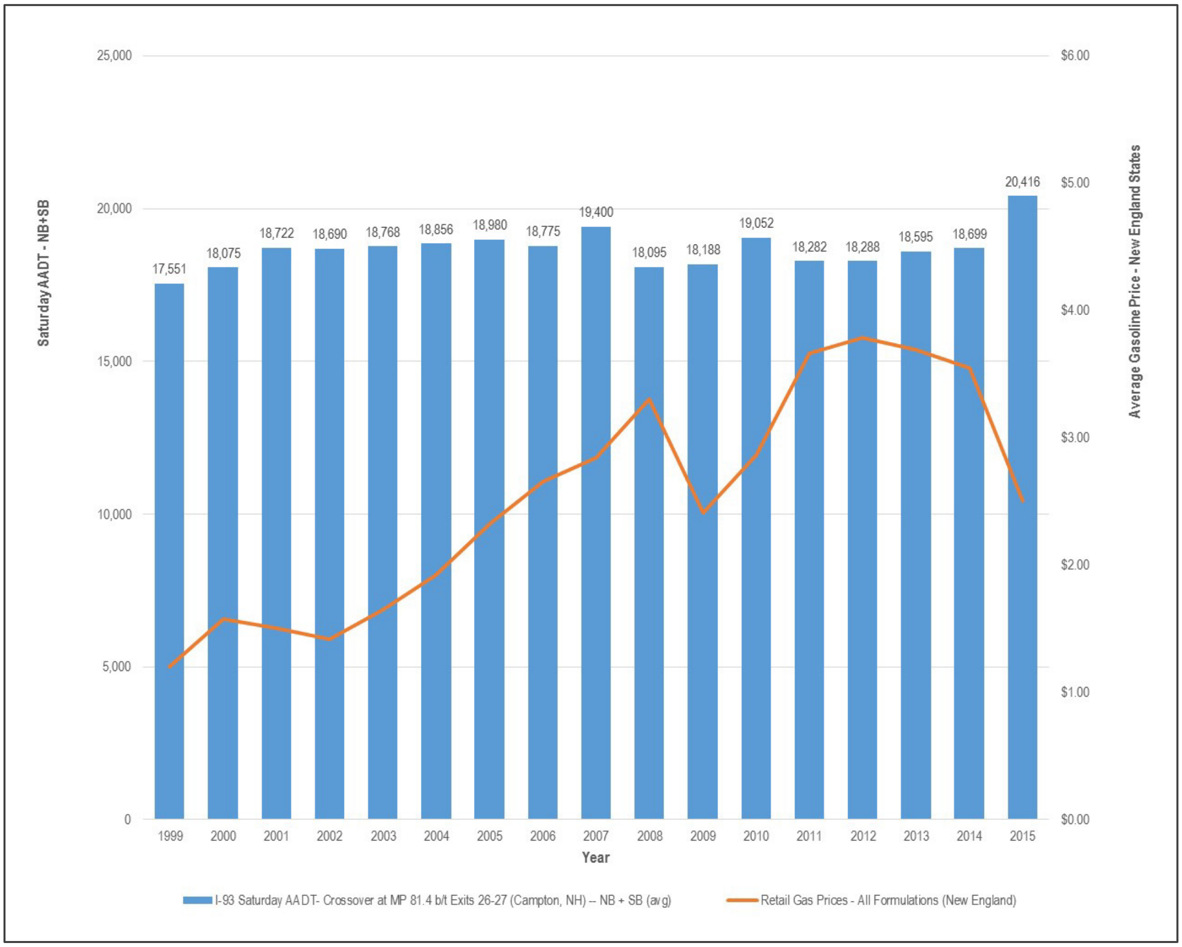
In 2003 this popular attraction, located in Franconia Notch State Park along I-93, completely collapsed, effectively erasing the very point of the attraction itself. With the attraction gone, it was reasonable to conclude that tourism could be affected.

A quantitative analysis of the effect of the collapse of the Old Man of the Mountain on tourism was not possible. The New Hampshire Division of Parks and Recreation (NHDPR) indicated that specific visitation records do not exist to be able to evaluate the pre- and post-collapse effects. Also, the methodology for collecting revenues has changed over the period, so comparing revenues would not be accurate.

To assess the potential impacts of the collapse of the Old Man of the Mountain on tourism, Saturday traffic counts were examined (Saturday traffic is generally used as an indicator of leisure or tourist traffic because it does not include weekday commuting traffic). Saturday AADT along I-93 in Campton was reviewed for years pre- and post-collapse, and is displayed in **Chart 4-2**.[66] Generally, traffic counts rose from 1999 to 2007, including the period after the 2003 collapse of the attraction. AADT dipped substantially in 2008, slowly recovered through 2010, then dipped again in 2011. These periods coincide with the nationwide recession from 2008 to 2012 (see **Chart 4-2**). Average annual gasoline prices in New England are overlaid on the chart. Increases in gasoline prices are generally inversely proportional to AADT—in other words, an increase in gasoline prices generally corresponds to a decrease in AADT. Although gasoline prices were comparatively high in 2007—a point which additionally depicts the highest traffic volumes—the nationwide economy was also at a corresponding high point. These data suggest that tourism statewide is more dependent on macroeconomic factors, such as a nationwide recession and gasoline prices, than upon micro factors such as the Old Man of the Mountain's collapse or other local influences.

[66] Traffic data for Lincoln and Franconia, NH (which are closer to the Old Man of the Mountain site) were also collected, but datasets for these locations are incomplete. The dataset for I-93 at MP 81.4 in Campton was the most complete dataset available in a location proximate to the Old Man of the Mountain site.

Chart 4-2. Average Annual Daily Traffic – Saturdays (I-93 at Campton, NH; NB + SB)



Source: NHDOT 2017a, EIA 2017a

Conclusion

No studies have been completed documenting the potential impacts of transmission lines on tourism, and there is no existing literature with which to judge the potential impact of the Project on tourism in New Hampshire. However, impacts to tourism appear to be more affected by macroeconomic factors such as the stability of the national economy and gasoline prices more than site-specific changes. While it is reasonable to conclude that the Project may have some level of impact to tourism within New Hampshire, and to individual locations proximate to the Project route, these are not quantifiable.

Electricity System Infrastructure

As shown in **Table 4-10**, the analysis conducted estimates that the Project would result in an increase in net imports of electricity into the ISO-NE region of approximately 7,400 GWh annually under Alternative 2 in 2020–2026. Based on outputs of the analysis, it is assumed that the Project would operate at an average of approximately 79 percent of maximum capacity throughout the year. The analysis assumes that operation of the Project itself would not cause a change in total electricity demand; therefore, electricity from the Project would replace the same amount of electricity from other sources. **Table 4-10** shows that the primary effect would be a reduction in output from natural-gas-fired generators within ISO-NE. Generation from these sources would fall by approximately 7,400 GWh (11 percent) under Alternative 2. According to the analysis, ISO-NE also would experience reductions in oil- and coal-based generation, although the nominal amount of the reductions is relatively small (measured in GWh), since these fuels provide a small amount of the total electricity supply in ISO-NE. The analysis shows that imports—the "Net Import" category, which would include electricity delivered by the Project as well as other lines into ISO-NE from Canada—would provide no more than approximately 25.5 percent of total electricity supply to ISO-NE (reaching this maximum in the first year of the Project's potential operation, 2020), up from approximately 20 percent compared to the No Action Alternative. Domestic natural gas and nuclear generators would remain by far the major suppliers within ISO-NE, with those two sources collectively continuing to provide approximately 58 percent of power to ISO-NE.

Table 4-10. Impact on ISO-NE Electricity Supply in 2020–2026 Average (GWh)

Generation Type	No Action GWh (% of total)	Alternative 2 GWh (% of total)	Change
Gas (Domestic)	66,264 (45.1%)	58,864 (40.0%)	-11.2%
Coal (Domestic)	454 (0.3%)	323 (0.2%)	-28.8%
Oil (Domestic)	0 (0.0%)	0 (0.0%)	0.0%
Nuclear (Domestic)	26,792 (18.2%)	26,792 (18.2%)	0.0%
Hydro (Domestic)	5,459 (3.7%)	5,623 (3.8%)	3.0%
Renewable (Domestic)	13,421 (9.1%)	13,421 (9.1%)	0.0%
Other (Domestic)	5,719 (3.9%)	5,714 (3.9%)	-0.1%
Net Import	28,886 (19.7%)	36,258 (24.7%)	25.5%

Note: Electricity supplied by the Project appears within the "Net Import" classification above.

Future system reliability and impact studies would be conducted according to ISO-NE parameters in order to determine the effect of interconnecting the Project into the ISO-NE grid. The Project has not been identified as a reliability project, although the Applicant addressed reliability issues in their Amended Application (Northern Pass 2013a).[67]

4.1.2.3 Alternative 3

Property Taxes

Under Alternative 3, construction cost would total approximately $2.128 billion. Statewide property tax collections are anticipated to increase by approximately $57.9 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-11 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period (2017–2019) would be $643.9 million under Alternative 3.

[67] As per the ISO-NE Open Access Transmission Tariff Attachment K.

Table 4-11. Direct Economic Impacts in NH during Construction ($ million) – Alternative 3

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$69.9	$194.3	$267.9	$532.1
Visiting Workers	$9.5	$22.4	$29.8	$61.6
Government	$2.9	$14.0	$33.3	$50.2
Total	**$82.3**	**$230.6**	**$331.0**	**$643.9**

Note: Totals may not sum due to rounding.

Table 4-12 summarizes the results for total employment and output within New Hampshire. The Project would generate $1.116 billion of additional output within New Hampshire over a three-year period, under Alternative 3. Employment impacts during the construction phase would be about 10,240 annual FTE positions during the three-year construction period. Because Alternative 3 would cost nearly twice as much as Alternative 2 to construct, nearly twice as many FTE positions would be created. These jobs would exist only during the construction phase.

Table 4-12. Total Economic Impacts in NH during Construction – Alternative 3

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,331	3,681	5,227	10,240
Output ($ million)	$137.0	$394.9	$584.2	$1,116.1

Impacts from Operations, Maintenance, and Emergency Repairs

Table 4-13 shows projections of the impact of Alternative 3 on wholesale electricity prices and total payments for energy for 2020–2026. Due to the nature of the ISO-NE system, the addition of a source of electricity into a location within New Hampshire—like the Project—would have the effect of lowering the cost of wholesale power throughout the ISO-NE system, including New Hampshire itself. It is estimated that the Project would cause a decline in wholesale costs of about 0.2 percent across ISO-NE, with a total reduction in spending for wholesale electricity of about $23 million per year across ISO-NE. The corresponding figures for New Hampshire are 1.3 percent, and $9 million per year. On a percentage basis, New Hampshire residents and businesses would be impacted by the Project in the form of reduced overall expenditures on wholesale electricity in somewhat larger proportion relative to New England as a whole.

Table 4-13. Impact on ISO-NE Wholesale Electricity Prices in 2020–2026 Average

	No Action	Alternative 3	% Change from No Action
Load-Weighted Wholesale Spot Price ($/MWh)			
ISO-NE	$49.69	$49.60	-0.2%
NH	$49.27	$48.64	-1.3%
Total Wholesale Load Payments ($ million)			
ISO-NE	$7,425.6	$7,402.4	-0.4%
NH	$605.0	$596.4	-1.7%

The Project would generate additional economic impacts in New Hampshire due to its ongoing tax payments (see Property Taxes section above). Finally, the Project would generate economic activity within the state via direct spending on operation and maintenance activities, estimated to be approximately $5.7 million per year.[68] Combined with the impact due to reduced spending on electricity, these elements represent the direct impact of the Project during the operation phase.

[68] Estimates for ongoing operation and maintenance costs were held constant across all alternatives evaluated.

Table 4-14 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $72.3 million annually under Alternative 3.

Table 4-14. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 3

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$57.9	$72.3

Table 4-15 summarizes the results for total employment and output within New Hampshire. Under Alternative 3, the Project would generate additional output within New Hampshire of $194.0 million annually. Employment impacts during the operation phase would be 1,333 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-15. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 3

Total FTE Jobs	Output ($ million)
1,333	$194.0

Property Values

Because the Project would be buried under Alternative 3, no long-term impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 3 because the transmission line and associated infrastructure would be primarily buried (see **Section 4.1.1.2** for a discussion of visual impacts).

Electricity System Infrastructure

As shown in **Table 4-16**, the Project would result in an increase in net imports of electricity into the ISO-NE region of approximately 6,674 GWh for the 1,090 MW alternatives (which includes Alternative 3). These figures assume operation of the Project line at an average of approximately 79 percent of maximum capacity throughout the year. The analysis assumes that operation of the Project itself would not cause a change in total electricity demand; therefore, electricity from the Project replaces the same amount of electricity from other sources. **Table 4-16** shows that the primary effect is a reduction in output from natural-gas-fired generators within ISO-NE. Generation from these sources would decrease by approximately 6,682 GWh (10.1 percent) with this alternative's 1,090 MW capacity. According to the projections, ISO-NE also would experience reductions in oil- and coal-based generation, although the nominal amount of the reductions is relatively small, since these fuels provide only a small amount of the total electricity supply in ISO-NE. The analysis shows that imports—the "Net Import" category, which would include electricity delivered by the Project as well as other lines into ISO-NE from Canada—would provide no more than approximately 25 percent of total electricity supply to ISO-NE (reaching this maximum in the first year of the Project's potential operation, 2020), up from approximately 21 percent in a scenario without the Project. Domestic natural gas and nuclear generators would remain by far the major suppliers within ISO-NE, with those two sources collectively continuing to provide approximately 59 percent of power to ISO-NE.

Table 4-16. Impact on ISO-NE Electricity Supply in 2020–2026 Average (GWh)

Generation Type	No Action GWh (% of total)	Alternative 3 GWh (% of total)	% Change
Gas (Domestic)	66,264 (45.1%)	59,582 (40.5%)	-10.1%
Coal (Domestic)	454 (0.3%)	324 (0.2%)	-28.6%
Oil (Domestic)	0 (0.0%)	0 (0.0%)	0.0%
Nuclear (Domestic)	26,792 (18.2%)	26,792 (18.2%)	0.0%
Hydro (Domestic)	5,459 (3.7%)	5,602 (3.8%)	2.6%
Renewable (Domestic)	13,421 (9.1%)	13,421 (9.1%)	0.0%
Other (Domestic)	5,719 (3.9%)	5,715 (3.9%)	-0.1%
Net Import (the Project)	28,886 (19.7%)	35,560 (24.2%)	23.1%

Note: Electricity supplied by the Project appears within the "Net Import" classification above.

Future system reliability and impact studies would be conducted according to ISO-NE parameters in order to determine the effect of interconnecting the Project into the ISO-NE grid. The Project has not been identified as a reliability project, though the Applicant addressed reliability issues in their Presidential Permit Amended Application (Northern Pass 2013a).

4.1.2.4 Alternative 4a

Property Taxes

Under Alternative 4a, construction cost would total approximately $2.034 billion. Statewide property tax collections are anticipated to increase by approximately $56.5 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-17 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $616.2 million under Alternative 4a.

Table 4-17. Direct Economic Impacts in NH during Construction ($ million) – Alternative 4a

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$66.8	$185.7	$256.1	$508.6
Visiting Workers	$9.1	$21.4	$28.4	$58.9
Government	$2.8	$13.5	$32.3	$48.7
Total	**$78.7**	**$220.6**	**$316.8**	**$616.2**

Note: Totals may not sum due to rounding.

Table 4-18 summarizes the results for total employment and output within New Hampshire. The Project would generate $1.070 billion of additional output within New Hampshire over a three-year period, under Alternative 4a. Employment impacts during the construction phase would be about 9,816 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-18. Total Economic Impacts in NH during Construction – Alternative 4a

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,274	3,527	5,016	9,816
Output ($ million)	$131.1	$378.5	$560.8	$1,070.4

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 4a would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 4a would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-19 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire during the first year of operation are projected to be $70.9 million annually under Alternative 4a.

Table 4-19. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 4a

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$56.5	$70.9

Table 4-20 summarizes the results for total employment and output within New Hampshire. Under Alternative 4a, the Project would generate additional output within New Hampshire of $189.7 million annually. Employment impacts during the operation phase would be 1,303 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-20. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 4a

Total FTE Jobs	Output ($ million)
1,303	$189.7

Property Values

Because the Project would be buried under Alternative 4a, no long-term impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4a because the transmission line and associated infrastructure would be primarily buried (see **Section 4.1.1.2** for a discussion of visual impacts).

Electricity System Infrastructure

Under Alternative 4a, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.5 Alternative 4b

Property Taxes

Under Alternative 4b, construction cost would total approximately $2.163 billion. Statewide property tax collections are anticipated to increase by approximately $59.1 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-21 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $654.0 million under Alternative 4b.

Table 4-21. Direct Economic Impacts in NH during Construction ($ million) – Alternative 4b

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$71.1	$197.5	$272.2	$540.8
Visiting Workers	$9.7	$22.7	$30.2	$62.6
Government	$2.9	$14.1	$33.6	$50.6
Total	**$83.7**	**$234.3**	**$336.1**	**$654.0**

Note: Totals may not sum due to rounding.

Table 4-22 summarizes the results for total employment and output within New Hampshire. The Project would generate $1.134.8 billion of additional output within New Hampshire over a three-year period, under Alternative 4b. Employment impacts during the construction phase would be about 10,411 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-22. Total Economic Impacts in NH during Construction – Alternative 4b

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,353	3,742	5,316	10,411
Output ($ million)	$139.2	$401.5	$594.1	$1,134.8

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 4b would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 4b would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-23 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $73.5 million annually under Alternative 4b.

Table 4-23. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 4b

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$59.1	$73.5

Table 4-24 summarizes the results for total employment and output within New Hampshire. Under Alternative 4b, the Project would generate additional output within New Hampshire of $197.5 million annually. Employment impacts during the operation phase would be 1,357 FTE positions in the first year of operation, assumed to be 2019. These figures include direct, indirect, and induced impacts.

Table 4-24. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 4b

Total FTE Jobs	Output ($ million)
1,357	$197.5

Property Values

Because the Project would be buried under Alternative 4b, no long-term impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4b because the transmission line and associated infrastructure would be primarily buried (see **Section 4.1.1.2** for a discussion of visual impacts).

Electricity System Infrastructure

Under Alternative 4b, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.6 Alternative 4c

Property Taxes

Under Alternative 4c, construction cost would total approximately $2.094 billion. Statewide property tax collections are anticipated to increase by approximately $58.0 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-25 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $634.0 million under Alternative 4c.

Table 4-25. Direct Economic Impacts in NH during Construction ($ million) – Alternative 4c

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$68.8	$191.2	$263.6	$523.5
Visiting Workers	$9.4	$22.0	$29.3	$60.6
Government	$2.9	$13.9	$33.1	$49.9
Total	**$81.0**	**$227.1**	**$325.9**	**$634.0**

Note: Totals may not sum due to rounding.

Table 4-26 summarizes the results for total employment and output within New Hampshire. The Project would generate $1.101 billion of additional output within New Hampshire over a three-year period, under Alternative 4c. Employment impacts during the construction phase would be about 10,100 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-26. Total Economic Impacts in NH during Construction – Alternative 4c

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,311	3,629	5,160	10,100
Output ($ million)	$134.9	$389.5	$576.9	$1,101.3

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 4c would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 4c would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-27 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire during the first year of operation are projected to be $72.3 million annually under Alternative 4c.

Table 4-27. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 4c

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$58.0	$72.3

Table 4-28 summarizes the results for total employment and output within New Hampshire. Under Alternative 4c, the Project would generate additional output within New Hampshire of $194.1 million annually. Employment impacts during the operation phase would be 1,334 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-28. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 4c

Total FTE Jobs	Output ($ million)
1,334	$194.1

Property Values

Because the Project would be buried under Alternative 4c, no long-term impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4c because the transmission line and associated infrastructure would be primarily buried (see **Section 4.1.1.2** for a discussion of visual impacts).

Electricity System Infrastructure

Under Alternative 4c, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.7 Alternative 5a

Property Taxes

Under Alternative 5a, construction cost would total approximately $1.180 billion. Statewide property tax collections are anticipated to increase by approximately $31.3 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-29 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $355.7 million under Alternative 5a.

Table 4-29. Direct Economic Impacts in NH during Construction ($ million) – Alternative 5a

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$38.8	$107.7	$148.5	$295.0
Visiting Workers	$5.3	$12.4	$16.5	$34.2
Government	$1.5	$7.4	$17.6	$26.5
Total	**$45.6**	**$127.5**	**$182.6**	**$355.7**

Note: Totals may not sum due to rounding.

Table 4-30 summarizes the results for total employment and output within New Hampshire. The Project would generate $615.9 million of additional output within New Hampshire over a three-year period, under Alternative 5a. Employment impacts during the construction phase would be about 5,655 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-30. Total Economic Impacts in NH during Construction – Alternative 5a

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	737	2,035	2,884	5,655
Output ($ million)	$75.8	$218.2	$322.0	$615.9

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 5a would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 5a would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-31 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $45.7 million annually under Alternative 5a.

Table 4-31. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 5a

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$31.3	$45.7

Table 4-32 summarizes the results for total employment and output within New Hampshire. Under Alternative 5a, the Project would generate additional output within New Hampshire of $114.5 million annually. Employment impacts during the operation phase would be 782 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-32. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 5a

Total FTE Jobs	Output ($ million)
782	$114.5

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 5a, could result in a reduction in taxable assessed residential property values of approximately $10.7 million. This could result in a reduction of residential property tax payments of approximately $290,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 5a, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.8 Alternative 5b

Property Taxes

Under Alternative 5b, construction cost would total approximately $1.252 billion. Statewide property tax collections are anticipated to increase by approximately $32.9 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-33 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $376.9 million under Alternative 5b.

Table 4-33. Direct Economic Impacts in NH during Construction ($ million) – Alternative 5b

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$41.1	$114.3	$157.6	$313.0
Visiting Workers	$5.6	$13.2	$17.5	$36.3
Government	$1.6	$7.7	$18.3	$27.6
Total	**$48.3**	**$135.1**	**$193.4**	**$376.9**

Note: Totals may not sum due to rounding.

Table 4-34 summarizes the results for total employment and output within New Hampshire. The Project would generate $652.3 million of additional output within New Hampshire over a three-year period, under Alternative 5b. Employment impacts during the construction phase would be about 5,991 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-34. Total Economic Impacts in NH during Construction – Alternative 5b

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	781	2,156	3,054	5,991
Output ($ million)	$80.3	$231.1	$340.9	$652.3

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 5b would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 5b would have a 1,200 MW capacity, these impacts would be identical to those under Alternative 2 (see **Section 4.1.2.2**).

Table 4-35 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire during the first year of operation are projected to be $48.7 million annually under Alternative 5b.

Table 4-35. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 5b

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$10.1	$5.7	$32.9	$48.7

Table 4-36 summarizes the results for total employment and output within New Hampshire. Under Alternative 5b, the Project would generate additional output within New Hampshire of $121 million annually. Employment impacts during the operation phase would be 823 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-36. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 5b

Total FTE Jobs	Output ($ million)
823	$121.3

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 5b, could result in a reduction in taxable assessed residential property values of approximately $11.4 million. This could result in a reduction of residential property tax payments of approximately $310,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 5b, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 2 (see **Section 4.1.2.2**) because the transmission line would have a 1,200 MW capacity under both alternatives.

4.1.2.9 Alternative 5c

Property Taxes

Under Alternative 5c, construction cost would total approximately $1.227 billion. Statewide property tax collections are anticipated to increase by approximately $32.2 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-37 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $369.3 million under Alternative 5c.

Table 4-37. Direct Economic Impacts in NH during Construction ($ million) – Alternative 5c

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$40.3	$112.0	$154.4	$306.6
Visiting Workers	$5.5	$12.9	$17.1	$35.5
Government	$1.6	$7.6	$18.0	$27.2
Total	**$47.4**	**$132.4**	**$189.6**	**$369.3**

Note: Totals may not sum due to rounding.

Table 4-38 summarizes the results for total employment and output within New Hampshire. The Project would generate $639.1 million of additional output within New Hampshire over a three-year period, under Alternative 5c. Employment impacts during the construction phase would be about 5,869 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-38. Total Economic Impacts in NH during Construction – Alternative 5c

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	765	2,113	2,992	5,869
Output ($ million)	$78.7	$226.5	$334.0	$639.1

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 5c would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 5c would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-39 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $46.6 million annually under Alternative 5c.

Table 4-39. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 5c

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$32.2	$46.6

Table 4-40 summarizes the results for total employment and output within New Hampshire. Under Alternative 5c, the Project would generate additional output within New Hampshire of $117.2 million annually. Employment impacts during the operation phase would be 801 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-40. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 5c

Total FTE Jobs	Output ($ million)
801	$117.2

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 5c, could result in a reduction in taxable assessed residential property values of approximately $10.8 million. This could result in a reduction of residential property tax payments of approximately $290,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 5c, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.10 Alternative 6a

Property Taxes

Under Alternative 6a, construction cost would total approximately $1.876 billion. Statewide property tax collections are anticipated to increase by approximately $52.5 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-41 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $567.5 million under Alternative 6a.

Table 4-41. Direct Economic Impacts in NH during Construction ($ million) – Alternative 6a

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$61.6	$171.2	$236.1	$468.9
Visiting Workers	$8.4	$19.7	$26.2	$54.3
Government	$2.6	$12.3	$29.4	$44.3
Total	**$72.6**	**$203.3**	**$291.7**	**$567.5**

Note: Totals may not sum due to rounding.

Table 4-42 summarizes the results for total employment and output within New Hampshire. The Project would generate $988.4 million of additional output within New Hampshire over a three-year period, under Alternative 6a. Employment impacts during the construction phase would be about 9,062 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-42. Total Economic Impacts in NH during Construction – Alternative 6a

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,176	3,255	4,632	9,062
Output ($ million)	$121.0	$349.3	$518.1	$988.4

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 6a would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 6a would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-43 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $66.9 million annually under Alternative 6a.

Table 4-43. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 6a

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$52.5	$66.9

Table 4-44 summarizes the results for total employment and output within New Hampshire. Under Alternative 6a, the Project would generate additional output within New Hampshire of $177.8 million annually. Employment impacts during the operation phase would be 1,221 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-44. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 6a

Total FTE Jobs	Output ($ million)
1,221	$177.8

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 6a, could result in a reduction in taxable assessed residential property values of approximately $5.1 million. This could result in a reduction of residential property tax payments of approximately $140,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 6a, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.11 Alternative 6b

Property Taxes

Under Alternative 6b, construction cost would total approximately $2.002 billion. Statewide property tax collections are anticipated to increase by approximately $55.0 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-45 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period would be $604.6 million under Alternative 6b.

Table 4-45. Direct Economic Impacts in NH during Construction ($ million) – Alternative 6b

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$65.8	$182.7	$251.9	$500.4
Visiting Workers	$8.9	$21.0	$28.0	$58.0
Government	$2.7	$12.9	$30.6	$46.2
Total	**$77.4**	**$216.6**	**$310.6**	**$604.6**

Note: Totals may not sum due to rounding.

Table 4-46 summarizes the results for total employment and output within New Hampshire. The Project would generate $1,051.5 billion of additional output within New Hampshire over a three-year period, under Alternative 6b. Employment impacts during the construction phase would be about 9,645 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-46. Total Economic Impacts in NH during Construction – Alternative 6b

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	1,253	3,466	4,925	9,645
Output ($ million)	$128.9	$371.9	$550.6	$1,051.5

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 6b would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 6b would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-47 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $69.4 million annually under Alternative 6b.

Table 4-47. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 6b

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$55.0	$69.4

Table 4-48 summarizes the results for total employment and output within New Hampshire. Under Alternative 6b, the Project would generate additional output within New Hampshire of $185.4 million annually. Employment impacts during the operation phase would be 1,274 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-48. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 6b

Total FTE Jobs	Output ($ million)
1,274	$185.4

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, it is estimated that implementation of Alternative 6b could result in a reduction in taxable assessed residential property values of approximately $5.1 million. This could result in a reduction of residential property tax payments of approximately $140,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Under Alternative 6b, potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 6b, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.2.12 Alternative 7 – Proposed Action

Property Taxes

Under Alternative 7, construction cost would total approximately $1.410 billion. Statewide property tax collections are anticipated to increase by approximately $37.0 million annually.

The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) details the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project.

Economic Activity

Impacts from Construction

Table 4-49 shows the expenditure amounts for the analysis of direct impacts during the construction phase. Total direct impacts in New Hampshire over the three-year construction period (2017–2019) would be $424.4 million under Alternative 7.

Table 4-49. Direct Economic Impacts in NH during Construction ($ million) – Alternative 7

Direct Expenditure Category	2017	2018	2019	Total
In-State Construction	$46.3	$128.7	$177.5	$352.5
Visiting Workers	$6.3	$14.8	$19.7	$40.8
Government	$1.8	$8.6	$20.6	$31.0
Total	**$54.4**	**$152.2**	**$217.8**	**$424.4**

Note: Totals may not sum due to rounding.

Table 4-50 summarizes the results for total employment and output within New Hampshire. The Project would generate $734.6 billion of additional output within New Hampshire over a three-year period, under Alternative 7. Employment impacts during the construction phase would be about 6,747 annual FTE positions during the three-year construction period. These jobs would exist only during the construction phase.

Table 4-50. Total Economic Impacts in NH during Construction – Alternative 7

Economic Impact Category	2017	2018	2019	Total
Total FTE Jobs	880	2,428	3,439	6,747
Output ($ million)	$90.5	$260.3	$383.9	$734.6

Impacts from Operations, Maintenance, and Emergency Repairs

The operation of Alternative 7 would impact wholesale electricity prices and total payments for energy, lowering the cost of wholesale power throughout the region, including New Hampshire. Because the transmission line under Alternative 7 would have a 1,090 MW capacity, these impacts would be identical to those under Alternative 3 (see **Section 4.1.2.3**).

Table 4-51 shows the key data components for the analysis of direct impacts during 2020–2026, assumed to be the first seven years of operation. As shown here, total direct impacts in New Hampshire are projected to be $51.4 million annually under Alternative 7.

Table 4-51. Direct Economic Impacts in NH during Operation (2020–2026 Average) ($ million) – Alternative 7

Electricity Cost Savings	Operation and Maintenance Expenditures	Property Tax Payments	Total
$8.6	$5.7	$37.0	$51.4

Table 4-52 summarizes the results for total employment and output within New Hampshire during 2020–2026, assumed to be the first seven years of operation. Under Alternative 7, the Project would generate additional output within New Hampshire of $131.5 million annually. Employment impacts during the operation phase would be 901 FTE positions. These figures include direct, indirect, and induced impacts.

Table 4-52. Total Economic Impacts in NH during Operation (2020–2026 Average) – Alternative 7

Total FTE Jobs	Output ($ million)
901	$131.5

Property Values

Based on the average combined tax rates for state, local, and municipal authorities with jurisdiction over the Project, Alternative 7 could reduce taxable assessed residential property values by approximately $8.7 million, and thereby reduce residential property tax payments by approximately $240,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Under Alternative 7, potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Under Alternative 7, changes to the diversity of energy sources in the ISO-NE region would be identical to those under Alternative 3 (see **Section 4.1.2.3**) because the transmission line would have a 1,090 MW capacity under both alternatives.

4.1.3 RECREATION

The Project would result in short-term and long-term impacts to recreational resources related to construction, operation, maintenance, and emergency repairs. Short-term impacts include temporary closures to recreational sites, generation of noise, ground disturbance, reduced parking, and others. Long-term impacts refer to visual impacts, which would occur throughout the Project's operational lifetime.[69] Users of recreation resources would likely experience unique impacts based upon their individual characteristics, including their objectives, experience level, and skill. With the application of APMs (see **Appendix H**), impacts to the recreation experience could be reduced. Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.3, 4.3.3, 4.4.3,** and **4.5.3**.

[69] Existing long-term impacts to recreation from the visibility of the PSNH transmission line would continue under all alternatives. For alternatives other than Alternative 1, long-term impacts are stated as additional visual impacts that would occur as a result of the Project.

Four types of recreational resources are included in this analysis:

1. Point sites as identified in NH GRANIT (e.g., recreational resources with small spatial area, such as a scenic overlook, boat launch, etc.)
2. The Ammonoosuc River, Upper Ammonoosuc River, Wild Ammonoosuc River, Phillips Brook, Israel River, Mill River, Mad River, Merrimack River, Soucook River, Suncook River, Baker River, Little River, and Pemigewasset River, which have potential to be designated as federal Wild and Scenic Rivers[70]
3. Sites that have a spatial area (e.g., parks)
4. Trails

4.1.3.1 Impacts from Construction

The operation of construction equipment (including low-flying helicopters) would result in short-term impacts due to the generation of noise, ground disturbance, short-term closures of recreational resources, reduced parking, impacts to wildlife viewing, and displacement of flora and fauna, among others. While these impacts would not necessarily occur to each affected recreational resource, each could potentially impact the user's experience of recreation sites and trails by decreasing opportunities for solitude, contributing to a less-natural environment, limiting or precluding access to recreation sites, or decreasing use. For example, construction activities could result in short-term closures to recreation sites or be visible from recreation sites. Closures to recreation sites would occur where construction equipment crosses a recreation site, or where construction creates a hazard to users. These impacts would be short-term in nature, but would still have the potential to affect user experiences. Regarding impacts to trails, it is likely that trails would be closed at the trailhead during construction, limiting recreational use of portions of these trails beyond the portion directly impacted by construction activities. Impacts resulting from the construction of an underground transmission cable could occur over a longer period of time compared with an overhead transmission line, due to the more involved nature of construction. Construction of underground cable in a roadway corridor would generally result in fewer impacts than installation of cable in transmission routes because recreation resources near roadways already experience some level of disturbance. **Table 4-53** presents a Project-wide total of all recreational resources that could experience short-term impacts due to construction of the Project.

[70] These rivers are the only rivers within the study area for recreation with potential to be designated federal Wild and Scenic Rivers. Phillips Brook and the Ammonoosuc, Upper Ammonoosuc, Israel, and Little Rivers are located in the Northern Section. The Ammonoosuc, Wild Ammonoosuc, Mad, Mill, and Pemigewasset Rivers are located in the Central Section. The Merrimack, Soucook, and Suncook Rivers are located in the Southern Section.

Table 4-53. Summary of Potential Impacts to Recreational Resources – Construction

Alternative	Point Sites	Potential Federal Wild and Scenic Rivers Crossings (Type)	Sites with Spatial Area acres (ha)	Trails	
				miles (km)	ANST[a] Crossings
1 (No Action)	--	--	--	--	--
2	1	9 (overhead)	496 (201)	5.6 (9)	1
3	1	9 (buried)	496 (201)	5.6 (9)	1
4a	--	8 (buried)	112 (45)	0.3 (0.5)	1
4b	--	8 (buried)	141 (57)	0.2 (0.3)	1
4c	--	7 (buried)	82 (33)	0.2 (0.3)	1
5a	1	9 (overhead and buried)	312 (126)	1 (1.6)	1
5b	1	10 (overhead and buried)	410 (166)	0.9 (1.4)	1
5c	1	10 (overhead and buried)	334 (135)	0.9 (1.4)	1
6a	--	8 (overhead and buried)	127 (51)	0.4 (0.6)	1
6b	--	9 (overhead and buried)	155 (63)	0.3 (0.5)	1
7 (Proposed Action)	1	7 (overhead and buried)	295 (119)	0.8 (1.3)	1

[a] ANST impacts are included in the total impact to trails.

4.1.3.2 Impacts from Operations, Maintenance, and Emergency Repairs

The operation of equipment as necessary for repairs and line inspection would result in short-term, localized impacts identical to short-term construction impacts (see **Section 4.1.3.1**). However, short-term impacts during maintenance and emergency repairs would only occur as needed, and would not be expected to last for the same amount of time.

Construction and operation of an overhead transmission line (including periodic vegetation management) would result in long-term visual impacts (see **Section 4.1.1.1**). Overhead transmission line crossings of eligible federal Wild and Scenic rivers are expected to have relatively minor and incremental impacts on the recreational experience, as existing overhead transmission line crossings are already in place. In contrast, there would be a smaller degree of long-term visual impacts associated with underground transmission cable (mainly associated with vegetation removal and any aboveground facilities such as transition stations, substations, and converter station). Underground transmission cable river crossings are not expected to impact the recreational experience, as the cable would likely be installed underneath existing bridges in locations where road crossings already exist.

The recreation experience would be visually affected by the construction of aboveground portions of the Project because it would result in a modification to the natural environment. The implementation of the Project would alter the natural appearance of the landscape, thus impacting the recreation experience in recreation areas, trails, and eligible federal Wild and Scenic rivers. These potential visual impacts could result in decreased use of recreation areas. **Table 4-54** presents a Project-wide total of recreational resources that could experience long-term visual impacts due to operation of the Project.

Table 4-54. Summary of Recreational Resources with Potential to Experience Long-Term Visual Impacts

Alternative	Point Sites	Sites with Spatial Area acres (ha)	Trails	
			miles (km)	ANST[a] miles (km)
1 (No Action)	--	--	--	--
2	15	2,267 (917)	9 (14)	0.1 (0.2)
3	--	--	--	--
4a	--	--	--	--
4b	--	--	--	--
4c	--	--	--	--
5a	13	2,121 (858)	8 (13)	0.1 (0.2)
5b	14	2,207 (893)	8 (13)	0.1 (0.2)
5c	14	2,161 (875)	8 (13)	0.1 (0.2)
6a	3	--	0.6 (0.9)	--
6b	3	--	0.6 (0.9)	--
7 (Proposed Action)	12	2,109 (894)	9 (14)	0.1 (0.2)

[a] ANST impacts are included in the total impact to trails.
[b] Alternatives 3, 4a, 4b, and 4c would be located underground, and the construction and operation would not result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures

4.1.4 HEALTH AND SAFETY

The Project could result in short-term and long-term impacts to health and safety related to construction, operation, maintenance, and emergency repairs. In general, construction and operation of the Project could create and/or increase risks related to: spills/leaks of hazardous materials, petroleum products, and hazardous wastes; exposure of contaminated soils or groundwater; damage to underground pipelines and utilities; fire hazards; fire support services; worker safety; EMFs; extreme weather events and natural disasters; and general public safety concerns. These risks could be either short-term impacts from construction or maintenance activities, or long-term impacts resulting from operation of the Project. Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.4, 4.3.4, 4.4.4,** and **4.5.4**.

The Applicant has committed to safety mitigation measures outlined in **Appendix H** and within the further amended Presidential permit application (Northern Pass 2015). These include designing the Project according to NESC and other applicable standards; having construction crews comply with all applicable guidelines and standard construction practices for installation of facilities; maintaining safety signage during construction and at substations; and limiting access to substations to authorized personnel. In addition, the transmission line would be equipped with protective devices, such as circuit breakers and relays, designed to de-energize the line and, therefore, safeguard members of the public who may come into contact with the line if it were to be accidentally brought down by events such as storms, trees, ice, motor vehicles, or contact with other equipment. In addition to accidental events, the transmission line could be brought down and de-energized for maintenance purposes.

Table 4-55 summarizes health and safety impacts for each alternative.

Table 4-55. Summary of Potential Health and Safety Impacts

Alternative	Summary of Impacts
1 (No Action)	No impacts.
2	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, public safety, and fires would be minimized through the implementation of APMs (see **Appendix H**). In particular, design measures would reduce risks related to extreme weather events. The Project would generate electric and magnetic fields (EMFs), but there would be no impact of the Project due to EMFs outside of the transmission route, and minimal (not harmful) potential impacts due to AC electric fields within the transmission route.
3	Risks related to spills, hazardous materials, petroleum products, hazardous wastes, worker safety, and fires would be similar to those of Alternative 2. Impacts related to weather, public safety, and EMFs would be reduced because the cable would be buried. There could be an increased risk of unearthing hazardous materials and contaminated groundwater.
4a	Risks would be similar to those of Alternative 3 because both alternatives would be underground cable; however, there could be more transportation-related risks because the cable would be buried in a roadway corridor.
4b	Same as Alternative 4a
4c	Same as Alternative 4a
5a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
5c	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6a	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
6b	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions
7 (Proposed Action)	Same as Alternative 2 for aboveground portions; same as Alternative 4a for underground portions

4.1.4.1 Impacts from Construction

During construction, hazardous materials and petroleum products would be used and wastes would be generated. In areas where the existing towers would be relocated to make room for the Project, creosote-treated transmission poles would be removed and need to be handled according to EPA-recommended procedures (EPA 2007a). Hazards that could occur during construction include small spills and leaks, accidental larger spills, unearthing previously contaminated soils or groundwater, disturbing buried utilities or pipelines, fires, and risks to the public and workers, including those occurring in or near roadways. In general, the Project would create risks associated with these hazards. These impacts are considered short-term and localized.

Hazardous Materials, Petroleum Products, and/or Hazardous Wastes

Construction of the Project would result in an increased risk of spills of hazardous materials, petroleum products, and/or hazardous wastes. Hazardous materials and fuels that could be used, transported, and stored on-site include: transformer oil, dielectric fluids, fuels (diesel, gasoline), lube oils and grease, used oil, solvents, adhesives, coatings, paints, compressed gas, and propane.

Impacts from leaks or small spills from improper use, storage, or disposal of oil and/or hazardous materials could occur. However, the construction contractor would be required to comply with the appropriate state and federal regulations, (New Hampshire Puc 300, NHDOT, and OSHA), including those for hazardous waste (Resource Conservation and Recovery Act [RCRA]), and petroleum products (Spill Prevention, Control, and Countermeasure Rule [SPCC Rule]) which dictate how hazardous materials are managed. In addition, the construction contractor would be required to implement a Stormwater Pollution Prevention Plan (SWPPP) and the Applicant has committed to implement the NHDRED's (2010a) *Best Management*

Practices Manual for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire under all alternatives. Both of these include stipulations about the handling of hazardous materials. By adhering to federal and state regulations, the required SWPPP, and implementation of BMPs recognized by NHDRED and across the industry, the potential for leaks or small spills during construction would be minimized.

Large spills could occur where fuels or hazardous materials are stored in bulk, such as at construction yards or at the substations. An SPCC plan may be required to be implemented depending on the volume of and the location in which petroleum products would be stored. Adequate secondary containment would be required to contain spills of the largest volume containers. OSHA requirements dictate how hazardous materials must be stored and managed, and RCRA dictates how hazardous wastes are managed. Implementation of the New Hampshire Puc-required Safety and Health Plan would further reduce the risk of exposure to workers and the public and minimize the potential for release of hazardous materials. Therefore, assuming that Northern Pass and its contractors implement all applicable laws and regulations, provide adequate and sufficient training to their employees, and make the appropriate equipment available, any spill that would occur should be contained within proper secondary containment; impacts would likely be short-term and localized.

When conducting maintenance and emergency repair work, industry standard and NHDRED BMPs would be implemented to facilitate cleanup of accidental hazardous material spills. Implementation of the New Hampshire Puc-required Safety and Health Plan would further reduce the risk of exposure to workers and the public and minimize the potential for release of hazardous materials. Therefore, any impacts associated with spills of hazardous materials or petroleum products would likely be short-term and localized.

Some existing transmission and distribution lines would be replaced as part of the Project under Alternatives 2, 5a, 5b, 5c, 6a, 6b, and 7. The existing utility poles are creosote-treated. Although creosote is an EPA-registered pesticide, EPA does not consider creosote-treated utility poles as a hazardous waste and they can be disposed of in municipal landfills. However, EPA recommends specific handling procedures (EPA 2007a). With the implementation of EPA's recommendations, potential impacts associated with creosote poles would be minimized.

Contaminated Geology and Soils or Groundwater

During construction, the potential to expose the public or workers to previously unidentified contamination, or to mobilize contaminants already in soils, could occur because construction would occur on or near existing contaminated sites. Northern Pass or its construction contractor would be required to report any contamination unearthed to the NHDES based on New Hampshire's reporting requirements relating to contaminated site management (Env-Or 600). With proactive investigation of potentially contaminated sites and with the implementation of a plan for training construction workers about the protocols appropriate to undertake when contamination is unearthed and identified, the adverse impact would be short-term and localized. The risk for exposing contaminated soils or groundwater would be greater for buried portions of the Project including buried cable, compared with overhead lines.

Underground Pipelines and Utilities

If a pipeline or other utility is encountered during excavation, an accident could occur and the public and/or workers could be at risk. The Applicant or the construction contractor would be required under state law to notify the New Hampshire Dig Safe system 72 hours prior to construction. The construction contractor is required to mark all areas designated for excavation. After being notified, utilities would mark the ground where their facilities exist (Dig Safe 2014a). These procedures are designed to ensure that excavation would not damage any underground utilities and to decrease potential safety hazards for workers. Therefore, accidental damage of underground utilities from Project-related construction or maintenance would be unlikely.

To ensure the safety of any existing pipelines or utilities during operation of the Project, the Applicant would be responsible for conducting studies during detailed design of the Project to determine if the presence of the buried cable could adversely affect other (existing) utilities, such as by transferring potential or charging pipelines.[71] The Applicant would also be responsible for providing appropriate mitigation if it is determined that existing utilities could be adversely affected.

The risk for damaging underground pipelines or utilities would be greater for buried portions of the Project including buried cable, compared with overhead lines.

Fire Hazards

Potential impacts from fire hazards would largely be avoided or minimized with implementation of routine industry safety measures, such as NESC standards. There could be an increased risk for fires during construction or operation of the Project. During construction, fire hazards could result from workers welding, operating motorized construction equipment, smoking, refueling, and operating or parking vehicles in areas with dry vegetation. Once ignited, fire could spread, causing injuries to workers or the public and damage to construction equipment, construction materials, Project facilities, private property, or wild areas in the path of the fire.

The State of New Hampshire requires that electrical utilities comply with NESC. NESC includes design criteria pertaining to the prevention of fire hazards for outdoor public utility installations. NESC Rule 152A details standards to minimize fire hazards that could result from liquid-filled power transformers and regulators installed in outdoor substations. Some of these requirements include minimizing the use of flammable liquids; regulations on space separation; and utilizing fire-resistant barriers, automatic extinguishing systems, absorption beds; and enclosures. The NESC contains numerous other provisions designed to minimize the risk of fire from structural and electrical system failures.

According to Eversource Energy's *Vegetation Clearing Procedures and Practices for Transmission Line Sections*, burning or burying of vegetation is not permitted during construction (Northeast Utilities 2008a). Burning should not be conducted in the transmission route and the vegetative load in the transmission route should be minimal due to safety practices for removing cleared vegetative material, which would further reduce the fire potential.

The Applicant would perform vegetation management during the operation of the Project which would limit the growth of vegetation proximate to the transmission line, thereby reducing fire hazards. In addition, the control and protection systems of HVDC systems are designed to detect and take appropriate corrective actions very quickly to reduce fire hazards.

As a result of measures listed above, the likelihood of a fire during either construction or operation would be minimized, but not eliminated.

Fire Support Services

Construction activities such as welding and parking vehicles over dry vegetation, transporting and handling hazardous materials, and transporting heavy equipment and materials could cause fires, hazardous material spills, or equipment/vehicle accidents. These could result in short-term impacts on emergency services.

For incidents involving hazardous material spills, emergency medical issues, or fires that require assistance not provided on site, the local first responder would be the local fire department or district.

[71] Transferred potentials occur where the change in voltage over distance is so great between a grounding installation (for the Project) and nearby non-grounded metallic structures (such as a pipeline), that a current could flow between the two points.

Fire departments are located throughout New Hampshire, but not every town along Project routes has a fire station. Most of New Hampshire operates under mutual aid associations. These associations enable local fire departments to draw upon the services of nearby communities if their resources have been depleted from fire or other disaster. The mutual aid associations operate under a statewide fire mobilization implementation plan. The plan provides a structure for the response to incidents and establishment of task forces/strike teams. (Federation of Fire Mutual Aid Associations of New Hampshire n.d.).

Although New Hampshire has a system capable of addressing fires or other accident conditions associated with the construction or operation of the Project, in the Northern Section the mutual aid associations do not cover all the communities or unincorporated areas. These areas are not part of the mutual aid associations, but they may have agreements with local fire departments. However, local fire departments do not have the same access to resources as do the mutual aid associations. In addition, there are undeveloped forested areas in the Northern Section through which the Project would pass where there is little to no infrastructure or fire support. Fires in these areas could occur without being immediately noticed and firefighting resources could be located miles away.

Safety in Roadways

Construction of the Project in and near public roadways could create an increased safety risk for the public as well as construction workers. This increased risk would be a short-term impact of construction. To protect the public during construction, the Applicant will develop a transportation management plan in compliance with NHDOT requirements and in coordination with state, federal, and local officials (see **Appendix H**).

4.1.4.2 Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities could include the same hazards as discussed for construction. Additional potential hazards during operation include EMFs, interference with an existing pipeline or utility, fallen lines or collapsed towers, lightning, extreme weather events, and fires at the transition stations, substations, or converter stations.

Electric and Magnetic Fields

Neither New Hampshire nor the U.S. federal government directly limit human exposure to DC or 60 Hz electric or magnetic fields from transmission lines; therefore, there are no specific regulatory limits for the Applicant for this Project. To provide context for discussion below, field strengths are compared against guidelines established by the International Commission on Nonionizing Radiation Protection (ICNIRP) and the Institute of Electrical and Electronics Engineers (IEEE). Both sets of guidelines are widely recognized around the world. The guidelines specify limits in two forms: basic restrictions (electric field strengths induced within the body, which are difficult to determine experimentally) and reference levels (field strengths outside the body, compliance of which would ensure compliance with the basic restrictions). The reference levels are designed to ensure compliance with the basic restrictions under worst-case exposure conditions, and thus incorporate a second level of safety (since typical exposures scenarios are not "worst-case").

The Project would generate EMFs (DC and 60 Hz EMFs) from both the HVDC and HVAC lines, which will be in addition to EMF (AC EMFs) from the existing transmission lines along the corridor. This section will describe electric fields separately from magnetic fields, because the impacts would differ. The discussion below refers to calculated maximum field levels from the Project operating at maximum load (1,200 MW, which is the design of the line under Alternatives 2 and 5b) or 1,090 MW (all other action alternatives). These field strengths do not take into account shielding of the electric fields by vegetation outside the corridor, which would reduce the electric field strengths below calculated values.

The maximum DC magnetic field generated within the transmission route in the segments where the HVDC line runs aboveground would be about 400 mG, decreasing to a maximum field of approximately 100 mG at the edge of the route and about 4 mG at a distance of 300 feet (91 m) from the center of the corridor (Exponent, Inc. 2014a). For underground segments operating at 1,200 MW the calculated maximum DC magnetic field would be 253 mG at ground level immediately above the transmission line, falling to 34 mG at a distance of 25 feet (8 m) from the line, and 0.3 mG at 300 feet (91 m) from the Project centerline. These field levels are reported as maximum for any segment. These levels are far below ICNIRP limits ($4*10^6$ gauss) and IEEE C95.6-2002 limits ($1.2*10^6$ gauss)

The underground segment of the HVDC line will produce no electric fields in the surrounding environment due to the shielding of the conductors. The DC electric fields produced by the aboveground segment of the HVDC line varies according to environmental conditions. The DC electric field strength at ground level was calculated (Exponent, Inc. 2014a) as an "ion-enhanced" field that includes the effects of corona (ionization of air near the conductors) on the electrical field strength at ground level. The maximum DC electric field within the transmission route would be 21 kV/m (ion enhanced field under foul weather condition) or 13 kV/m (fair conditions). DC lines operate at 0 Hz. ICNIRP does not specify limits on DC electric fields. IEEE C95.6-2002 gives specific limits between the range of 1-368 Hz (which are 5 kV/m for the general public and 20 kV/m for controlled environments, which are essentially occupational exposures). IEEE does not have a specific limit for DC electric fields because the safe levels for DC fields vary with environmental conditions and other factors that determine the resistance between the body and ground. It is concluded that painful spark discharges to an individual beneath the HVDC line are theoretically possible, but in practice would require an unusual combination of circumstances (insulation from ground through an extraordinarily high resistance under foul weather conditions).

Corona

An electrical discharge from a conductor caused by the ionization of surrounding gas. Corona can also result in noise impacts.

The maximum AC magnetic field from the Project is about 400 mG (center of corridor) falling to about 100 mG (edge of corridor) and about 7 mG (300 feet [91 m] from center of corridor). AC magnetic fields from the Project at all locations inside and outside of the Project corridor would comply with ICNIRP and IEEE C95.6-2002 reference levels for the general population, which are 2000 and 9000 mG respectively.

Project Corridor(s)

Area where the Project would be built, including areas of potential disturbance (e.g., laydown areas, access roads, etc.).

The maximum AC electric field strength in the center of the corridor is approximately 5 kV/m, falling to 1.7 kV/m at the edge of corridor and to 0.6 kV/m at a distance of 300 feet (91 m) from the center of the corridor. Within the transmission route the 60 Hz electric fields may exceed ICNIRP limits (reference levels) for the general public (4.1 kV/m) but will comply with IEEE C95.6-2002 limits (5 kV/m). As a result, there would be no anticipated impact as related to the AC or DC magnetic fields in any area beyond the corridor. In view of the considerable safety factors built into the ICNIRP and IEEE guidelines (exceeding a factor of 10 above exposures that are considered possible to induce adverse effects such as nerve stimulation), no adverse effects are anticipated from exposures to AC electric fields at levels present even within the Project corridor. See discussion of the noise impacts of the corona in **Section 4.1.7.2**.

These maximum field levels were calculated by taking into account the presence of the existing lines in the corridor as well as the Project. The fields from the existing line will add to those from aboveground portions of the Project. Because the Project would be the strongest source of field (either electric or magnetic) the maximum field strength in any segment of the line will chiefly reflect the fields from the Project. Much of the area surrounding the proposed new transmission route and existing PSNH transmission route is forested, which would shield a portion of the electric fields. Consequently, in forested areas the electric field strengths outside of the corridor would be lower than calculated values (Keikko, Isokorpi, and Korpinen 1999a).

As a practical matter, the recognized hazards of powerline fields arise from indirect effects, in particular from contact currents that enter the body of a grounded person who touches a large conductive object that is located in the field (microshock). A typical scenario is when a grounded worker touches a truck or other large vehicle that is insulated from ground, which in effect acts as a large antenna that picks up current from the line. These shocks would not induce harmful levels of contact in most cases.

These hazards are controlled by safe work practices (e.g., grounding large objects) and by electrical safety codes (e.g., the National Electrical Safety Code [NESC]) which directly limits contact currents and consequently indirectly limits the field strength in air beneath HVAC fields to about 10 kV/m. Grounding of HVAC transmission structures would eliminate the risk of microshocks in most cases. These limits would not exclude perceptible microshock to an individual who touches a car or truck that is parked beneath a HVAC line. The Project will be built in conformance with NESC and the maximum AC field levels beneath the line (5.2 kV/m) will be well below maximum levels that are allowed by NESC. Consequently, perceptible microshock may occur to an individual who touches a parked vehicle beneath the line; such effects would be annoying but not hazardous. Under some occupation scenarios (e.g., working on long sections of ungrounded metal pipe located within or adjacent to the transmission route) hazardous levels of contact current may be present, but safe work practices would mitigate such risks. Scenarios of this sort are not realistic for nonoccupational settings.

HVDC lines do not create indirect effects from contact currents. However, HVDC lines produce air ions due to corona that flow to ground, creating small DC currents of the order of tens of nanoamperes per square meter. These currents will induce electrostatic charges on ungrounded objects in their path, which can result in transient shocks if they are discharged through a person who touches them. The effect is similar to the static shock that one might experience when walking across a carpet in a dry room. However, the charges are dissipated through any resistance of the object to ground, even though the relatively high resistance provided by footwear or tires, and charge remaining on the object will be too low to create noticeable shocks. A review of the scientific literature uncovered no reports of harmful levels of spark discharge beneath HVDC lines and very little discussion of the effect at all—in contrast to the considerable literature on microshock beneath HVAC lines. Consequently, it is concluded from the above discussion that spark discharges beneath the HVDC segments of the Project will not represent a significant hazard, although under some circumstances individuals might perceive transient sparks if they touch large objects that are well insulated from ground beneath the HVDC lines.

Some individuals can perceive DC electric fields at the highest levels that may be present beneath the Project (21 kV/m under foul weather conditions). The sensations arise from movement of hair on the skin and are not reported as unpleasant. (Maruvada et al. 1982; Blondin et al. 1996).

The potential hazards discussed above are acute effects resulting from short term exposure to the AC or DC fields beneath high voltage power lines. A large body of scientific research exists regarding potential human health risks associated with exposure to EMFs. The most thorough, authoritative, and scientifically accepted review of the health impacts of power frequency EMFs was the Environmental Health Criteria (EHC) document of the World Health Organization (WHO) (World Health Organization 2007a), which is referred to below as the ELF-EHC. The ELF-EHC review focuses on potential non-cancer risks, but it references and updates the earlier (2002) International Agency for Research on Cancer (IARC) review of possible carcinogenic effects of ELF fields (IARC 2002a). The ELF-EHC concluded that there are “no substantive health issues related to ELF electric fields at levels generally encountered by members of the public” (World Health Organization 2007a) and that ICNIRP (and by extension IEEE C95.6-2002) limits are protective against known hazards.

The major issue related to possible health effects of transmission line fields is the possibility that long-term exposures to ELF magnetic fields at levels far below ICNIRP or IEEE reference levels may cause cancer. The ILF-EHC review concluded that while ELF magnetic fields are “possibly carcinogenic to humans,” "the evidence related to childhood leukemia is not strong enough to be considered causal" (World Health Organization 2007a). Finally, despite a scattering of other adverse health effects that are mentioned in the literature (other cancers, neurological effects for example) "the WHO Task Group concluded that scientific evidence supporting an association between ELF magnetic field exposure and all of these health effects is much weaker than for childhood leukemia. In some instances (i.e., for cardiovascular disease or breast cancer) the evidence suggests that these fields do not cause them" (World Health Organization 2007a).

A full review of recent literature on this topic is available in the **EMF Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

The possibility of interference from static or 60 Hz EMFs with cardiac implants (pacemakers and implantable cardioverter defibrillators (ICDs) has been examined by a number of researchers both in benchtop tests and in tests on humans wearing the devices. These studies have generally found that the devices function without signs of interference in AC fields up to several kV/m. However, anomalies in function, which are not necessarily related to patient safety, could sometimes be observed at field levels above about 3 kV/m (Scholten and Silny 2001a). Because AC electric fields up to 6 kV/m may be present at some locations beneath HVAC segments of the Project, one can presume that some anomalies might occur in some devices worn by people within the Project corridor as well. These anomalies, typically interference observed in internal signals stored within the devices, do not indicate a hazard to the patient, because the devices are designed with fail-safe modes of operation to accommodate such events. Pacemakers, for example, revert to an asynchronous (constant pacing rate) mode in the presence of interference.

Implantable cardioverter-defibrillators (ICDs) are designed to quickly identify a life-threatening arrhythmia and deliver therapy (a shock to the heart) to bring the heart back to normal rhythm. ICDs commonly also have pacemaker functions. The sensitivity of such devices to external electric fields varies with the settings of each particular device, which in turn depends on the condition of the patient. The most common interference problem with ICDs is "oversensing," when the device confuses electromagnetic interference with a too-fast heartbeat or fibrillation and delivers inappropriate therapy (Koneru 2011a). (In severe cases of interference, ICDs might alternatively revert to a "noise mode" that provides asynchronous pacing but renders it incapable of detecting fibrillation). Inappropriate therapy, which can occur for a number of reasons unrelated to electromagnetic interference, can be distressing and painful to the patient but occasional instances of inappropriate therapy are not life threatening.

However, in reality, incidents of hazardous interference to medical devices are very rare. A search of the literature found no evidence of harm to patients with implanted cardiac devices from exposure to fields from a high voltage power line. A review of medical literature revealed no reports since the 1980s of interference to cardiac pacemakers from fields near a transmission line. An examination of the FDA MAUDE database (a database of reports of malfunctions in medical devices, which are required to be submitted to FDA by federal law) for instances of interference to pacemakers, 58 reports of interference to pacemakers were disclosed between January 1, 1990 and April 30, 2014. Most of these were associated with medical treatment, none were associated with proximity of the patient to power transmission lines.

A review of the MAUDE database over the same period uncovered 133 reports of some kind of malfunction in ICDs related to electromagnetic compatibility, but none were associated with patient injury associated with exposures from fields close to power lines. The reported anomalies in most cases consisted of alerts from the devices or presence of interference in stored data in the devices without indication of malfunction of the devices and involved exposures unrelated to power transmission lines. None of these reports indicated death or injury to the patient, although there were some reports of inappropriate therapy (shocks to the heart). The MAUDE database includes a few reports of inappropriate therapy from use of electrical equipment (one report described inappropriate therapy delivered to a patient who was using a hot tub); a 2002 report described inappropriate therapy from use of a domestic washing machine (Kolb 2002a). One report, from December 14, 2010, concerned a patient who was "digging a hole near some buried power lines," and later examination of data stored in the ICD indicated presence of electromagnetic interference without any apparent adverse effects to the patient. One might presume that such events might possibly occur to an individual with an ICD who touches a parked vehicle within the transmission route, but all evidence indicates that such cases of inappropriate therapy induced by electromagnetic interference or leakage currents passed into the body are very rare, and they are not life threatening.

As a practical matter, manufacturers must design implanted devices with a high level of electromagnetic immunity in view of the many sources of EMFs in the environment. The expectation of device manufacturers and regulatory bodies is that "[active implanted medical devices] are expected to work uninfluenced as long as the General Public Reference levels of 1999/519/EC are not exceeded" (CENELEC Standard EN 50527). These limits are the same as ICNIRP limits (i.e., 4.2 kV/m for 60 Hz electric fields), which are similar to maximum field levels (up to 5 kV/m) beneath the Project. Rigorous standards are imposed by a number of regulatory agencies including the FDA governing the functionality of these devices in the presence of EMFs (IEC 60601-1-2 or ANSI/AAMI PC69:2007).

One recent (2015) review concluded "The limit values for the protection of humans exposed to EMFs in general public [i.e., exposure limits for the general public] assume [i.e., are designed] to protect patients with ICDs at 50/60 Hz. In contrast, strong electric, magnetic, or combined fields in certain occupational environments are capable of causing undersensing or inappropriate sensing of atrial/ventricular tachyarrhythmias. However, a correct device function can still be expected in most cases" (Napp 2014). In the Project, fields outside of the transmission route of the Project will be within limits for the general public; electric fields within the transmission route will fall below occupational limits but may exceed ICNIRP limits (reference levels) by a small fraction (e.g., 5.2 kV/m at a maximum level vs. 4.2 kV/m limit for ICNIRP).

In summary, there is no direct evidence that patients with implanted cardiac devices will suffer injury even in the comparatively high fields within the Project corridor. Under rare conditions ICDs and cardiac pacemakers may experience some effects in their operation under exposure conditions that may exist with the Project, in particular if a patient located within the transmission route touches a conductive object so as to allow electrical current to enter the body. Because of fail-safe design such events will not harm the individual. Since there appear to be no reports of such events despite many thousands of high voltage transmission lines in the U.S., this possibility remains theoretical only. A patient who merely drives across the transmission route would face no risk at all since the vehicle will shield its occupants from the electric fields. In any event, a patient with an implanted cardiac (or other active) device should follow the advice of his or her physician.

Northern Pass would develop measures during the detailed design of the Project to prevent and minimize any potential interference with other utilities, such as pipelines, telephone lines, radio, TV, etc.

The overall conclusion of this analysis is that there would be no impact of the Project due to EMFs outside of the transmission route, and minimum (and not harmful) potential impacts due to the much stronger AC electric fields that are present in some segments within the transmission route. The impacts that may occur will range from minor (microshocks from touching a vehicle parked within the transmission route) to moderate (in theory, inappropriate therapy to an individual wearing an ICD, although few if any such events have been reported to such individuals under presently existing HVAC lines). Activities that may result in an individual touching one of the conductors would be immediately life threatening.

General Worker Safety

Accidents that can occur at construction sites include heavy equipment and commuting vehicle accidents, electrocution, personal accidents (e.g., slips, trips, and falls), hazardous materials spills, construction-induced fires, and aircraft accidents. Specific health and safety risks for large-scale construction projects involving electrical components, working at height, and operating heavy machinery could include:

- Falls from working at height
- Crush injuries in excavation work
- Slips and trips
- Cuts and scrapes from sharp tools or construction materials or debris
- Receiving injuries from hand tools and/or rotating machinery
- Electrocution
- Being struck by falling objects
- Manually lifting heavy loads
- Bad working positions, possibly in confined spaces
- Being struck or crushed by a workplace vehicle
- Inhalation of dust
- Handling of rough materials
- Exposure to dangerous substances (chemical and biological)
- Working near, in, or over water
- Hearing damage from loud noises
- Sustaining injuries as a result of an on-road or off-road accident involving a motor vehicle or construction equipment.

Normal operation of the Project would create a risk for worker safety. Based on nationally reported statistics from the Bureau of Labor Statistics (BLS) in 2015, construction of power, communication, and related structures resulted in a total of 23 fatalities. The BLS also reported that non-fatal injuries are not specifically reported for construction of power, communication, and related structures, but for construction of utilities in general, there were 11,700 cases with an incidence rate of 2.4 per 100 full time workers. Nationally in 2015 during operations in the electric power generation, transmission, and distribution industry, there were a total of 15 fatalities and 7,500 non-fatal occupational injuries (incidence rate of 1.9 per 100 full-time workers) (BLS 2015a, 2015b, 2015c).

The Applicant would be required to implement OSHA's rules and it is assumed that they would follow guidelines and industry standards which are specifically designed to reduce workplace risks. Therefore, construction and operation of the Project would still have potential risks, but they would be minimized through adherence to OSHA and industry standards of practice.

Public Safety

The greatest risk to the public from transmission lines would be contact between an object or the ground and an energized line (e.g., contact with a fallen line) (BPA 2007a). Transmission lines can be brought down by storms, trees, ice, motor vehicles, or other equipment. Other hazards are lightning, extreme weather events, and potential fires from downed lines or arc flashes (where a flashover of electric current leaves its path and travels through the air from a conductor to ground, or another conductor). Arc flashes associated with high voltage transmission lines are not common under normal conditions, but may be caused by smoke from fires. Transmission systems are typically designed so that faults, such as a fallen line, would be detected and the protection and control systems would de-energize the line immediately.

The Project would be designed to minimize the risk of arc flashes to individuals walking in the transmission corridor in normal conditions. The Applicant would equip the transmission line with protective devices to safeguard the public should they come into contact with the line (see **Appendix H**). These protective devices are designed to de-energize the line should such an event occur. In addition, the Project's overhead transmission lines would be designed with shield wires to reduce the likelihood of a lightning strike to the transmission line causing a flashover from the towers to the conductors. A flashover is similar to an arc flash—electricity travels through the air and causes sparks, arcing, or noises. The shield wires would also provide protection against direct lightning strikes to the transmission line conductors. HVDC systems are typically designed so that flashovers are detected and appropriate corrective actions are taken very quickly by the protection and control systems.

Another hazard within the Project corridor is the potential for shocks. The Project would comply with NESC and health-based exposure guidelines designed to protect against harmful levels of electric shocks. Potential for harmful levels of electric shocks would largely be avoided or minimized with implementation of routine industry safety measures, such as NESC standards that would include grounding of structures.

Standards, guidelines, codes, and regulations govern the installation and operation of transmission lines and converter stations. The Applicant would use these in developing a detailed design. The detailed design of the Project has not been completed and, therefore, the exact specifications and standards that would be incorporated into the Project have not been identified. At a minimum, the Project would include all the standards required by the State of New Hampshire under Puc 306.1—Standard Practice in Construction, Operation, and Maintenance. Maintenance associated with the other aboveground, ancillary facilities (including transition stations, converter stations, and substations) would also be performed in accordance with Eversource Energy system maintenance policies and procedures (Northeast Utilities 2004a, 2008a).

Many public safety hazards associated with accident conditions of the overhead transmission lines would be reduced by burying the transmission cable. Since the transmission cable would be buried, the potential for breakage and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under alternatives with buried cable. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

Extreme Weather Events and Natural Disasters

Potential impacts as a result of extreme weather events and natural disasters would largely be avoided or minimized with implementation of routine industry safety measures, such as NESC standards. If the Project's overhead transmission lines were to be damaged during an extreme weather event or natural disaster, there could be risks to public safety. Safety measures have been incorporated into the Project design to address extreme weather conditions that occur in New Hampshire, particularly in northern New Hampshire and high elevation locations. The Applicant has incorporated three NESC design cases, Rules 250B, 250C, and 250D, for wind and ice loading into their design of the overhead transmission line. Therefore, the overhead transmission line would be constructed to satisfy all three NESC design cases related to extreme wind and temperature conditions. Rule 250B includes 0.5 inch (1 cm) of ice loading and winds of 40 mph (64 km/h). Rule 250C considers wind velocities of 100 mph (161 km/h) at 60ºF (16ºC). Rule 250D considers wind velocities of 40 mph (64 km/h) with 1 inch (3 cm) of ice and wire temperatures of 15ºF (-9ºC) (Northern Pass 2010a). The Applicant also included an additional ice loading design case for winds of 40 mph, 1.25 inches (3 cm) of ice, and a wire temperature of 15ºF (64 km/h, 3.2 cm, and -9ºC).

Implementation of these measures should reduce the potential for downed wires due to winds and ice loading, thus reducing the potential for power outages or for the public to come in contact with downed lines. Although there are no means of preventing lightning strikes, safety measures, including shield wires, are incorporated into transmission line design to prevent flashovers or power surges due to lightning strikes. These measures would decrease the likelihood of the adverse effects on health and safety due to lightning strikes.

However, when severe or extreme weather events occur, it may be necessary to implement action measures to protect the public from damaged structures and conductors, repair structures and conductors, and return the facility to normal operation as soon as practicable given the severity of conditions. Thus, adverse safety impacts would be short-term and localized until facilities are repaired and returned to normal operation.

The use of underground cable would avoid these risks. Technical specifications would consider ambient air temperatures, ground temperature, and frost depth to identify the appropriate depth of burial and minimize risks resulting from weather.

Intentional Destructive Acts

The DOE considered the potential effects of intentionally destructive acts and other potential causes of transmission line structural failure. Failures of the transmission line due to accidents could occur as a result of intentionally destructive acts by third parties, or other unforeseeable instances. The transmission line, proposed Franklin Converter Station, North Road Converter Station, Deerfield Substation, and other associated infrastructure could be subject to physical attacks. In accordance with the APMs, the substation facilities would have appropriate signage and access would be limited to authorized personnel. In addition, the transition stations, substation, and converter station would be fenced which would provide a level of protection against physical attacks; however, the transmission line and structures would be unfenced and, therefore, more vulnerable to attacks (see **Appendix H**).

Although it is not possible to predict whether acts of terrorism or sabotage events would occur, or the nature of such events if they did occur, DOE has considered the potential for events involving terrorism, sabotage, or criminal mischief that could result in health and safety impacts to workers and members of the public. Sabotage of onsite equipment or placement of explosive devices that could disrupt the Project is a remote possibility. Impacts to health and safety from intentional destructive acts would be unlikely to be greater than the potential impacts from events involving extreme weather. Intentionally destructive acts could include firearm use near the Project, including shooting at Project components. This activity could result in fires, electrical hazards, personal injury, or death to people in the area. A terrorist cyber-attack could potentially impact operating and communications systems leading to a disruption in service. Although such an attack is possible, it would not create a health and safety risk, but could potentially impact the local energy system and grid.

While the likelihood of acts of terrorism are relatively low, other mischievous or criminal acts of theft or vandalism are more likely, and would generally pose lower safety risks. Theft of tools, equipment, and construction materials is a relatively common occurrence at large sites, especially when spread across large geographic areas where security is more difficult to maintain. Impacts could result in schedule and cost delays to the construction effort, or could result in a loss of electrical service to some areas for a period of time. Although the possibility of some theft or vandalism is considered possible, related health and safety impacts to workers or the public are negligible from such events.

In general, the Project presents no greater target for intentionally destructive acts than any other high-voltage transmission lines or power plants in the U.S. Although the likelihood of intentional destruction of the Project is difficult to predict, such acts are unlikely based on past experience along the thousands of miles of electrical transmission lines in the country. If such an act were to occur and to succeed in destroying aboveground infrastructure or other equipment related to the Project, the main consequence for the public would be the temporary loss of 1,200 MW or 1,090 MW, depending on the alternative, of electrical service in the ISO-NE region.

4.1.5 TRAFFIC AND TRANSPORTATION

Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.5, 4.3.5, 4.4.5,** and **4.5.5**. **Table 4-56** summarizes the number of roadways within the Project study area and the number of miles (km) of the Project that would be buried in roadway corridors.

Table 4-56. Summary of Potential Traffic and Transportation Impacts – Roads within Study Area and Miles (km) Buried in Roadway Corridors

Alternative	Roadways within Study Area					Miles (km) Buried in Roadway Corridor
	Interstates	US Highways	State Highways	Local Roads	Total	
1 (No Action)	--	--	--	--	--	--
2	3	5	22	186	216	6 (10)
3	3	5	22	186	216	6 (10)
4a	3	6	22	440	471	173 (278)
4b	3	6	25	499	533	188 (303)
4c	3	6	22	574	605	179 (288)
5a	3	5	22	208	238	26 (42)
5b	3	5	22	199	229	19 (31)
5c	3	5	22	247	277	31 (50)
6a	3	5	22	413	443	137 (220)
6b	3	5	25	472	505	152 (245)
7 (Proposed Action)	3	5	24	283	315	58 (93)

4.1.5.1 Impacts from Construction

Project construction would have the potential to adversely impact transportation. These direct and localized impacts would consist of physical damage to roadways and infrastructure from the movement of oversized vehicles and other construction vehicles and short-term physical alteration of road lanes, intersections, and corridors for the burial of transmission cables. Other localized impacts to transportation would result from short-term closures of roadways, precluded access to private land, and delays resulting from increases in construction vehicle trips.

Impacts from the burial of transmission cables within roadway corridors have the potential to be more regional—affecting a greater number of commuters and travelers and resulting in longer travel delays on roadways with higher traffic volumes. Highways with the greatest traffic volumes where the transmission cable would be buried in the roadway corridor are I-93 in Holderness, Ashland, Meredith, and Tilton, NH in the Central Section and I-93 and I-393 in Concord, NH in the Southern Section. **Table 4-57** demonstrates the length each alternative would be buried within the I-93 or I-393 roadway corridors. Impacts to these roadways would be minimized with the implementation of APMs (see **Appendix H)**, including the implementation of a transportation management plan for traffic control.

Table 4-57. Traffic and Transportation Impacts – Miles (km) Buried Within the I-93 or I-393 Corridors

Alternative	Miles (km) Buried Within the I-93 or I-393 Corridors
1 (No Action)	0
2	0
3	0
4a	83 (134)
4b	71 (114)
4c	46 (74)
5a	21 (34)
5b	0
5c	0
6a	52 (84)
6b	40 (64)
7 (Proposed Action)	0

Project components such as tower and overhead transmission lines that are too tall have the potential to conflict with the safe operation of public airports and could represent a potential collision hazard to aircraft during landing and takeoff. Structures in close proximity to an airport also have the potential to cause electronic interference with navigational equipment. Tower and overhead transmission lines may also impact flight patterns of low flying aircraft especially in areas where aerial applications of fertilizer or pesticides are used (such activities are uncommon in the study area).

Aboveground structures that would have a height exceeding the imaginary slope from an airport runway designed to evaluate obstructions would require the Applicant to file notice with the FAA (14 CFR § 77.9). Potential impacts to air traffic would be localized and long-term; however, with the implementation of APMs contained in **Appendix H** that include communicating with the FAA, impacts to airfields and air traffic would be avoided or minimized

Vehicles and equipment (e.g., overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) could damage roads and bridges, shortening the life of the pavement and eventually leading to rutting and cracking. This would be especially true for heavy equipment, which does more damage to road surfaces than lighter passenger vehicles. Roadway use permits must be obtained from the NHDOT when the truckload limits would be exceeded (NHDOT 2007a). These roadway use permits or similar documents would stipulate the party responsible for the repair of damage to roadways and structures caused by the Project.

Construction of components, such as overhead lines, that cross public roadways may require that roadway access to private land be temporarily limited. The implementation of standard BMPs for traffic control would ensure that impacts to access to existing private lands are minimized; BMPs may include halting construction activity to allow queued vehicles to pass and developing a detailed construction and mitigation plan with local officials where roadways would be temporarily closed. Therefore, adverse impacts that may occur from temporary delays in access to private lands would be localized and short-term. Restrictions on roadways are expected to occur where the Project would cross roadways, such as during the installation of transmission lines over a roadway, and may result in short-term reductions in speed or lane closures. These restrictions are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. It is expected that construction activities for the burial of transmission cables in roadway corridors would require the short-term closure of one roadway lane. This would allow a minimum of one lane to be open for vehicles passing through the construction area; however, stops in traffic flow for short durations may still occur in the open traffic lanes. Burial of the transmission cable in a roadway corridor would also result in a short-term closure of other roads that cross the Project.

Impacts to roadways would be avoided or minimized with the implementation of APMs (see **Appendix H)**, including the implementation of a transportation management plan for traffic control and the scheduling of heavy truck deliveries during off-peak hours to the extent practical. This may include halting construction activity to allow queued vehicles to pass and developing a detailed construction and mitigation plan with local officials where roadways would be temporarily closed. Impacts to traffic patterns due to potential roadway closures would result in short-term, localized inconvenience or delay and would not likely interrupt overall area traffic patterns and flow.

Construction laydown yards for the Project are likely to have localized adverse impacts on traffic volumes from construction vehicles using public roadways to access the Project corridor. Construction vehicles would be expected to use designated access roads to access the Project corridor. However, it was assumed in this analysis that each construction vehicle would generate one round trip on non-access roads intersecting the disturbance area—a one-way trip to access the Project corridor initially, and a one-way trip to leave the Project corridor upon completion. Additional trips may take place on designated access roads for the duration of construction.

4.1.5.2 Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on public roadways that may occur during operation would be similar to those occurring during construction but would be more localized, require fewer vehicles, and would occur for a shorter duration. The Project would be inspected regularly, as necessary, using fixed-wing aircraft, helicopters, ground vehicles, All-Terrain Vehicles (ATVs), and/or personnel on foot. The requirement for these inspections is included in the further amended Presidential permit application, in accordance with Eversource Energy's system maintenance policies and procedures (Northern Pass 2013a, 2015). For underground alternatives, maintenance and emergency repairs would not require inspection by fixed-wing aircraft or helicopter and would last for a shorter duration. Maintenance of facilities would be performed as needed. Applicable federal and state permits would be obtained prior to conducting maintenance as needed.

Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H** that would include implementing a transportation management plan applicable to operation, maintenance, and emergency repairs. The transportation management plan would describe measures designed to avoid and/or minimize adverse effects associated with the existing transportation system, including roadway damage or safety hazards that may occur due to vehicle weight or size. Therefore, any adverse impact on public roadways that may occur during operation and maintenance would be short-term and would be minimized through the application of APMs.

4.1.6 LAND USE

Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.6, 4.3.6, 4.4.6,** and **4.5.6.**

Table 4-58 summarizes impacts to land use for each alternative.

Table 4-58. Summary of Potential Land Use Impacts

Alternative	Land Use Conversion acres (ha)	Forest Plan Standards Inconsistencies
1 (No Action)	--	--
2	454 (184) non-developed to Developed, Open Space	1) Forest-wide, Recreation General Standard S-2, 2) MA 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2, 3) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1, and 4) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2
3	454 (184) non-developed to Developed, Open Space	--
4a	28 (11) non-developed to Developed, Open Space	--
4b	28 (11) non-developed to Developed, Open Space	
4c	28 (11) non-developed to Developed, Open Space	--
5a	454 (184) non-developed to Developed, Open Space	--
5b	454 (184) non-developed to Developed, Open Space	1) MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1
5c	454 (184) non-developed to Developed, Open Space	--
6a	28 (11) non-developed to Developed, Open Space	--
6b	28 (11) non-developed to Developed, Open Space	--
7 (Proposed Action)	454 (184) non-developed to Developed, Open Space	--

4.1.6.1 Impacts from Construction

Land Use and Land Cover

Construction of the Project would convert non-developed land in areas of new transmission route outside of roadway corridors to a use of Developed, Open Space, as defined by the NLCD (see **Table 3-5** in **Section 3.1.6.1**). These areas of new transmission route outside of roadway corridors are primarily found in the Alternative 2 alignment in the Northern Section. While forested and shrub lands surrounding the Project corridors of the alternatives in this alignment (Alternatives 2, 3, 5a, 5b, 5c, and 7) would be maintained, the conversion of undeveloped lands in the transmission route could impact some of the values of the surrounding forested and shrub lands for wildlife, plants, watershed, recreation, and biodiversity, particularly with respect to fragmentation. Undeveloped agricultural lands surrounding the Project corridor could also continue their current use during and following construction, but the presence of the transmission line could affect farm operations and increase costs for the farm operator. Specific impacts depend on the type of farming, but the presence of the transmission lines could affect field operations, irrigation, aerial spraying, wind breaks, and future land uses. Any impacts to agricultural production would be minimized though the implementation of the APMs contained in **Appendix H**.

Areas of new transmission route within roadway corridors would not experience a land use conversion, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Portions of the Project located in existing transmission routes would also not experience a land use conversion, as these areas would continue their existing use as transmission routes.

Construction of the transmission line could temporarily disrupt (i.e., disturb, interrupt, or change) the normal routines of the residential and commercial uses along the currently developed portions of the Project corridors (e.g., towns and residences) due to limitations on property access from the presence of construction work areas and equipment and associated lane closures (see **Section 4.1.5** for a discussion of traffic and transportation impacts). These impacts would last only for the duration of construction. This analysis assumes the implementation of standard construction BMPs such as establishing the construction schedule to minimize disruption to any identified competing land uses along the corridor, providing timely information to adjacent property owners or tenants regarding construction activities and schedules, and coordinating with NHDOT and local officials before and during construction activities as appropriate, as outlined in **Appendix H**. The presence of the transmission route would likely reduce the development potential of lands, but given the scale of these impacts, any impact to lands with high development potential would be localized.

In areas with overhead or underground transmission lines within a new transmission route, the Applicant must obtain legal authorization to access private property (e.g., via purchase or securement of an easement) or other appropriate interest or rights to use public lands (via SUP or other use and occupancy permits) that would accommodate construction, maintenance, inspection, and emergency repair activities. Property owners granting the use of portions of their lands for the transmission route may be prohibited from taking action on that land that would damage or interfere with the Applicant's legally-defined corridor maintenance, inspection, and emergency repair activities, in accordance with the terms of any agreement that may be negotiated. Therefore, operation of the Project would limit the future use of some property for the lifespan of the transmission line. Property owners would receive compensation from the Applicant for this loss of use. See **Section 4.1.2** for more information regarding potential impacts on property values. Portions of the Project in the existing PSNH transmission route are already subject to these restrictions in use within the existing PSNH transmission route; thus, no further impacts to land use in the existing PSNH transmission route are anticipated.

Construction activities associated with the installation of the underground transmission cable in public roadway corridors (including under the road surface or adjacent to the road surface, as appropriate) would result in short-term disturbances that disrupt existing road operations, such as roadway lane closures or reduced shoulders, and presence of heavy equipment and construction. Construction of portions of the Project underground within a roadway corridor would temporarily disrupt normal routines of land uses along the route due to limitations on private property access and the presence of construction work areas and equipment. Disturbance of surface features (e.g., landscaping, street pavements, curbs, sidewalks, and other features) or underground infrastructure (e.g., utilities such as water and gas services) may temporarily disrupt the use of these features in the immediate area where construction is occurring. These impacts would last only for the duration of construction in that area. All surface features and underground infrastructure disturbed during construction would be restored to their pre-construction condition upon completion of installation. There would be no permanent land use conversions in these locations, as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Construction of the Project in areas with underground transmission within a roadway corridor would impact lands that have been experiencing development activity. These impacts would be short-term only because the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

While forested and shrub lands surrounding the Project corridor would continue their current use, the conversion of lands in the Project corridor could impact some of the values of the surrounding forested and shrub lands for wildlife, plants, watershed, and recreation. Construction of the Project in areas with underground transmission within a roadway corridor would create some disturbance in these areas, but would not be expected to result in long-term impacts to the values of the surrounding undeveloped lands. Additionally, there would not be any permanent land use conversions because the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Impacts to land use would be minimized though the implementation of the APMs contained in **Appendix H**, which include coordination with communities in the construction of the underground portion of the Project.

Conservation Lands

Conservation lands within a transmission route could experience deterioration of landscape character, fragmentation of wildlife habitat, impacts to stream health, riparian habitat, wetlands, and vernal pools, and effects to the recreation experience. These impacts would be greater in areas not currently affected by an existing transmission route. The conservation lands within the existing PSNH transmission route are already impacted by the presence of the existing transmission line. A new transmission line in the transmission route could have additional incremental effects to conservation values (including aesthetics, wildlife, water resources, recreation, etc.) on the parcels. Conservation lands in roadway corridors are similarly impacted by the presence of a road. Detailed discussions of impacts to each of these resources are addressed for each alternative under each geographic section.

For all alternatives, construction activities would temporarily affect the conservation lands in the Project corridor, which may have a short-term impact on the aesthetic, wildlife, water, and recreation values of these parcels. This analysis assumes the implementation of standard construction BMPs.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the study area; thus, there would be no impacts to federal Wild and Scenic Rivers resulting from the Project. There are eligible federal Wild and Scenic Rivers and State-protected rivers (designated in RSA 483; New Hampshire Rivers Management and Protection Program. NH Rev. Stat. §483) located in the study area. Potential impacts to these rivers are discussed specifically in each geographic section (see **Sections 4.2.6**, **4.3.6**, **4.4.6**, and **4.5.6**).

Rights-of-Way

The impacts associated with ROWs are procedural rather than environmental, meaning they relate to law, regulation, or policy, rather than the human or biological environment. Implementation of the Project would require the negotiation of easements, SUPs, and other property right transfers, as appropriate.

New and Existing Transmission Routes

As discussed in **Section 3.1.6.3**, the Project corridors are permitted through of a combination of means. For portions of the Project located overhead in the existing PSNH transmission route, all existing easements allow for overhead transmission and would not require any amendment for construction of the Project. For portions of the Project located underground in the existing PSNH transmission route, many of the easements do not allow underground transmission and would need to be amended.

Some portions of the Project would be located in a new transmission route under all Alternatives. All agreements for the Project within new transmission routes outside of public roadways provide the ability to construct, operate and maintain the Project as either an overhead or underground transmission line. It is anticipated that new agreements negotiated with private landowners would be bilateral and the Applicant and landowner would mutually agree to the agreement provisions. In these cases, the landowner would be provided financial compensation for providing the Applicant with the right to construct the transmission line on their property and for future access to the property to conduct maintenance, inspections, and emergency repairs.

As existing roads do not necessarily contain existing transmission lines, a new transmission route would be created in locations where the Project would be constructed underground within existing roadway corridors. The Applicant would be required to secure an authorization in order to construct the Project within any roadway corridor. Areas of the Project located within a federal-aid or direct federal highway ROW would require that the FHWA and the NHDOT review and make a decision on the application, making these projects subject to the provisions of the NHDOT Utility Accommodation Manual. Areas of the Project located within a NHDOT ROW would be reviewed by NHDOT and are also subject to the provisions of the NHDOT Utility Accommodation Manual. Local roads that do not fall under the jurisdiction of NHDOT would be subject to approval by a local board of selectmen or others having jurisdiction over the issuance of such authorizations. Areas of the Project located with the WMNF would need to obtain a special use authorization from the USFS in order to install a transmission cable in a roadway corridor.

Road Crossings

Construction of the Project (including both overhead and underground portions) proximate to roadway corridors would result in impacts to traffic and transportation (see **Section 4.1.5**). Any transportation and access-related impacts to land use would be minimized though the implementation of the APMs discussed in **Appendix H**, which include the use of a transportation management plan developed in compliance with NHDOT requirements and in coordination with state, federal and local officials.

Construction of underground portions of the Project could have additional impacts to roadway corridors, but all surface features (e.g., landscaping, street pavements, curbs, sidewalks, and other features) and underground infrastructure (e.g., utilities such as water and gas services) disturbed during construction would be restored to their pre-construction condition upon completion of transmission cable installation.

Road crossings listed in this analysis do not include the roadway corridors in which the Project would be longitudinally buried.

4.1.6.2 Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to land use, land cover, and conservation lands would be expected from periodic maintenance inspections of the transmission route because these activities primarily consist of passive visual or instrument assessments of conditions, which would not create any disruptions to adjacent land uses. If necessary, emergency repairs could result in impacts similar to those described for construction of the Project, but for a shorter duration and within a smaller area, depending on the nature of the emergency. If emergency repair activities were required in a residential area or at roadway, these activities could temporarily conflict with existing uses during the repair, resulting in a short-term disturbance.

The ongoing presence and operation of the underground road crossings and/or the ongoing longitudinal presence and operation of the Project within a roadway corridor would potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. The Project (including construction, operation, maintenance, and emergency repairs) would impact NHDOT's ability to maintain these roadway corridors. The presence of underground cables within the roadway corridor would complicate future activities in the ROWs.

Conservation Lands

The ongoing presence and operation of the Project could have an impact on conservation values on the conservation lands each alternative passes through outside of a public roadway corridor. Conservation lands could experience deterioration of the landscape character of the parcel (see **Sections 4.1.1, 4.2.1, 4.3.1, 4.4.1, and 4.5.1** for more information regarding potential impacts to visual resources). Fragmentation of wildlife habitat and/or the subsequent disruption of terrestrial and aquatic species could affect conservation lands with wildlife habitat values (see the **Sections 4.1.11, 4.2.11, 4.3.11, 4.4.11, and 4.5.11** for more information regarding potential impacts to wildlife). Impacts to stream health and the functions and values of surface hydrology, riparian habitat, wetlands, and vernal pools could affect conservation lands with wetlands and hydrologic resource values (see **Sections 4.1.13, 4.2.13, 4.3.13, 4.4.13, and 4.5.13** for more information regarding potential impacts to water resources). The ongoing presence and operation of the Project in the Northern Section could physically and/or visibly impact the recreation experience on conservation lands with recreation values (see **Sections 4.1.3, 4.2.3, 4.3.3, 4.4.3, and 4.5.3** for more information regarding potential impacts to recreation). Impacts to conservation lands would be greatest in areas of new transmission route (outside of a public roadway corridor), which are found primarily in the Northern Section. Impacts would be less where conservation lands are already impacted by the presence of the existing transmission line, but a new transmission line in the transmission route is expected to have some incremental effects to the conservation values on the parcels, particularly where the line would be overhead transmission.

Where the Project would be located within a public roadway corridor, no long-term impacts to the conservation values of the conservation lands are expected from the ongoing presence and operation of the Project, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

4.1.7 NOISE

Currently, there are no applicable quantitative noise standards for the State of New Hampshire, or any of the counties that the alternatives cross through.

Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.7, 4.3.7, 4.4.7,** and **4.5.7. Table 4-59** summarizes noise impacts for each alternative.

Table 4-59. Summary of Potential Noise Impacts

Alternative	Audible Corona Noise Level (dBA) During Operations			Exceed EPA Guidance Level of 55 dBA
	HVDC Transmission Line (below conductors)	345 kV AC Transmission Line (below conductors)	345 kV AC Transmission Line (150 feet [46 m] from centerline)	
1 (No Action)	--	--	--	--
2	28	44	36	No
3	No audible corona noise associated with underground lines			
4a	No audible corona noise associated with underground lines			
4b	No audible corona noise associated with underground lines			
4c	No audible corona noise associated with underground lines			
5a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
5c	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6a	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
6b	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			
7 (Proposed Action)	Overhead portions would be identical to Alternative 2; No audible corona noise associated with underground lines			

4.1.7.1 Impacts from Construction

The construction of HVDC and HVAC transmission lines or underground transmission cables, access roads, and associated facilities would cause short-term, adverse noise impacts to those in the vicinity, particularly sensitive noise receptors located within 50 feet (15 m) of the construction activities. Without mitigation, these impacts at 50 feet would be expected to be above USDOT guidelines and beyond 50 feet, noise levels would fall below USDOT guidelines. USDOT guidelines are used as a benchmark for determining noise impacts in the absence of noise standards for the state or counties (FTA 2006). Most of these impacts would occur during daylight hours (generally 7:00 a.m. to 7:00 p.m.) and would be short-term. Some construction activities, such as blasting, would result in high noise levels that could adversely affect normal residential uses; however, these adverse effects would be intermittent and of very short duration. Construction noise would also result in effects to nearby recreational areas, creating a short-term elevated noise levels above 90 dBA which may result in irritation to those involved in outdoor recreational activities at those locations.

Noise levels resulting from construction equipment are dependent on several factors, including the number and type of equipment operating, the level of operation, and the distance between sources and receptors. The loudest equipment used during construction would contribute to a composite average or equivalent site noise level. Based on typical construction equipment to be used and noise emission data and usage factors from the Federal Highway Administration (FHWA) Construction Noise Handbook, a commonly accepted reference for construction equipment noise levels, a composite noise level for all construction activities at 50 feet (15 m) from the centerline of the transmission line was estimated. When adjusted for quantity of equipment and utilization factor, the estimated composite noise level without APMs is 88 dBA for burying cable, 87 dBA for vegetation clearing, 91 dBA for structure foundation construction, 96 dBA for structure assembly, and 96 dBA for wire stringing. The estimated composite noise level for all construction activities at 50 feet (15 m) from the center of the converter stations is 93 dBA for site preparation, 91 dBA for station foundations, and 95 dBA for station construction. The estimated composite noise level for all construction activities at 50 feet (15 m) from the center of the transition stations is 89 dBA for site preparation, 89 dBA for station foundations, and 87 dBA for station construction. Although these levels are temporary, they would all be well above the existing noise levels in the study area. For a comparison of noise levels, see Table 2 of the **Noise Technical Report** which lists typical sound levels measured in the environment and industry (http://www.northernpasseis.us/library/final-eis/technical-reports).

In addition, noise from trucks, commuter vehicles, and other on-road equipment, which would mainly be along streets and access roads, would produce peak levels of approximately 84 dBA at 50 feet (15 m) from the source (FHWA 2006a). Construction activities would generally occur during daylight hours (e.g., 7:00 a.m. to 7:00 p.m.) (see **Appendix H**). Thus, noise generated by construction activities would typically occur during the time period governed by USDOT daytime construction noise guidance, which covers 7:00 a.m. to 10:00 p.m.

Currently, there are no applicable quantitative noise standards for the State of New Hampshire, or any of the counties that the alternatives cross through. Some of these potential noise levels (discussed above) are above the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area, which is used as a benchmark for determining noise impacts (FTA 2006a). Based on these noise levels, it is likely that there would be short-term, localized noise impacts related to overhead line construction. With the application of APMs (see **Appendix H**), such as the implementation of a blasting plan, coordination with community officials, and utilization of the construction equipment manufacturers' stock sound muffling devices, the noise levels would be expected to fall below USDOT guidelines.

4.1.7.2 Impacts from Operations, Maintenance, and Emergency Repairs

Aboveground Portions

The audible corona noise level contribution from the overhead HVDC transmission line would be about 28 dBA for someone standing beneath the transmission line during fair weather. This would be lower than daytime and nighttime ambient noise levels for the five land use categories presented in **Table 3-6.** The levels would be lower as one moves away from the conductors and would also be lower during foul weather. For the 345 kV HVAC transmission line, the audible noise would be about 44 dBA beneath the conductors during foul weather, dropping off to about 36 dBA at a distance of 150 feet (46 m) from the tower centerline. Audible noise from the 345 kV AC transmission line would be comparable to nighttime ambient noise levels experienced in low-density urban residential, open space park, and suburban land uses (Category 1), and the noise levels would be lower than daytime and nighttime ambient noise levels for the remaining land use categories in **Table 3-6**. During fair weather, the levels would be less than 30 dBA beneath the conductors. The audible noise due to the corona effect would not exceed the EPA guidance level of Ldn of 55 dBA for outdoor areas beyond the transmission route (EPA 1974).[72]

> **Corona Effect**
>
> The ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. The corona discharge occurs at the conductor surface, representing a small dissipation of heat and energy in the form of local pressure changes that may result in audible noise. The corona discharge generates audible noise during operation of transmission lines and substation equipment and this noise is generally characterized as a crackling or hissing sound that may be accompanied by a 120 Hz hum.

Additional noise may be generated by wind blowing through transmission wires, also known as aeolian sound. This may result in noise resulting from vibrations of wires during high winds.

Ongoing maintenance activities under the Project would include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. In addition, Northern Pass would periodically conduct visual inspections of the transmission lines via helicopter. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized. These operational noise sources could also cause short-term, adverse effects to nearby outdoor recreational uses. Additionally, noise generated by the Project could impact wildlife, see **Section 4.1.11**. Operational noise could have indirect impacts to property values; however, impacts to property values are largely attributed to the perceived health hazards and potential adverse aesthetic impacts (see **Section 4.1.2**).

Underground Portions

There would be no long-term noise impacts resulting from the operation of underground cables. There would be some short-term noise impacts resulting from maintenance and repair activities, including vehicles.

Converter Stations

Noise levels due to the operation of the Franklin Converter Station were estimated based on typical converter station equipment and a typical converter station layout. The estimated noise level at the nearest receptor to the Franklin Converter Station (a residence at approximately 200 feet) could range from 45 to 58 dBA depending on station layout, equipment, and orientation. Noise levels due to the operation of the North Road Converter Station were estimated based on typical converter station equipment and a typical converter station layout. The estimated noise level at the nearest receptor to the North Road Converter

[72] Ldn refers to the Day Night Average Sound Level—the average equivalent sound level over a 24-hour period, with a 10 dBA penalty added for noise occurring during the nighttime hours between 10:00 p.m. and 7:00 a.m.

Station (approximately 780 feet) could range from 41 to 55 dBA depending on station layout, equipment, and orientation.

The audible noise requirements will be considered in the detailed Project design and the station will be designed to meet the requirements.

4.1.8 HISTORIC AND CULTURAL RESOURCES

This section describes the potential impacts to historic and cultural resources in the study area. As explained in **Section 3.1.8**, DOE is conducting its Section 106 review in coordination with its NEPA review. The information arising out of the Section 106 process informs this final EIS. For more information about the Section 106 process and the definition of the APE (the study area), see **Sections 3.1.8.1** and **3.1.8.2**, respectively. DOE has initiated its Section 106 review with the NH SHPO and VT SHPO and has been consulting with both SHPOs in a manner appropriate to the nature of the undertaking and its effects on historic properties. Further, ACHP is consulting in the Section 106 consultation for this Project. DOE is also consulting with a number of organizations and individuals under 36 CFR § 800.2(c)(5) as well as with the applicant (36 CFR § 800.2(c)(4)). DOE has also determined that it will involve the public through its NEPA review process to comply with the public participation requirement of the Section 106 implementing regulations (36 CFR Part 800) and provide the public with information about DOE's Section 106 consultation through the Section 106 Consultation Page for this project: http://www.northernpasseis.us/consultations/section106/. **Section 1.5** describes the public involvement in this process.

For this Section 106 review, 67 entities comprising federal agencies, tribal organizations, state agencies, local governments, historical organizations, non-governmental organizations, the Applicant, and individuals are participating as consulting parties. Additional details about participating consulting parties are available in **Appendix K**. Several consulting party calls and meetings were held to inform the identification of historic properties and the development of the Section 106 PA; additional consulting party input will continue to be integrated throughout DOE's Section 106 review.

The APE has been defined in consultation with the NH SHPO, VT SHPO, USFS, USACE, and additional consulting parties. For more information regarding the definition of the APE, see **Section 3.1.8.2 and Appendix K**.

DOE, in consultation with the SHPOs, USFS, USACE, and additional consulting parties, has undertaken identification of cultural resources and historic properties within the APE for the Project which informs this cultural resource assessment in accordance with NEPA (40 CFR § 1502.16(g)).

As described in **Section 3.1.8.3**, DOE conducted the following for the Project:

- An archaeological investigation of the direct APE to identify archaeological resources and archaeologically sensitive areas
- A field reconnaissance survey to record those architectural resources visible from public roads within the indirect APE
- An architectural inventory which noted previously and newly identified architectural or other aboveground/built resources within the indirect APE that included historic contexts for the portions of the towns crossed by the APE and identified architectural resources that would require further investigation and/or evaluation
- Development of a ZVI to identify historic properties and consider the potential impacts and effects on historic architectural resources

Consultation is ongoing and DOE has developed a draft Section 106 PA, in accordance with 36 CFR § 800.14(b), to address the complexity regarding the identification of historic properties within the APE and the uncertainty regarding the assessment and treatment of effects from the Project on historic properties. Additional archaeological and architectural investigations will be conducted in accordance with the terms of the Section 106 PA that can be found in **Appendix K** of this EIS.

Phase IB investigations undertake intensive, systematic field-testing of areas identified as archaeologically sensitive during Phase IA. Consistent with NHDHR's recommendations, Phase IB investigations will be conducted for any newly identified archaeological sites or archaeologically sensitive areas that have been identified in the direct APE, or known resources for which Phase IB archaeological investigations have not previously been conducted. As discussed in **Section 3.1.8.3**, Phase IB archaeological investigations include detailed surface and subsurface investigations to identify cultural remains, delineate site boundaries, and where possible, evaluate and make recommendations regarding NRHP eligibility or the need for additional Phase II archaeological investigations to evaluate NRHP eligibility. These Phase IB and/or Phase II investigations will be completed for any alternative that may be selected or approved for the Project and would be required prior to construction.

Listing in the NRHP provides formal recognition of a property's historical, architectural, or archeological significance based on national standards. The NRHP is authorized by the NHPA (54 U.S.C. § 300101 *et seq*.) and implemented in accordance with 36 CFR Part 60 – National Register of Historic Places. To be considered eligible for the register, a historical or cultural resource must meet the National Register Criteria for Evaluation (NPS 1997a). Historic and cultural resources are considered to be NRHP-eligible, and, therefore, historic properties, if they display the quality of significance in one or more of the following areas: American history, architecture, archaeology, engineering, or culture. Determining NRHP eligibility involves examining a property's age, integrity, and significance. Generally, a property must be at least fifty years old and appear much the way it did in the past.

The historic or cultural resource also must possess integrity of location, design, setting, workmanship, feeling, and association, and generally have to meet one of the following four NRHP criteria (NPS 1997a):

- Criterion A – properties that are associated with the events that have made a significant contribution to the broad patterns of American history; or
- Criterion B – properties that are associated with the lives of persons significant in our past; or
- Criterion C – properties that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- Criterion D – properties that have yielded or may likely yield information important in prehistory or history.

NRHP eligibility has not yet been determined for all historic and cultural resources identified in Project-specific surveys to date; this determination would occur prior to construction, in accordance with the Section 106 PA (see **Section 1.6** and **Appendix K)** for the proposed Project that also addresses any project changes (e.g., route, design, construction methods), including after a final route has been selected or potentially approved by the appropriate siting authorities (see **Section 1.7)**.

Historic and cultural resources, which refer to both archaeological and architectural resources in this document, would be affected by the Project. Specific effects to each geographic section, including NRHP-eligible sites, are discussed in more detail in **Sections 4.2.8**, **4.3.8**, **4.4.8**, and **4.5.8**.

4.1.8.1 Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Both short- and long-term adverse impacts to archaeological resources (or sites) and archaeologically sensitive areas from construction of the Project would potentially result from surface and subsurface ground disturbance. Any archaeological sites that are identified as a result of further pre-construction archaeological investigations of the archaeologically sensitive areas along the sited transmission route would be subject to the same types of impacts from construction activities, discussed below. Proposed APMs to avoid, minimize or mitigate adverse effects to archaeological resources have been developed by Northern Pass and are listed in **Appendix H**.

Table 4-60 summarizes the number of archaeological resources potentially impacted during construction.

Table 4-60. Summary of Potential Impacts to Archaeological Resources – Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	
2	49	--	--	49
3	49	--	--	49
4a	30	--	--	30
4b	35	--	--	35
4c	36	--	--	36
5a	44	--	--	44
5b	52	--	--	52
5c	57	--	--	57
6a	36	--	--	36
6b	41	--	--	41
7 (Proposed Action)	43	--	--	43
AC System Support Projects	6	--	--	6

Source: Claesson et al. 2014a, 2015a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

Table 4-61 summarizes the number of archaeologically sensitive areas potentially impacted during construction.

Table 4-61. Summary of Potential Impacts to Archaeologically Sensitive Areas – Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	254	150 (61)
3	254	109 (44)
4a	174	125 (51)
4b	216	118 (48)
4c	270	120 (49)
5a	233	136 (55)
5b	252	145 (59)

Table 4-61. Summary of Potential Impacts to Archaeologically Sensitive Areas – Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
5c	273	140 (57)
6a	198	158 (64)
6b	241	161 (65)
7 (Proposed Action)	308	123 (50)
AC System Support Projects	45	--

Source: Claesson et al. 2014a, 2015a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

Architectural Resources

Construction activities would have the potential to result in short-term, adverse visual impacts on architectural resources for the duration of construction activities. These visual impacts would have the potential to temporarily alter the setting of these architectural resources, as well as temporarily alter views of and from these resources.

In addition, construction activities would have the potential for long-term, adverse effects on architectural resources that are located within disturbance areas and which are removed or damaged during construction. For example, blasting that may be necessary as part of construction activities at some locations would have the potential to result in long-term, adverse effects on architectural resources. These impacts could result in alterations to structural integrity if resources are located in areas where geological conditions facilitate the travel of shock waves from blasting locations to nearby buildings and structures, thus damaging these features.

Long-term, adverse visual impacts on these resources could occur if they result in changes to the settings of, or views to and from, these resources. For the purposes of this analysis, while the initial impact of overstory vegetation removal and tower installation would occur during construction, these visual impacts to architectural resources are analyzed under operation, maintenance, and emergency repairs because the impact would persist through the operation of the Project and would be perpetuated through periodic vegetation management.

Consistent with NHDHR's standards and guidance for survey and evaluation of architectural resources, all architectural resources identified during Project-specific surveys, whether they are in the indirect or direct APE or disturbance area of the Project (a description of these areas is provided in **Section 3.1.8.2**), are recommended for additional pre-construction investigations to confirm or determine NRHP eligibility and/or further evaluate the effects of the Project on those resources that are NRHP-eligible.

Proposed APMs to avoid, minimize or mitigate adverse effects to architectural resources have been developed by Northern Pass and are listed in **Appendix H**. Resolution of adverse effects on historic properties will be determined through DOE's Section 106 consultation, in accordance with the Section 106 PA (see **Section 1.6** and **Appendix K)**, and may be informed by these APMs.

Table 4-62 summarizes the number of architectural resources potentially impacted during construction.

Table 4-62. Summary of Potential Impacts to Architectural Resources – Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)	--	--	--	--
2	226	30	17	209
3	225	29	16	209
4a	230	174	49[a]	174
4b	259	248	50[a]	202
4c	347	320	57[a]	283
5a	230	53	17	213
5b	226	34	17	209
5c	232	49	17	215
6a	218	188	27[b]	190
6b	246	212	26[b]	219
7 (Proposed Action)	327	72	20	301
AC System Support Projects	62	--	0[c]	49

Source: Claesson et al. 2014b; Dunham et al. 2017; Higgins et al. 2015, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f
[a] Seven previously evaluated architectural resources were determined to be not NRHP-eligible.
[b] One previously evaluated architectural resources was determined to be not NRHP-eligible.
[c] Thirteen previously evaluated architectural resources were determined to be not NRHP-eligible.

4.1.8.2 Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Maintenance and emergency repair activities would have the potential to result in short-term impacts associated with surface and subsurface ground disturbance similar to those described for construction activities, but occurring for a shorter duration. However, potential impacts to archaeological resources from maintenance and repair activities would not be expected to occur so long as disturbance of new areas (i.e., areas that were not previously disturbed during construction) is avoided. To a limited extent potential impacts could occur and would be mitigated through implementation of a Historic Properties Treatment Plan developed in accordance with the Programmatic Agreement.

Long-term impacts from ongoing operation would not be expected to result in any impacts to archaeological resources or archaeologically sensitive areas—including those resources that are NRHP-listed or -eligible. Operation activities include the transmission of electric power and ongoing vegetation management, neither of which would be likely to affect characteristics of an archaeological site that would contribute to its NRHP eligibility.

Architectural Resources

If architectural resources within the direct APE cannot be avoided during maintenance or emergency repairs, surface and subsurface ground disturbance would have the potential to result in long-term, adverse physical impacts on these resources. Impacts would potentially result from damage to, or change in, the physical features of these resources.

Maintenance and emergency repair activities would also have the potential to result in short-term, adverse visual impacts on architectural resources for the duration of these activities. These visual impacts would potentially alter the setting of, as well as views of and from, these resources.

Long-term visual impacts on any architectural resources within the zone of visual influence (ZVI) for the indirect APE of the Project would be likely to occur wherever the Project would be visibly prominent and appear inconsistent with the existing setting of the architectural resources, or within views to and from architectural resources. Long-term, adverse visual impacts on these resources could occur if they result in changes to the settings of, or views to and from, these resources.

Proposed APMs to avoid, minimize or mitigate adverse effects to architectural resources have been developed by Northern Pass and are listed in **Appendix H**. Resolution of adverse effects on historic properties will be determined through DOE's Section 106 consultation, in accordance with the Section 106 PA (see **Section 1.6** and **Appendix K)**, and may be informed by these APMs.

4.1.9 ENVIRONMENTAL JUSTICE

The Project would impose environmental impacts on New Hampshire communities, which could have the potential to result in disproportionately adverse human health and environmental effects on minority or low-income populations.

CEQ defines human health and environmental effects as follows:

Human Health Effects

1. Whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death
2. Whether the risk or rate of hazard exposure by a minority or low-income population to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group
3. Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards

Environmental Effects

1. Whether there is or will be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment
2. Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group
3. Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards (CEQ 1997b)

An analysis of data from the U.S. Census was conducted to evaluate whether these impacts could "disproportionately" affect low-income or minority communities within New Hampshire. The assessment identified "block groups" (a group of residences designated by the Census) in which any part of the block group resided within 1,000 feet (305 m) of the proposed placement of the Project.[73] For the purposes of this

[73] Census block groups in New Hampshire comprise an average of about 1,428 residents and have an average land area of about 9.7 square miles (25.1 km²), with a median of 2.9 square miles (7.5 km²).

analysis, residents of these block groups are defined as the "potentially affected" populations. This evaluation was performed separately for the Proposed Action and for each action alternative. For comparison, other block groups within the New Hampshire counties through which the Project would traverse (the potentially affected counties of Belknap, Coös, Grafton, Merrimack, and Rockingham) were identified, as well as block groups within the five other New Hampshire counties (Carroll, Cheshire, Hillsborough, Strafford, and Sullivan). Three demographic measures were identified for each block group: the percentage of minority residents, the median household income (categorized by the Census within ranges), and the percentage of families living below the poverty level.

Impacts to "potentially affected" populations, who live in block groups within 1,000 feet (305 m) of the Project would occur during both construction and operation, maintenance, and emergency repairs. These impacts would include those relating to visual resources (**Section 4.1.1**), socioeconomics (**Section 4.1.2**), recreation (**Section 4.1.3**), health and safety (**Section 4.1.4**), traffic and transportation (**Section 4.1.5**), land use (**Section 4.1.6**), noise (**Section 4.1.7**), historic and cultural resources (**Section 4.1.8**), air quality (**Section 4.1.10**), wildlife (**Section 4.1.11**), vegetation (**Section 4.1.12**), water resources (**Section 4.1.13**), and geology and soils (**Section 4.1.14**).

Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.9, 4.3.9,** and **4.4.9**.

4.1.9.1 Impacts from Construction

Short-term construction impacts relating to environmental justice could include increased traffic, construction emissions, dust, and noise, among others. These impacts would generally be felt on a localized scale and could temporarily impact minority and low-income populations who reside in proximity to the Project corridors.

Long-term construction impacts such as changes in soil productivity and ongoing noise could also occur to each of the resources listed above as a result of the installation of both aboveground and belowground structures and facilities, permanent roads, and laydown areas.

4.1.9.2 Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts from operations, maintenance, and emergency repairs would occur during maintenance and emergency repair activities. This would have an effect on all populations, and would not be expected to result in disproportionately high or adverse human health or environmental impacts on minority or low-income populations because they would occur on an intermittent and temporary schedule.

Long-term impacts to minority and/or low-income populations occurring throughout operation of the Project include those relating to EMFs, degraded visual resources, decreases in property value, and loss of overstory vegetation, among others. These impacts could occur from operation of aboveground portions of the Project. For underground portions of the Project, limited long-term impacts would be expected because the Project would be buried and long-term impacts (such as those to visual resources and EMFs) would be minimal or would not occur.

4.1.10 AIR QUALITY

Table 4-63 provides a summary of emissions totals resulting from construction under all alternatives. Broad-scale impacts that could potentially occur across the ISO-NE region are discussed in this section and are summarized in **Table 4-63**. Impacts that could result from the construction of the Project in each geographic section are discussed in **Sections 4.2.10**, **4.3.10**, **4.4.10**, and **4.5.10**. Additional information is provided in the **Air Quality and Greenhouse Gas Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 4-63. Summary of Potential Impacts to Air Quality – Construction Emissions and Loss of CO_2 Uptake from Vegetation Removal

Alternative	Total Construction Emissions (Entire Construction Period)							Loss of Carbon Sink from Forest Removal (metric tons CO_2)
	Criteria Pollutants (tons)						GHG Emissions (metric tons)	
	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
1 (No Action)	--	--	--	--	--	--	--	--
2	365	32	229	5.5	724	123	91,930	215,068
3	164	17	150	0.4	421	61	33,734	66,737
4a	134	14	124	0.3	336	48	27,663	16,599
4b	141	15	130	0.3	356	51	28,910	17,283
4c	140	14	129	0.3	353	51	28,744	17,226
5a	362	32	235	5.1	729	122	89,894	186,921
5b	374	33	241	5.4	749	126	93,288	206,295
5c	365	32	237	5.1	738	123	90,615	189,159
6a	183	18	149	1.4	414	63	41,440	16,711
6b	190	18	155	1.4	433	66	42,687	17,411
7 (Proposed Action)	333	30	222	4.3	691	114	81,529	159,651

4.1.10.1 Impacts from Construction

Emissions of air pollutants would occur during construction of the Project. Emissions of criteria pollutants and GHG emissions would result in the immediate vicinity of the Project from equipment and vehicle operation used during construction. Particulate matter emissions (PM_{10} and $PM_{2.5}$) would also result from equipment operation and soil disturbance, such as fugitive dust, during site preparation. These construction-related emissions would be localized and short-term, and would not cause exceedances of the NAAQS.

Emissions would be lower for the portions of the Project with underground cable compared to the aboveground lines because of the use of different types of equipment, fewer pieces of equipment, and less overall vehicle activity. For example, installation of underground cable would not require the use of helicopters.

The removal of forest cover from clearing a new transmission route or expanding the existing PSNH transmission route, a new converter station and the expanded substations for each alternative would result in a loss of carbon sequestration capacity, or "carbon sink." The reduction in forest carbon sink could have adverse, long-term, and regional impacts.

4.1.10.2 Impacts from Operations, Maintenance, and Emergency Repairs

The analysis, based on an energy model that evaluates the annual change in generation by technology and fuel type across the ISO-NE market, shows that operation of the Project could have long-term, beneficial impacts to air quality by reducing electricity generation from fossil fuel sources within the ISO-NE system and thereby reducing annual criteria pollutants such as SO_2, NO_X, and GHG emissions such as CO_2.[74]

[74] This information reflects the results of independent analyses performed for this final EIS, refer to the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for additional detail (GE Energy Consulting 2015a, 2017a).

The long-term environmental consequences within the ISO-NE region (discussed below) would be similar for all of the alternatives except Alternative 1, the No Action Alternative, which represents the current air quality baseline. Under the No Action Alternative, the Project would not be constructed, so there would be no impacts or benefits. The Project would provide 1,200 MW under Alternatives 2 and 5b, or 1,090 MW under Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6, 6b, and 7, replacing the need to generate or import an equivalent amount of power within the ISO-NE region, which includes New Hampshire.

The electricity provided to the region from the Project could result in a decrease in the utilization of existing fossil fuel-driven electricity generation across ISO-NE. **Table 4-64** shows the projected baseline and expected annual reduction in environmental pollutant emissions across ISO-NE in 2020, 2025 and 2030 with the addition of the Project. Compared to the Project baseline (no action) in 2030, ISO-NE annual NO_X emissions could be reduced by approximately 9 to 10 percent, and sulfur dioxide (SO_2) emissions could be reduced 21 to 24 percent. In addition, the ISO-NE market could experience a 9 to 10 percent reduction in annual carbon emissions as a result of the Project. This could amount to an average annual reduction of 2.5 million metric tons of CO_2 per year for the 1,090 MW alternatives and 2.8 million metric tons CO_2 for the 1,200 MW alternatives. As discussed in **Section 3.1.10** and presented in **Table 3-11,** GHG emissions in ISO-NE in 2014 were approximately 35.7 million metric tons (39,317 ktons). Therefore, total emissions reductions from 2014 to 2030 with the implementation of the 1,090 MW alternatives could represent a 28 percent decrease from existing levels, and reductions due to the 1,200 MW alternatives could represent a 29 percent decrease from existing levels. These impacts to emissions would be expected to continue throughout the life of the Project.

Table 4-64. Projected Annual ISO-NE Emissions 2020, 2025, and 2030

Emission	2020	2025	2030
Projected Baseline Emissions (Alternative 1: No Action)			
NOX (tons)	6,883	6,702	7,200
SO2 (tons)	1,291	923	1,036
CO2 (metric tons)	25,500,000	26,700,000	28,100,000
Projected Emissions, after Project Implementation of 1,200 MW (Alternatives 2 and 5b)			
NOX (tons)	6,094	6,041	6,478
SO2 (tons)	883	645	787
CO2 (metric tons)	22,400,000	23,800,000	25,300,000
Projected Change in Emissions, after Project Implementation of 1,200 MW (Alternatives 2 and 5b)			
NOX (tons)	-789(-11%)	-661(-10%)	-722(-10%)
SO2 (tons)	-408(-32%)	-278(-30%)	-249(-24%)
CO2 (metric tons)	-3,160,000(-12%)	-2,940,000(-11%)	-2,780,000(-10%)
Projected Emissions, after Project Implementation of 1,090 MW (Alternatives 3, 4, 5a, 5c, 6, and 7)			
NOX (tons)	6,191	6,150	6,564
SO2 (tons)	941	692	818
CO2 (metric tons)	22,900,000	24,100,000	25,600,000
Projected Change in Emissions, after Project Implementation of 1,090 MW (Alternatives 3, 4, 5a, 5c, 6, and 7)			
NOX (tons)	-692(-10%)	-552(-8%)	-636(-9%)
SO2 (tons)	-350(-27%)	-231(-25%)	-218(-21%)
CO2 (metric tons)	-2,850,000(-11%)	-2,610,000(-10%)	2,500,000(-9%)

Source: GE Energy Consulting 2017a.
Key:
CO2 = carbon dioxide
MW = megawatt
NOX = nitrogen oxides
SO2 = sulfur dioxide

Emissions from vegetation management, emergency repairs and maintenance operations for the transmission line would be a small fraction of the Project's short-term emissions from construction described above

4.1.11 WILDLIFE

General impacts to wildlife common to all alternatives and geographic sections are presented here. Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.11, 4.3.11, 4.4.11,** and **4.5.11. Table 4-65** and **Table 4-66** present a summary of Project-wide effects to federally- and state-listed species and indicate the extent to which federally- and state-listed species may be affected.

Table 4-65. Determination Summary of Potential Project-wide Potential Effects for Federally-Listed Wildlife Species

Species[a]	Determination of Effects by Alternative[b]
Shortnose Sturgeon (*Acipenser brevirostrum*) FE, SE	**Impact for All Alternatives:** Not located in study area (barrier dams located downstream prevent migration into study area). **ESA Determination for All Alternatives:** "No Effect"
Dwarf Wedgemussel (*Alasmidonta heterodon*) FE, SE	**Impact for All Alternatives:** Not detected in study area during Project-specific surveys, but there is potential for populations to exist in downstream areas.[b] **ESA Determination for All Alternatives:** "May Affect, but is not Likely to Adversely Affect"
Karner Blue Butterfly (*Lycaeides melissa samuelis*) FE, SE	**Impact for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Localized, short-term effects resulting from disturbance/displacement during construction and maintenance actions, particularly in the Southern Section where wild lupine stands (the Karner Blue Butterfly host-plant) exist. **ESA Determination for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** "May Affect, and is Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, and 4c:** "No Effect" (Suitable habitat not located in study area)
Puritan Tiger Beetle (*Cicindela puritana*) FT, SE	**Impact for All Alternatives:** Not located in study area. **ESA Determination for All Alternatives:** "No Effect"
Canada Lynx (*Lynx canadensis*) FT	**Impact for All Alternatives:** No lynx or suitable denning habitat located within study area; suitable foraging habitats are prevalent throughout the Northern Section. **ESA Determination for Alternatives 2, 3, 5a, 5b, 5c, and 7:** "May Affect, but is not Likely to Adversely Affect" **ESA Determination for Alternatives 4a, 4b, 4c, 6a, and 6b:** "No Effect" (Suitable habitat not located in study area)
Gray Wolf (*Canis lupus*) FE, SE	**Impact for All Alternatives:** No current documentation of the species in the eastern U.S. **ESA Determination for All Alternatives:** "No Effect"
Indiana Bat (*Myotis sodalis*) FE	**Impact for All Alternatives:** Localized, short-term effects resulting from disturbance/displacement during construction. **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"
Northern Long-eared Bat (*Myotis septentrionalis*) FT, ST	**Impact for All Alternatives:** Localized, short-term effects resulting from disturbance/displacement during construction and maintenance actions. **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"

Table 4-65. Determination Summary of Potential Project-wide Potential Effects for Federally-Listed Wildlife Species

Species[a]	Determination of Effects by Alternative[b]
Rusty patched bumble bee (*Bombus affinis*), FE	**Impact for All Alternatives:** Not located in study area. **ESA Determination for All Alternatives:** "No Effect"

Notes:
[a] The list of species are all of those known to occur in the State of New Hampshire.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Suitable habitat is located within the study area unless otherwise noted.
Key: FT = federally-threatened; FE = federally-endangered; RFSS = Regional Forester Sensitive Species; MIS = Management Indicator Species; SE = state-endangered; ST = state-threatened

Table 4-66. Summary of Potential Project-wide Effects for State Threatened and Endangered Wildlife Species

Species[a]	Effects by Alternative[b]
Birds	
American Three-Toed Woodpecker (*Picoides dorsalis*) ST	**Impact for All Alternatives:** Occurrence is rare in New Hampshire; if present, localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Bald Eagle (*Haliaeetus leucocephalus*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Common Loon (*Gavia immer*) ST, RFSS	**Impact for All Alternatives:** No lakes and few large rivers in the study area; if present, localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Common Nighthawk (*Chordeiles minor*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction; localized, long-term, beneficial effects resulting from operation of the new corridor and creation/maintenance of grassland and shrubland habitats (preferred foraging habitats for the common nighthawk).
Golden Eagle	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Grasshopper Sparrow (*Ammodramus savannarum*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions; long-term beneficial effects related to creation and maintenance of grassland habitats in the corridor (preferred foraging and nesting habitats for the grasshopper sparrow).
Northern Harrier *(Circus cyaneus*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions; long-term beneficial effects related to creation and maintenance of grassland habitats in the corridor (preferred foraging and nesting habitats for the northern harrier).
Peregrine Falcon (*Falco peregrinus*) ST, RFSS	**Impact for All Alternatives:** Limited habitat in the study area; if present, localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Pied-Billed Grebe (*Podilymbus podiceps*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Sedge Wren (*Cistothorus platensis*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.

Table 4-66. Summary of Potential Project-wide Effects for State Threatened and Endangered Wildlife Species

Species[a]	Effects by Alternative[b]
Upland Sandpiper (*Bartramia longicauda*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions; long-term beneficial effects related to creation and maintenance of grassland habitats in the corridor (preferred foraging and nesting habitats for the upland sandpiper).
Fish	
Bridle Shiner (*Notropis bifrenatus*) ST	**Alternative 2, 5a, 5b, and 5c:** No effect for construction and maintenance actions. **Buried Alternatives in Central and Southern Sections (including sections of Alternatives 3, 4a, 4b, 4c, 6a, 6b, and 7)**: localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Invertebrates	
Brook Floater Mussel (*Alasmidonta varicosa*) SE	**Alternative 2, 5a, 5b, 5c, 6a, 6b, and 7:** No effect for construction and maintenance actions. **Buried Alternatives in Southern Section (including sections of Alternatives 3, 4a, 4b, 4c)**: Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Frosted Elfin Butterfly (*Callophrys irus*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Persius Duskywing Skipper (*Erynnis persius*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Pine Pinion Moth (*Lithophane lepida lepida*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Ringed Boghaunter Dragonfly (*Williamsonia lintneri*) SE	**Impact for All Alternatives:** If present, localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Mammals	
American Marten (*Martes americana*) ST	**Impact for All Alternatives:** Localized, long-term adverse effects resulting from construction and maintenance of the new transmission route in the Northern Section.
Eastern Small-footed Bat (*Myotis leibii*) RFSS, SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
New England Cottontail (*Sylvilagus transitionalis*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Reptiles and Amphibians	
Blanding's Turtle (*Emydoidea blandingii*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Eastern Hognose Snake (*Heterodon platirhinos*) SE	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.
Spotted Turtle (*Clemmys guttata*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions.

Table 4-66. Summary of Potential Project-wide Effects for State Threatened and Endangered Wildlife Species

Species[a]	Effects by Alternative[b]
Northern Black Racer (*Coluber constrictor constrictor*) ST	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance actions; long-term beneficial effects related to creation and maintenance of the transmission route (preferred habitat for this species).

Notes:
[a] The list of species are all of those known to occur in the State of New Hampshire.
[b] Study area is defined as the extent of disturbance for each of the alternatives.
DOE (or its sub consultant) has made the determinations, based on the most current analysis to-date. Future coordination/consultation with the USFWS, USFS, and NHFG, may influence the final determinations.
Key: SE = State Endangered; ST = State Threatened; RFSS = Regional Forester Sensitive Species

Table 4-67 shows impacts to wildlife habitat by alternative.

Table 4-67. Summary of Potential Impacts to Wildlife

Alternative	Impacts to Wildlife Habitat acres (ha)
1 (No Action)	--
2	1,838 (744)
3	1,295 (524)
4a	295 (119)
4b	308 (125)
4c	296 (120)
5a	1,663 (673)
5b	1,770 (716)
5c	1,674 (677)
6a	426 (172)
6b	439 (178)
7 (Proposed Action)	1,494 (605)

4.1.11.1 Impacts from Construction

Aquatic Species

Impacts to aquatic species could result from direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. With the application of APMs such as the implementation of a SWPPP, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction (see APMs in **Appendix H**), impacts to aquatic species would be minimized.

Short-term increases in turbidity and sediment loads in aquatic habitats resulting from construction-related ground disturbance, erosion, or run-off would cause loss or injury of aquatic species or viable eggs, especially if the affected species are sensitive to siltation during spawning periods (including fish, shellfish, and aquatic invertebrates). Erosion and increased sedimentation may result from in-stream excavation or from work in adjacent uplands and could affect aquatic species not only at Project crossings, but also at downstream locations. In order to analyze the maximum possible level of disturbance, the disturbance near or across waterbodies was assumed to be trenched; however, Horizontal Directional Drilling (HDD) or jack and bore would likely be used to avoid larger bodies of water.

The presence of humans and Project-related vehicles and equipment could cause fish and other mobile aquatic species to temporarily avoid or abandon otherwise suitable habitat, or induce stresses that could disrupt essential life processes, such as foraging and breeding. In general, these impacts would occur at the time of the construction disturbances and would be short-term. Any effects on aquatic species should lessen and dissipate soon thereafter.

Project-related construction activities would result in impacts on aquatic species related to increased depredation through potential in-water work activities that result in the removal of instream structures during construction. In-water structures, such as large woody debris, submerged aquatic vegetation (SAV), and boulders provide cover and structure for various aquatic species. Removal of these features during construction would result in adverse impacts to aquatic species, through increased exposure to predators. These impacts would be localized to the site of disturbance and would likely be short-term, as SAV would recolonize the area, or features such as large woody debris would eventually return to the area, following future high flow events.

Clearing in a new transmission corridor would result in short-term localized disturbance to aquatic biota dependent upon riparian communities. For instance, thermal loading in coldwater systems such as headwater streams, or spring-fed drainages, could occur, which could adversely affect coldwater species such as the eastern brook trout. The tree and shrub clearing along the edges of streams or spring-fed open water areas would allow greater light penetration, which could result in localized warming of the stream channel. However, these impacts are expected to be minor, based on the small size of the transmission corridor clearings in relation to the entire riparian corridor along the perennial streams that support these species. In addition, scrub-shrub communities would develop along these corridors, which would result in a decrease in the thermal load during operation of the Project.

Underground portions of the Project would result in additional impacts to aquatic species resulting from construction activity at waterbody crossings. Impacts would include habitat disturbance in the trench area and suspension of sediments, resulting in short-term, adverse impacts at the specific waterbody crossings. Impacts to aquatic habitat, including bank and channel disturbance, could be avoided through the use of HDD. However, HDD could have other negative impacts as the technology could smother the benthic community (organisms that live in or on the bottom of a waterbody) and result in short-term localized impacts to water quality. Long-term, adverse impacts would be minimized through the implementation of APMs (see **Appendix H**) and CWA and NHDES permit requirements for waterbody crossings, including erosion and sediment control, minimizing duration of in-stream work, and restoration of banks and channels.

Terrestrial Species

Impacts to terrestrial species could result from direct mortality or injury to individuals, sensory disturbance, and increased depredation. During pre-construction activities, any sufficiently mobile terrestrial wildlife (e.g., white-tailed deer, birds) would be expected to flush from or flee the area prior to construction equipment physically clearing vegetation. Adverse impacts would be short-term (some wildlife would be expected to return to the Project corridor following construction if habitat is still available, particularly as vegetation returns) and would vary in scale from local to regional depending upon the extent of active construction activities. Forest interior species would experience long-term adverse impacts resulting from the loss of mature forest habitat in the study area.

Construction of the Project would result in habitat loss and modification. Habitat loss and/or modification of existing habitats in the study area during construction would also have adverse impacts on wildlife resources. Forest interior dwelling species would experience long-term adverse effects based on habitat loss and fragmentation. Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience short-term habitat loss during the time the Project corridor revegetated in areas of short-term disturbance but would have a long-term increase in habitat in places the corridor is new or widened.

The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase, causing increased mortalities and/or injuries. For less mobile species (e.g., garden snails or caterpillars) and shallow dwelling subterranean species (e.g., field mouse), the potential for physical injury or death would be increased. Slow-moving species, such as the wood turtle, could suffer from mortality or injury by construction equipment or construction crew foot traffic during clearing, grading, and excavation activities compared to more mobile species that would be expected to disperse to adjacent habitats. Populations of most wildlife species are prevalent in the state and individuals from adjacent undisturbed habitats would be expected to return to the Project corridors following construction. Adverse impacts to wildlife in the form of mortality or physical injury could occur; however, no population-level effects are expected and the majority of adverse effects would be short-term.

The increased presence of humans, as well as noise and vibrations associated with construction activities, would likely cause sensory disturbances of wildlife in the vicinity of the Project. Wildlife responses to sensory disturbances may include displacement or avoidance of the area, stress, and disorientation. The resulting adverse impacts would be short-term and localized, primarily occurring during work hours and ceasing after construction activities have moved from a given area. No long-term adverse effects would be expected.

The presence of predators may increase due to factors such as habitat alteration and trash. Trash created by construction personnel can attract predators like gulls, crows, and raccoons. This would be a short-term impact that would end with the removal of the trash receptacles. A longer-term impact would result from the creation of edge habitats, which can also attract predators. A number of common predators, including crows, blue jays, and raccoons, are often classified as edge species (Masters et al. 2002). Habitat alteration can facilitate movement and improve hunting efficiency for some predators. In forests, for example, coyotes are most abundant in areas of disturbance (Kays et al. 2008). They are also known to travel extensive distances on linear pathways, including transmission routes (Way and Eatough 2006). An increase in predators could result in a localized loss of various prey species.

Some species may continue to forage during construction activities. However, most species would experience short-term displacement during construction. Because clearing and grading activities would be confined to the transmission route, roadway corridors, and other work areas, suitable habitat for many wildlife species would remain undisturbed in habitats adjacent to the transmission route for the duration of construction.

Biodiversity represents the species composition of the wildlife community, as well as the existing habitat conditions across a given landscape. Habitat modification through human development may contribute to the loss of biodiversity. The construction disturbance associated with the Project (under all alternatives in all geographic sections) would result in adverse impacts to various wildlife species. While localized impacts during construction would likely cause a short-term decrease in species richness and/or abundance, species richness and/or abundance are expected to return to similar levels for most species, during operation of the Project.

Wildlife Habitats

In order to differentiate Project-specific impacts to wildlife habitats, an assessment was conducted to identify land cover types within the study area. This was developed through a combination of remote sensing and field survey observations. Remote sensing involved a trained GIS/field biologist physically reviewing aerial photography and other GIS field data, as well as field specific observations regarding changes in cover type. This information was used to delineate land cover types within the study area, with the reasoning that this on-site data would improve assessment of existing vegetation resources within the study area. For this analysis, the following land cover type categories were used:

- Agricultural
- Cliff/Rocky Ridge
- Conifer Forest
- Deciduous Forest
- Developed
- Grassland
- Mixed Hardwood-Softwood Forest
- Mowed ROW
- Open Water
- Other
- Scrub-Shrub
- Wetland

This combined approach of determining land cover categories via remote sensing, coupled with field surveys to ground truth boundaries, created a dataset to use in assessing potential impacts of the Project on wildlife habitats. Specific impacts to these habitats are discussed in additional detail for each geographic section.

Habitat Connectivity

Habitat fragmentation is defined as the disturbance or removal of forest stands within large blocks of forest habitat associated with the installation of a new transmission route. Habitat fragmentation may alter a species population size within a habitat either on a short-term or long-term basis, depending upon the extent and scope of the fragmentation. The following are terrestrial wildlife habitat fragmentation issues relevant to the Project:

- Reduction in the size of habitat available
- Creation of edge effects
- Creation of barriers to migration
- Introduction of invasive plants, animals, and nest parasites
- Potential increase in predation

Habitat fragmentation resulting from the Project would be more pronounced on interior forest habitat. This edge exposure along the transmission route may lead to the introduction of invasive species, possible interruption of migration corridors, and an increase in nest predation and/or parasitism (relationship between parasite and host).

Habitat loss and/or modification of existing habitats in the study area during construction would also have adverse impacts on wildlife resources. Forest interior dwelling species would experience long-term adverse effects based on habitat loss and fragmentation. For the purpose of this analysis, based on existing literature (Harper et al. 2005), interior forest habitat is defined as forested areas located over 300 feet (91 m) from a non-forested edge (e.g., a road or open land). Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience short-term habitat loss during construction and while the Project corridor naturally revegetated in areas of short-term disturbance. Because construction would occur over a limited time period, the duration of the impacts to those species would be short-term for herbaceous and scrub-shrub communities. Forest-interior species would experience long-term impacts because available habitat would be permanently reduced.

The removal of habitat may create barriers to travel for some species. While some species would still be able or willing to traverse the cleared area to travel between patches, others may not. These travel barriers could limit connectivity to nearby patches and likely reduce gene flow. In general, the reduction in connectivity would have a greater impact on smaller species, such as wood turtles, and have less of an impact on larger mammals, such as black bears. These impacts may be short-term or long-term, depending on the habitat type and Project land use. For example, the construction of a permanent facility such as a substation would result in a long-term barrier, while clearing in the transmission route would result in a short-term impact because some vegetation would be allowed to return and human presence would be less frequent.

Fragmenting these forest habitats would increase the distribution of "edge" habitats. Edges are the transitional areas between two different habitats. Increasing habitat edges in an area can impact wildlife populations and community structures because habitat edges benefit some species but can be detrimental to others (Masters et al. 2002). Species that require more than one habitat type, or successional stages of habitats, often benefit from the proximity of two habitat types at edges. Conversely, species that require habitat interiors or large, contiguous tracts of habitat are typically negatively impacted by increases in habitat edges.

Game species may benefit from habitat fragmentation and associated edge effects. For instance, deer, turkey, ruffed grouse, and rabbits have all been associated with edge habitats (Masters et al. 2002) and may experience long-term beneficial effects related to the construction of transmission routes. Potential predators (e.g., coyotes) may benefit from increases in edge habitats (Way and Eatough 2006; Kays et al. 2008), potentially leading to localized long-term adverse effects on their prey species populations.

4.1.11.2 Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repair activities would be similar to those discussed for construction, but would occur for shorter durations over the life of the Project. There could be short-term, adverse effects resulting from direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation.

Operation of overhead portions of the Project could result in impacts to bird species resulting from collision with overhead transmission lines or electrical shock through perching on transmission structures. The design of the Project (including line and structure spacing) would minimize risks associated with collision and electrical shock (see **Appendix H**).

Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience long-term beneficial effects through the increase in these habitat types throughout the operation of the Project. Continued habitat disturbance and fragmentation from vegetation maintenance activities would be a long-term impact during operation and maintenance. Following construction activities, temporary workspaces within these areas would be restored to pre-construction conditions to the extent practicable, and it is expected that wildlife would quickly return to utilize these habitats for foraging and nesting. Following construction, the temporary workspaces outside the aboveground facility fence lines would be maintained in a manner similar to pre-construction conditions. Therefore, effects on wildlife in agricultural lands and open lands that are within workspaces for aboveground facilities would be temporary, and these habitats would be expected to recover within weeks to months following construction.

4.1.12 VEGETATION

General impacts to vegetation common to all alternatives are discussed in this section. Vegetation refers to forestlands, wetland habitats, shrub-scrub communities, and grasslands, among other habitats. Impacts specific to each section would depend upon vegetation and community type, and are discussed by alternative in **Sections 4.2.12**, **4.3.12**, **4.4.12**, and **4.5.12**. **Table 4-68** presents a summary of Project-wide effects to the state-listed species that were identified in the study area during Project-specific surveys. As discussed in **Section 3.1.12**, the only federally- or state-listed plant species potentially identified during Project-specific surveys were the beaked sedge and wild lupine (both state-listed). However, even though other federally- and state-listed plant species were not identified during surveys (including the federally-listed small whorled pogonia), individuals could be present within the study area, including historic records in the NHB database for several species, including the Allegany vine, clasping milkweed, licorice goldenrod, red threeawn, satiny willow, and Wiegand's sedge. Thus, for all other federally- and state-listed plant species considered in this analysis (see **Table 3-14**), adverse impacts could occur if encountered during construction of the Project, but with the application of APMs no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Allegheny-vine/Climbing fumitory (*Adlumia fungosa*), SE	**Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** Known populations in the study area in Lancaster, NH based on NHB data (NHB 2014); impacts to individuals are expected; with the application of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Green Rockcress (*Arabis missouriensis*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine manzanita (*Arctostaphylos alpina*), RFSS	**Impacts for Alternatives 2 3, 5a, 5b, 5c:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Dragon's mouth (*Arethusa bulbosa*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Red threeawn (*Aristida longespica* var. *geniculata*), SE	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Known populations in the study area in the Towns of Concord and Pembroke based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Arnica (*Armica lanceolata*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Clasping milkweed (*Asclepias amplexicaulis*), ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Known populations in the study area in the Town of Concord based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c**: if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Robbin's milkvetch (*Astragalus robbinsii* var. *minor*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Dwarf white birch (*Betula minor*), RFSS	**Impacts for Alternatives 2, 3, 5a, 5b, 5c:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 6a, and 6b:** No effect, study area does not cross suitable habitat.
Northern neglected reed grass (*Calamagrostis stricta* ssp. *inexpansa*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine bittercrest (*Cardamine concatenate*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Golden-fruited sedge (*Carex aurea*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Back's sedge (*Carex backii*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Bailey's sedge (*Carex baileyi*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Brown bog sedge (*Carex buxbaumii*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Capitate sedge (*Carex capitata* ssp. *arctogena*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Rope-root sedge (*Carex chordorrhiza*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Clustered sedge (*Carex cumulata*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Lesser tussock sedge (*Carex diandra*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Meager sedge (*Carex exilis*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Livid sedge (*Carex livida*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Beaked sedge (*Carex rostrata*) SE	**Impacts for All Alternatives:** Project-specific floristic surveys identified one potential individual beaked sedge in the study area of Alternative 2 in the Northern Section (one individual plant), no records exist in the NHB database for the Project; if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Bulrush sedge (*Carex scripoidea*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Sparse-flowered sedge (*Carex tenuiflora*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Wiegand's sedge (*Carex wiegandii*), RFSS, SE	**Impacts for Alternatives 2 and 3:** Known populations in the study area in the Town of Lincoln based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Fogg's goosefoot (*Chenopodium foggi*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Autumn coralroot (*Corallorhiza odonotorhiza*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Faxon's hawthorn (*Crataegus faxonii*), SE	**Impacts for Alternative 7:** Known populations in the study area in the Towns of Franconia and Sugar Hill, NH, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, and 6b:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Slender rock-brake (*Cryptogramma stelleri*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Wild hound's-tongue (*Cynoglossum virginianum* ssp. *boreale*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Greater yellow lady's-slipper (*Cypripedium parviflorum* var. *makasin*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Large yellow lady's-slipper (*Cypripedium parviflorum* var. *pubescens*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Showy lady's-slipper (*Cypripedium reginae*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Diapensia (*Diapensia lapponica*), ST	**Impact for All Alternatives:** No effect, study area does not cross suitable habitat
Canescent Whitlow-mustard (*Draba cana*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Male wood fern (*Dryopteris filix-mas* ssp. *brittonii*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Fragrant wood fern (*Dryopteris fragrans*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Goldie's woodfern (*Dryopteris goldiana*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Few-flowered spikesedge (*Eleocharis quinqueflora* ssp. *fernaldii*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Oake's eyebright (*Euphrasia oakesii*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Showy orchid (*Galearis spectabilis*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Boreal bedstraw (*Galium kamtschaticum*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Northern comandra (*Geocaulon lividum*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Carolina crane's-bill (*Geranium carolinianum*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mountain avens (*Geum peckii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
American spurred-gentian (*Halenia deflexa*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mossplant (*Harrimanella hypnoides*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Robinson's hawkweed (*Hieracium robinsonii*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Common mare's-tail (*Hippuris vulgaris*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Long-leaved bluet (*Houstonia longifolia*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Small Whorled Pogonia (*Isotria medeoloides*), FT, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **ESA Determination for All Alternatives:** "May Affect, but Not Likely to Adversely Affect"
Butternut (*Juglans cinerea*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Moor rush (*Juncus stygius* ssp. *americanus*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Loesel's wide-lipped orchid (*Liparis loeselii*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Brook lobelia (*Lobelia kalmii*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Wild lupine (*Lupinus perennis*) ST	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 6a, 6b, and 7:** Project-specific floristic surveys and NHB data (NHB 2014) identified several populations in Concord and Pembroke, NH within the study area; impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, and 4c:** if populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Tufted yellow loosestrife (*Lysimachia thyrsiflora*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Green adder's-mouth (*Malaxis unifolia*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Auricled twayblade (*Neottia auriculata*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Broad-leaf Twayblade (*Neottia convallarioides*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Heartleaf twayblade (*Neottia cordata*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Prairie goldenrod (*Oligoneuron album*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine arctic cudweed (*Omalotheca supine*), RFSS, SE	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Northern adder's-tongue fern (*Ophioglossum pusillum*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mountain sweet-cicely (*Osmorhiza berteroi*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mountain sorrel (*Oxyria digyna*), ST	**Impact for All Alternatives:** No effect, study area does not cross suitable habitat
American ginseng (*Panax quinquefolius*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Silvery nailwort (*Paronychia argyrocoma*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Sweet colt's foot (*Petasites frigidua* var. *palmatus*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Jack pine (*Pinus banksiana*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Canada mountain ricegrass (*Piptatherum canadense*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Wavy bluegrass (*Poa laxa* ssp. *fernaldiana*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine meadow grass (*Poa pratensis* ssp. *alpigena*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Douglas' knotweed (*Polygonum douglasii*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Viviparous knotweed (*Polygonum viviparum*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Reddish pondweed (*Potamogeton alpinus*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Robbins' cinquefoil (*Potentilla robbinsiana*), RFSS, MIS, SE	**Impacts for All Alternatives:** Study area does not cross alpine habitats, no effect.
Boott's rattlesnake-root (*Prenanthes boottii*), RFSS, ST	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Pink wintergreen (*Pyrola asarifolia*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Giant Rhododendron (*Rhododendron maximum*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Northern willow (*Salix argyrocarpa*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
New England dwarf willow (*Salix herbacea*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Satiny willow (*Salix pellita*), SE	**Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** Known populations in the study area in the towns of Clarksville and Stewartstown, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 2, 3, 5a, 5b, 5c, and 7:** If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Large-fruited sanicle (*Sanicula trifoliata*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
White Mountain saxifrage (*Saxifraga paniculata*), RFSS	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Alpine brook saxifrage (*Saxifraga rivularis*), RFSS	**Impacts for All Alternatives:** Study area does not cross alpine habitats, no effect
Arizona cinquefoil (*Sibbaldia procumbens*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a,6b, and 7:** No effect, study area does not cross suitable habitat
Moss campion (*Silene acaulis* var. *exscapa*), RFSS	**Impacts for Alternatives 2 and 3:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected. **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat

Table 4-68. Summary of Project-wide Potential Effects for Federally- and State-listed Plant Species Potentially Present in the Study Area

Species	Effects by Alternative
Licorice goldenrod (*Solidago odora)*	**Impacts for Alternatives 2, 3, 5a, 5b, 5c, 7:** Known populations in the study area in the Town of Pembroke, based on NHB data (NHB 2014); impacts to individuals are expected. With the implementation of APMs, no population-level impacts are expected. **Impacts for Alternatives 4a, 4b, 4c, 6a, and 6b:** If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Case's ladies'-tresses (*Spiranthes casei*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Lindley's American-aster (*Symphyotrichum ciliolatum*), ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Nodding pogonia (*Triphora trianthophora*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Northern blueberry (*Vaccinium boreale*), RFSS, ST	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Mountain hairgrass (*Vahlodea atropurpurea*), RFSS, SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.
Smooth cliff fern (*Woodsia glabella*), SE	**Impacts for All Alternatives:** No individuals observed during Project-specific field surveys nor listed in the NHB database for the study area (NHB 2014). If populations are present within the study area, impacts to individuals could occur; with the application of APMs, no population-level impacts are expected.

Source: NHB 2014 and USDA Forest Service 2012b.
Key: RFSS = Regional Forester Sensitive Species; MIS = Management Indicator Species; SE = state-endangered; ST = state-threatened

The Project would affect vegetation resources. Both short-term and long-term impacts would occur during construction, resulting from vegetation disturbance and overstory vegetation removal. Long-term impacts would also result from operation, maintenance, and emergency repairs resulting from ongoing vegetation removal. Impacts would consist of those relating to clearing of vegetation for tower installation or line burial, service roads, and staging areas along and within the transmission route, access roads, converter stations, and substations (including the potential removal of listed plant species), maintenance of vegetation clearing so as not to interfere with aboveground or underground components, as well as the short-term and long-term disturbance in sensitive habitats.

Forestlands located within the Project corridors would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted to scrub-shrub and herbaceous wetland communities, which would persist during operation of the Project. Implementation of APMs listed in **Appendix H**, including vegetation management and maintenance in accordance with the NHDFL's *Best Management Practices for Utility Maintenance,* would minimize adverse effects related to the Project. The conversion of forestlands to herbaceous or shrub communities would change the vegetation community species composition and suitability for a variety of wildlife species but would not be expected to have any population-level effects to vegetation resources because the majority of affected vegetation species are abundant in other parts of the state and region.

Table 4-69 shows impacts to vegetated habitat by alternative.

Table 4-69. Summary of Potential Impacts to Vegetation

Alternative	Impacts to Vegetated Habitats (including Forestlands) acres (ha)	Impacts to Forestlands acres (ha)
1 (No Action)	--	--
2	1,682 (681)	747 (302)
3	1,144 (463)	233 (94)
4a	159 (64)	58 (23)
4b	157 (94)	60 (24)
4c	132 (53)	60 (24)
5a	1,505 (609)	651 (263)
5b	1,607 (650)	717 (290)
5c	1,504 (609)	659 (269)
6a	306 (124)	58 (23)
6b	303 (123)	60 (24)
7 (Proposed Action)	1,303 (527)	558 (226)

4.1.12.1 Impacts from Construction

Overhead Transmission Line

Clearing of forest cover along the transmission route and converting these vegetation communities to scrub-shrub, herbaceous, and other earlier successional cover types would be the primary vegetation impact related to the construction of overhead portions of the Project.[75] In many cases, complete removal of major portions of other early successional plant communities, including non-forested wetlands in the existing PSNH transmission route, would be avoided or minimized since the overhead conductors typically would be pulled between the towers, spanning major portions of the transmission route. In this manner, complete removal of vegetation and ground disturbance within the transmission route, other than surface traffic from construction vehicles within the typical 150-foot (46-m) wide transmission route, would not be expected to occur. The vegetative cover near ground surface and root systems on large portions of the transmission route would remain generally intact and would be expected to regenerate within one to three years (for herbaceous communities) and three to five years (for shrub communities). Forested communities would not

[75] The "Developed Land" category is excluded from the disturbance calculation for vegetative resources because it is not a natural habitat and has already been disturbed. However, "Developed Land" is included in the disturbance calculations for wildlife resources. This may result in differences in the disturbance numbers between vegetation and wildlife.

be likely to return; however, it is likely forested communities would revegetate to early successional forestland during the long-term operation of the Project. Regeneration for herbaceous and shrub communities would occur relatively quickly, compared to the areas of soil disturbance and excavations for tower structures. Thus, the impact acreages (ha) are conservative in that they are partially based on total transmission route widths, whereas the actual areas of complete vegetation cover removal within the construction footprints for the proposed facilities would be less than the total transmission route area. In addition, with the exception of portions of Alternatives 2, 3, 5a, 5b, 5c, and 7 in the Northern Section that include the creation of a new transmission route for approximately 40 miles (64 km) and widening of the existing PSNH transmission route, construction of the Project in all sections would utilize a combination of existing transmission and roadway corridors where vegetation management is already occurring.

Disturbance to wetland vegetation would occur and would present both short-term and long-term impacts, particularly where forested wetland would be converted to scrub-shrub or emergent wetland, or where wetland vegetation would be altered. The Project would result in a loss of wetlands (see Water Resources), but impacts would be minimized through the implementation of APMs (see **Appendix H**).

The removal of listed plant species within disturbance areas would represent long-term, adverse impacts. However, these impacts could be reduced with the application of measures to avoid portions of plant communities containing these species, such as locating the Project in the existing PSNH transmission route or roadway corridors. The small whorled pogonia, a federally-listed plant species (also listed as state threatened) potentially occurring within the study areas, was not found during field surveys in 2013 and 2014. The Natural Heritage Bureau also identified 81 state-listed plant species (40 endangered and 41 threatened species) with the potential to occur in the study areas. Two of these species, the beaked sedge and wild lupine, were potentially found during surveys; in addition, NHB historic records indicate the past presence of six additional state-listed species within the Project alternatives, including the Allegany vine, clasping milkweed, licorice goldenrod, red threeawn, satiny willow, and Wiegand's sedge.

Invasive plant species, including noxious weeds, could be introduced and spread through introduction of plant propagules on equipment. Soil disturbance and compaction could potentially present conditions for such species to colonize, potentially resulting in both short-term and long-term adverse impacts. The distribution of existing invasive species could also be expanded. Implementation of the APMs, specifically the Invasive Species Management Plan, in **Appendix H** would minimize impacts to vegetation resources.

Accidental wildfires during construction, especially during the spring and fall fire seasons, would also impact vegetation resources. Implementation of plans to control wildfires should effectively reduce this potential impact. In addition, accidental spills of fuels/lubricants and other chemicals used during construction could potentially affect vegetation resources through mortality of contaminated vegetation and soil contamination that could prevent or prolong the time for vegetation to regenerate.

Underground Transmission Cable

Impacts from construction of underground transmission cable would be similar to those discussed for overhead transmission lines, with some notable differences.

Tree clearing associated with the construction of underground transmission cable would be less extensive than required for overhead transmission lines. Underground transmission cable would require a narrower construction corridor, and forest cover is already limited within existing transmission and roadway corridors. The construction corridor would be typically 40 feet (12 m) wide along transmission routes or confined to the road surface and/or adjacent disturbed areas where the transmission line would be buried in roadway corridors. Tree clearing would not be needed in areas where the cable would be buried in the existing PSNH transmission route. While the overall disturbance areas would be smaller for underground construction, the soil disturbances and vegetation removal would be more intense or continuous within the narrower construction corridor since there would be a linear graded and trenched area extending along the transmission route on contour, rather than a transmission line spanning vegetation between tower structures. The construction of an underground transmission cable in a roadway corridor would impose fewer impacts because the roadway corridors are generally more disturbed with less forestland and other native vegetative communities than aboveground transmission routes.

Disturbance to wetlands would be greater when trenching across wetlands for cable installation, due to disturbance of the soil profile and potential to affect wetland contours and hydrology, and greater potential for a fill or sedimentation from erosion on the disturbed area in adjacent upland areas. Implementation of the APMs in **Appendix H** and adherence to Clean Water Act (CWA) Section 404 permit requirements to avoid and minimize sedimentation, salvage and replace wetland topsoil where conditions permit, and restore wetland contours and hydrology following cable installation should reduce these disturbances to wetlands to short-term impacts. However, the conversion of forested wetlands to scrub-shrub or emergent wetlands would be a long-term impact. Wetland cover conversion would occur to a lesser degree for underground cable construction than aboveground transmission line construction because there would be less tree clearing for underground alternatives than aboveground transmission line alternatives.

The potential for introduction of noxious weeds or other invasive plants would be greater for underground alternatives when compared to overhead transmission line because a linear area of exposed soil for construction could provide conditions for such species to colonize.

Vegetated Habitats

Similar to the Wildlife Habitats, in order to differentiate Project-specific impacts to vegetative habitats, an assessment was conducted to identify land cover types within the study area. This was developed through a combination of remote sensing and field survey observations. Remote sensing involved a trained GIS/field biologist physically reviewing aerial photography and other GIS field data, as well as field specific observations regarding changes in cover type. This information was used to delineate land cover types within the study area, with the reasoning that this on-site data would improve assessment of existing vegetation resources within the study area. For this analysis, the following land cover type categories were used:

- Agricultural
- Cliff/Rocky Ridge
- Conifer Forest
- Deciduous Forest
- Grassland
- Mixed Hardwood-Softwood Forest
- Mowed ROW
- Open Water
- Other
- Scrub-Shrub
- Wetland

This combined approach of determining land cover categories via remote sensing, coupled with field surveys to ground truth boundaries, created a dataset to use in assessing potential impacts of the Project on vegetated habitats. Specific impacts to these habitats are discussed in additional detail for each geographic section.

4.1.12.2 Impacts from Operations, Maintenance, and Emergency Repairs

Overhead Transmission Line

Operation and maintenance of an aboveground transmission line would result in long-term impacts associated with ongoing vegetation management which would prevent the recovery of forest cover. Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions. Permanent loss of vegetation of all types would largely be confined to the tower structure sites, new or expanded converter or substations, and transition stations. Implementation of the APMs listed in **Appendix H**, which include vegetation management and maintenance in accordance with the NHDFL's *Best Management Practices for Utility Maintenance*, would ensure consistency with safety and reliability requirements.

Operation and maintenance activities would also have the potential to affect listed species within the transmission routes. The potential for wildfires and the risk of spills of fuel/lubricants and other chemicals would continue through operation.

Fragmentation of contiguous vegetation communities or mature forest blocks associated with the creation and maintenance of a new transmission route is a potential long-term impact that would extend throughout operation. It should be noted that for shade-tolerant plants, forest fragmentation and the creation of a new transmission route would decrease the extent of suitable habitat. However, the creation of a new transmission route would create new habitat for a variety of shade intolerant species. Fragmentation is a larger concern for the portions of new transmission route than it is for the use of the existing PSNH transmission route. While the edges of new transmission route would be expected to result in some changes in species composition due to light penetration, wind, and humidity, this would not be expected to influence conditions of the interior forests beyond the vicinity of the transmission route edges. Fragmentation associated with the Project would not result in any population-level effects.

Loss of forest cover in the transmission route could result in a potential long-term loss of biodiversity. However, the loss of forest cover in the transmission route and alterations of species composition along the transmission route edges would not result in regional impacts because the size of the impacted area would be negligible compared to the extensiveness of forest cover in surrounding areas, as similarly described above for fragmentation. Plant species diversity could potentially increase locally through maintenance of the transmission routes in early successional plant communities, and potential creation of early successional wetland in poorly drained areas.

Emergency repairs would result in short-term, localized impacts similar to those that would occur during construction, but for shorter durations over the life of the Project. These disturbances would occur largely to herbaceous and shrub communities within the transmission route at specific locations.

Underground Transmission Cable

Impacts from operation, maintenance, and emergency repairs of underground transmission cable would be similar to those discussed for overhead transmission line, with some notable differences.

Operation and maintenance of underground transmission cable would result in some long-term impacts due to the loss of forest cover. However, impacts would be less than those of overhead transmission line because the transmission route would be narrower and less vegetation management would be required for purposes of safety and reliability. An area within approximately 15 feet (5 m) of the underground cable would be maintained free of tree cover to provide visibility and prevent damage from penetration of tree roots.

Any potential long-term effects associated with fragmentation and loss of biodiversity would also be less for the underground cable due to the narrower transmission route (including portions of new transmission route in the Northern Section) and the previously-disturbed nature of roadway corridors. However, because of the greater amount of soil disturbance for underground alternatives, there would be an increased chance of the spreading of invasive species.

4.1.13 WATER RESOURCES

The Project would result in short-term and long-term impacts to water resources related to construction, operation, maintenance, and emergency repairs. Overhead configurations would span the majority of streams, rivers, and riparian areas and minimize impacts to these resources. In areas where transmission cables would be underground, measures would need to be taken to minimize impacts, including directionally boring under the larger channels and replacing culverts where necessary. Although there would be some secondary water quality and habitat effects from canopy reduction, mitigation would be undertaken to address those effects. APMs to minimize water resource and wetland impacts can be found in **Appendix H**. Specific impacts within each geographic section are discussed in more detail in **Sections 4.2.13, 4.3.13, 4.4.13,** and **4.5.13**.

Table 4-70 shows impacts to water resources by alternative.

Table 4-70. Summary of Potential Impacts to Water Resources

Alternative	Wetland Disturbance acres (ha)			Impacts to Vernal Pools acres (ha)	Disturbance in Locations Overlying Aquifers acres (ha)	Disturbance in FEMA Flood Zones acres (ha)	Miles (km) of Impaired Rivers Crossed	Disturbance to Water Supply Resources		
	Direct	Temporary	Secondary					PWS Wells	SWPAs acres (ha)	WHPAs acres (ha)
1 (No Action)	--	--	--	--	--	--	--	--	--	--
2	2 (0.8)	212 86)	37 (15)	<0.5 (<0.5)	304 (123)	1,782 (721)	<0.5 (<0.8)	--	1,491 (603)	161 (65)
3	3 (1)	194 (79)	15 (6)	<0.5 (<0.5)	223 (90)	1,250 (506)	<0.5 (<0.8)	--	1,104 (447)	112 (45)
4a[b]	3 (1)	3 (1)	<0.5 (<0.2)	--	117 (47)	275 (111)	<0.5 (<0.8)	--	312 (126)	27 (11)
4b[b]	3 (1)	3 (1)	<0.5 (<0.2)	--	130 (52)	287 (116)	<0.5 (<0.8)	--	343 (139)	28 (11)
4c[b]	2 (0.8)	3 (1)	<0.5 (<0.2)	--	125 (51)	274 (111)	<0.5 (<0.8)	--	325 (132)	26 (11)
5a	2 (0.8)	182 (74)	36 (15)	<0.5 (<0.5)	299 (121)	1,606 (650)	<0.5 (<0.8)	--	1,204 (488)	165 (66)
5b	2 (0.8)	198 (80)	37 (15)	<0.5 (<0.5)	308 (124)	1,714 (693)	<0.5 (<0.8)	--	1,404 (569)	161 (65)
5c	2 (0.8)	183 (74)	36 (15)	<0.5 (<0.5)	311 (126)	1,618 (655)	<0.5 (<0.8)	--	1228 (497)	161 (65)
6a[b]	1 (<0.5)	23 (9)	<0.5 (<0.5)	--	194 (79)	407 (165)	<0.5 (<0.8)	--	443 (179)	75 (30)
6b[b]	1 (<0.5)	23 (9)	<0.5 (<0.5)	--	207 (84)	420 (170)	<0.5 (<0.8)	--	474 (192)	77 (31)
7 (Proposed Action)	2 (0.8)	170 (69)	36 (15)	<0.5 (<0.5)	264 (107)	1,438 (582)	<0.5 (<0.8)	--	1,036 (420)	87 (35)

Note: A vernal pool is a seasonal depressional wetland covered by shallow water for variable periods (often during winter or spring) that may be completely dry during summer and fall. An impaired river is a waterbody identified as impaired according to Section 303(d) of the Clean Water Act. A Public Water Supply (PWS) is defined as a piped water system having its own source of supply, serving 15 or more services or 25 or more people, for 60 or more days per year. Source Water Protection Areas (SWPAs) and Wellhead Protection Areas (WHPAs) are defined and regulated by the NH Department of Environmental Services under the NH State Drinking Water Act and federal Safe Drinking Water Act.

[a] Including all FEMA Flood Zones (Zone A, Zone AE, and Zone X).

[b] No vernal pools were identified in the Project corridor.

4.1.13.1 Impacts from Construction

Overhead Transmission Line

Water resources potentially affected by construction would include watersheds, surface water, groundwater, floodplains, and wetlands. General short-term construction impacts related to construction activities would include changes or modification of groundwater or surface water (streams and rivers) quantity and/or quality, potential sedimentation, changes in water flow patterns, increased bedrock fracturing near rock blasting areas (temporarily affecting turbidity in groundwater wells near the blast zone), and increased turbidity in surface water. In general, aboveground facilities would be able to span wetlands and waterbodies, thereby reducing potential impacts.

Generally, effects to watersheds would include diminished infiltration capacities from permanent structures (including towers, transition stations, converter stations, and the Deerfield Substation), addition of chemicals within soils and groundwater as a result of spills, and overland flow changes or other physical and chemical alterations that could result in negative impacts to surface and/or groundwater. Potential impacts to watersheds would primarily occur to water quality and resulting from increased turbidity and sedimentation, changes in water flow patterns and increased likelihood of pollutants reaching waterbodies.

Potential construction activities that would result in short-term impacts to surface waters would primarily include ground disturbance such as grading and excavation. These activities could result in increased erosion and sedimentation in runoff. In addition, runoff of chemicals onto surrounding soils from petroleum products or other chemicals on construction sites could eventually reach and impact groundwater. Localized increases in turbidity and re-suspension of sediments could occur as a result of disturbance near waterbodies. Increased turbidity has the potential to reduce light levels in aquatic habitats and could result in short-term changes to water chemistry, including impacts on pH and reduction of dissolved oxygen. Another potential impact affecting surface water would be spills from improper use, storage, or disposal of oil and/or hazardous materials.

Potential impacts to water supply as a result of construction and operational activities include water quantity and quality depletion, increased sedimentation, and increased turbidity. Because large water withdrawals are not anticipated and because New Hampshire BMPs and SPCC plans would be used, impacts to wells along the route are not anticipated from water withdrawal, erosion, or hazardous waste or fuel spills. The use of APMs (see **Appendix H**) would minimize impacts to all local water bodies.

Additionally, the short-term impacts during construction to water-quality functions of wetlands—including the trapping of sediment, pollution control, and the biochemical processes that take place as water enters, is stored in, or leaves a wetland, and their capacity to support forest biota—could occur depending on the proximity of disturbance to the wetland, but are expected to be minimal. As the Project corridor is revegetated to permanent scrub-shrub communities, overland flow would be expected to reduce and filtration would be expected to return to near pre-construction levels.

Short-term construction disturbance would also occur in the floodplain with some towers installed in flood zones. The flood zones would be affected by increased permanent structures which would decrease that zone's capacity for retaining flood waters. This could result in expansion of the flood zone into non-zone areas and thus increase the likelihood for flooding in areas previously not susceptible; however, the Project footprint is relatively small in comparison to the local flood zone and any displacement of water during a flood event is expected to be minimal. The only construction with permanent footprints of note would be the transmission tower foundations, along with the various converters, substations and transition stations. The Deerfield Substation would impact 9 acres (4 ha) of Zone X designation, Franklin Converter Station (Alternatives 2, 5a, 5b, 5c, 6a, 6b, and 7) would impact 42 acres (17 ha) of Zone X designation, and North

Road Converter Station (Alternatives 3, 4a, 4b, and 4c) would impact 2 acres (1 ha) of Zone A designation and 31 acres (13 ha) of Zone X designation.[76]

Construction activities would result in long-term impacts to water resources and wetlands. Forest losses can result in increased overland flow and reduced filtration of sediments and pollutants, which would increase the likelihood for pollutants reaching streams, rivers, and estuaries. Vegetation removal would change water flow patterns and affect runoff rates, which in turn could affect local instream flow characteristics.

Wetland impacts from construction activities would result in long-term impacts, such as removal of wetlands due to fill or tower placement, while other impacts would be short-term, such as vegetation clearing followed by natural regeneration of vegetation in the corridor.

Potential construction activities that would result in long-term impacts to wetlands include conversion of PFO wetlands into either PEM or PSS wetlands (see **Section 3.1.13.2**). Conversion of wetlands would change the function and uses of the wetland, including water retention, storage, increase or decrease of flow velocity, groundwater recharge or discharge areas, and the influence of wetlands on atmospheric processes. Construction activities could also impact vernal pools (seasonal wetlands covered by shallow water for variable periods of time), which can be valuable habitat for rare plants and animals. Vegetative clearing on areas surrounding vernal pools can result in changes in water flow, changes to the water table, increased pollution, and decreased wildlife habitat value. For information regarding wildlife and aquatic species that use vernal pools, see **Sections 4.2.13, 4.3.13, 4.4.13,** and **4.5.13.**

Underground Transmission Cable

Impacts to water resources from underground construction would be similar to aboveground construction, except that soil disturbance and resulting erosion and sedimentation would be greater from short-term construction activities, such as excavation and digging of the trench. Trenching would result in impacts on water quality from increased turbidity, potential downstream sedimentation, changes in water flow patterns, and increased likelihood of pollutants reaching waterbodies. Stream crossings could include installation methods for minimizing short-term construction impacts to water quality including trenching or HDD, and/or attaching to existing infrastructure such as bridges. HDD would have the potential for leaks of HDD drilling fluid, which could cause drilling fluid to become suspended or dispersed, impacting water quality. The specific locations of blasting and HDD are not known at this time, as project design continues to evolve through the New Hampshire Site Evaluation Committee review. Through this State siting process, Northern Pass would be required to coordinate with the New Hampshire Department of Environmental Services to establish appropriate impact avoidance and mitigation measures, including potentially, the use of HDD in particular areas. Additionally, monitoring protocols and public outreach requirements would be developed through coordination with the State and USFS, as the agencies with siting authority. Many of the APMs in **Appendix H**, such as an Erosion Prevention and Sedimentation Control (EPSC) Plan, would avoid or minimize impacts from erosion and sedimentation.

4.1.13.2 Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts, but would be more localized and would occur for a shorter duration. Maintenance grading and drainage control for permanent access/maintenance roads would present potential impacts associated with erosion, runoff, flooding potential, and sedimentation from vehicle use. In the event emergency repairs are required, impacts to water resources and wetlands would be similar to those during construction, depending upon the extent of the repairs necessary, amount of re-disturbance of the Project

[76] As described in **Section 3.1.13**, the 500-year floodplain is classified as Zone X, while the 100-year floodplain is classified as Zones A and AE.

corridor, and location. Localized impacts could occur, especially for underground alternatives, but would be expected to be short term.

Long-term impacts on water resources from the normal operation of the Project under any of the alternatives are not anticipated.

4.1.14 GEOLOGY AND SOILS

Certain impacts to surficial geology and soils common to all alternatives are discussed in this section. Impacts within each geographic section are dependent upon soil type and geology, and are thus discussed by alternative in **Sections 4.2.14**, **4.3.14**, **4.4.14** and **4.5.14**.

The analysis identifies earthquakes and faults near the Project corridor. Seven earthquakes were identified within 25 miles (40 km) of the Project corridor that occurred between 1810 and 1988. The data that were reviewed covers major, historic events from 1568 to 2004. In general, the likelihood that an earthquake strong enough and close enough to the Project corridor to cause liquefaction is considered low, based on the low historical incidence of damaging earthquakes and an absence of mapped active faults in New Hampshire (Boudette 1994a). Each alternative identifies the proximity of the Project corridor to the seven earthquakes and faults, all of which are inactive.

Table 4-71 shows impacts to geologic and soil resources by alternative.

Table 4-71. Summary of Potential Impacts to Geologic and Soil Resources

Alternative	Total Ground Disturbance acres (ha)	Disturbance to All Hydric Soils acres (ha)	Disturbance to Prime Farmland, Farmland of Statewide Importance, or Farmland of Local Importance acres (ha)
1 (No Action)	--	--	--
2	1,838 (744)	48 (19)	465 (188)
3	1,295 (524)	51 (21)	345 (140)
4a	295 (119)	7 (3)	103 (42)
4b	308 (125)	7 (3)	111 (45)
4c	296 (120)	6 (2)	109 (44)
5a	1,663 (673)	47 (19)	421 (170)
5b	1,770 (716)	49 (20)	462 (187)
5c	1,674 (677)	47 (19)	431 (174)
6a	426 (172)	13 (5)	210 (85)
6b	439 (178)	13 (5)	219 (89)
7 (Proposed Action)	1,494 (605)	48 (19)	399 (161)

4.1.14.1 Impacts from Construction

Construction of transition stations, converter stations, overhead tower construction and underground cable installation would result in impacts to surficial geology and soils.

In general, surficial geology impacts would be localized and long-term where the structures and transition facilities (locations where the transmission line/cable would transition from overhead to underground or underground to overhead) are placed or relocated. Construction and modifications of access roads and maintenance roads are not anticipated to have long-term impacts on surficial geology due to the depth of disturbance.

Blasting may be needed during installation of the underground cable (direct bury) and installation of support structures for new towers, depending on the depth of bedrock and the depth to which the structures' foundations are installed. This would be limited to the controlled use of explosives needed for a localized section of trench; as a result, the long-term impacts on surficial geology from construction of the underground cable are not expected and long-term impacts could occur from bedrock fracturing.

Impacts to soils would primarily be short-term and occur during the construction phase. Aboveground features such as construction pads, access roads and maintenance roads, and expanding the transmission route would impact soils because these features would require removing overhead vegetation and ground disturbance. This could expose soils to additional precipitation or wind. Although these impacts are likely to cause some short-term soil erosion, impacts are expected to be localized and extend primarily through the construction period, especially if aboveground features are returned to their pre-existing use. With implementation of the APMs in **Appendix H,** and revegetation of disturbed areas, long-term impacts on soils are not anticipated.

Impacts on soil during construction of the underground cable are expected to be regional and short-term. The disturbed transmission route for aboveground and underground cable installation would be exposed to erosion during construction, particularly on the steeper slopes and more highly erodible soils. Underground cable installation would require more grading, trenching, and other excavation along with backfilling resulting in more soil disturbance and exposure to erosion during construction. Use of topsoil segregation as a BMP when trenching and replacement of the subsoil then topsoil would reduce the impact on Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance (see **Section 3.1.14** for a description of these designations). Impacts on soils from construction of the underground cable using directional drilling would be localized in the areas where a transition station is located and impacts would not be expected with the implementation of APMs for erosion, sediment control, and restoration of the disturbed Project corridor.

Long-term soil impacts would include clearing and grading for new, permanent access and maintenance roads and transition stations resulting in compaction and erosion. New and permanent access and maintenance roads, as well as transition stations, would have long-term impacts to soils.

Impacts on soil from the construction of the overhead structures of the Project would be localized within the existing PSNH transmission route where the structures would be placed or relocated, some areas of Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance would be permanently converted and would lose the ability to serve their purpose.

Per the required SWPPP, the Applicant would need to ensure that appropriate erosion and sediment control plans or procedures were implemented during construction to prevent the migration of soils to nearby waterbodies, roads, or other sensitive areas. If these requirements were implemented, then the impacts on soils would be short-term and localized.

4.1.14.2 Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts, but would tend to be more localized and would occur for a shorter duration. Maintenance grading and excavation for permanent access/maintenance roads would present potential impacts associated with erosion. In the event emergency repairs are required, impacts to soils would be similar to those during construction, depending upon the extent of the repairs necessary, amount of re-disturbance of the Project corridor, and location. Localized impacts could occur, especially for buried alternatives, but would be expected to be short term.

Long-term impacts to soils and surficial geology from the normal operation of the Project under any of the alternatives evaluated are not anticipated.

4.2 NORTHERN SECTION

4.2.1 VISUAL RESOURCES

Refer to **Section 4.1.1** for a discussion of general impacts common to all geographic sections.

4.2.1.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.1.2 Alternative 2

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 2. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing and the construction of a new transmission route would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 2 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.2.8.2** for a discussion of impacts to historic resources within the study area.

Some visibility of the Alternative 2 structures would extend into Vermont, mainly into the Town of Canaan,VT. In particular, structures and the cleared corridor would extend east from the U.S./Canada border crossing, cross over Hall Stream Road and traverse a hill that lies immediately east of Hall Stream Road. This portion of Alternative 2 may be visible from parts of Canaan to the south and southwest of the Project. Areas of River Road, Vermont Route 253, and Vermont Route 102 may have visibility of the Project to the north and northeast, at distances of approximately 0.2 to 3 miles (0.3 to 5 km) away. The towns of Averill and Lemington, VT may also have minor views, although these would be no closer than 6 miles (10 km). The landscape assessment was not performed for areas within the State of Vermont.

Proposed structures in the U.S. near the U.S./Canada border have the potential to result in transboundary visual impacts. Structures and the new cleared transmission route in the U.S. would potentially be visible from several locations in Canada, including:

- At the border crossing in Comins Mills, Québec Alternative 2 structures and new cleared transmission route could be visible to the west on a hill near the Connecticut River. The opportunity for visibility would be greatest as one enters Canada driving north on Québec Route 253.
- Where the proposed Hydro-Québec transmission line would cross Québec Route 253, a new transmission route clearing could make it possible to view proposed Alternative 2 structures in the U.S. across the Connecticut River. Additionally, structures in the U.S. could be visible from other locations along Québec Route 253 within approximately 2 miles (3 km) of the U.S./Canada border where there are openings on the east side of the road.

- Proposed structures and new transmission corridor clearing in the U.S. could be visible from the summit of Mont Hereford, which is accessed by road or the Neil-Tillotson hiking trail. Mont Hereford is approximately 7 miles (11 km) from the Alternative 2 structures.

Additionally, proposed structures in Canada would potentially be visible to viewers in Vermont or New Hampshire, including:

- From the general area of the border crossing and customs facility on VT Route 253 in Beecher Falls, VT, the four easternmost proposed Hydro-Québec structures could be visible to the north. The U.S. Border Station is listed on the National Register of Historic Places.
- Where Alternative 2 would cross Hall Stream Road in Pittsburg, NH, a new transmission corridor clearing may make it possible to view several proposed Hydro-Québec structures in Canada across the Connecticut River. The proposed Hydro-Québec project could also be visible where the transmission corridor climbs an unnamed hill in Canada. Additional visibility of two or three structures on the hillside in Canada is possible from Halls Stream Road within approximately 2 miles (3 km) to the north of the proposed road crossing.
- The Ride-the-Wilds ATV trail follows Hall Stream Road in this area, and the proposed Hydro-Québec project could be visible from this trail as described above.
- The tops of several proposed Hydro-Québec structures could be visible from Lake Wallace, which straddles the U.S./Canada border, but at a distance of approximately 6 miles (10 km) it is unlikely they would be noticeable.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 2 would be approximately 33 square miles (85 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition and the No Action Alternative), which is 20 square miles (52 km^2). Thus, the viewshed under Alternative 2 would be more than 1.5 times larger than the viewshed of the existing PSNH transmission line. This increase is primarily due to the fact that Alternative 2 would require the clearing of a new transmission route in the Northern Section.

Alternative 2 would result in an additional 4.5 square miles (11.5 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 2 would increase the average visual magnitude from 1.25 to 1.61, indicating an increase in the number of visible transmission structures. Even with the increase in the number of visual structures, the visual magnitude would remain at its current level of "Very Low to Low." Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 2 would result in an additional 0.4 square mile (1 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 2 would increase the average scenic impact from 1.01 to 1.18, indicating an increased visibility at sensitive locations. Even with the increase in visibility at sensitive locations, the scenic impact would remain at its current level of "Very Low to Low." A factor in this rating is the number of potential viewers; because this area is sparsely populated the overall scenic impact remains relatively low. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-72 summarizes landscape assessment impacts in the Northern Section under Alternative 2.

Table 4-72. Landscape Assessment Impacts under Alternative 2 – Northern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Land Area within Viewshed	20 square miles ($52\ km^2$)	33 square miles ($85\ km^2$)	53 square miles ($137\ km^2$)
Average Visual Magnitude	1.25 (Very Low to Low)	0.36	1.61 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	0.3 square mile ($0.7 km^2$)	0.4 square mile ($1\ km^2$)	0.7 square mile ($1.8\ km^2$)
Average Scenic Impact	1.01 (Very Low to Low)	0.17	1.18 (Very Low to Low)
Aggregate Scenic Impact	20.02	42.15	62.17

Roads-Based Analysis

The overhead sections of Alternative 2 would cross 19 publicly accessible roads already crossed by the existing PSNH transmission line, and create a new corridor with 6 additional public road crossings. The Project would be visible from approximately 22 miles (35 km) of roads in addition to the 21 miles (34 km) of roads with visibility of the existing PSNH transmission line.[77] Approximately 9 additional miles (14 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 4 miles (6 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 2 would increase the average visual magnitude for roads within the viewshed from 2.16 to 2.59. Even so, the visual magnitude would remain at its current level of "Low to Moderate."

Included in the 22 miles (35 km) of increased visibility from roads within the viewshed of Alternative 2 would be 9.9 additional miles (16 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 323 hours per day from 269 hours per day to 592 hours per day. These impacts would primarily be to the Connecticut River National Scenic Byway (61 hours per day), the state designated Presidential Range Tour (78 hours per day), the state designated Moose Path Trail (149 hours per day), and the state designated Woodland Heritage Trail (35 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-73 summarizes roads-based analysis impacts in the Northern Section under Alternative 2.

Table 4-73. Roads-Based Analysis Impacts under Alternative 2 – Northern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Miles of Road within Viewshed	21 miles (34 km)	22 miles (35 km)	43 miles (69 km)
Average Visual Magnitude	2.16 (Low to Moderate)	0.43	2.59 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	6.8 miles (11 km)	9.9 miles (16 km)	16.7 miles (27 km)
Vehicle Exposure on Scenic Roads	269 hours per day	323 hours per day	592 hours per day

Viewpoint Assessment

A review of the six KOPs for the Northern Section in **Appendix E** gives an indication of how some existing views would change with the construction of Alternative 2. These KOPs represent the range of viewpoint characteristics and range of potential long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website

[77] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

(http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP CL-1 (Viewpoint CL-1c in **Appendix E**) is taken from the Connecticut River National Scenic Byway (NH Route 145 in Clarksville, NH) looking west looking into a successional field, with forested mountains in the background. It shows the visual impact of a transition station near the center of the view, with additional lattice structures visible in both the foreground and background; the existing condition does not have a contrast-dominance rating because there is not any existing infrastructure at this location. Under Alternative 2, the contrast-dominance rating would be "Strong" (29), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP DU-1 (Viewpoint DU-1c in **Appendix E**) shows a view across Little Dummer Pond to a forested hillside. An existing generator lead line connecting the Granite Reliable Wind development to the grid is visible above the trees at the foot of the hill; the existing contrast-dominance rating is "Weak" (13). Alternative 2 would cut a new transmission route higher up the hillside and employ large lattice transmission structures. Under Alternative 2, the contrast-dominance rating would be "Strong" (29), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP LA-2 (Viewpoint LA-2c in **Appendix E**) is a vista of the Presidential Range from an overlook in Weeks State Park in Lancaster, NH. The view is across a valley to snow-covered peaks in the far background; the existing contrast-dominance rating is "Weak" (14). The existing PSNH transmission line is visible across the lower portion of the view. Under Alternative 2, the contrast-dominance rating would be "Strong" (28), which indicates that the visual change would be large and would be likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP SE-3 (Viewpoint SE-3c in **Appendix E**) looks across Little Diamond Pond in Coleman State Park at a forested ridgeline. There are no visible transmission facilities in the existing view. The contrast-dominance rating under Alternative 2 would be "Strong" (27), which indicates that the visual change would be large and would be likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP ST-3 (Viewpoint ST-3c in **Appendix E**) is an overlook located on a short trail spur off the Cohos Trail, just north of Christine Lake in Stark, NH. The contrast-dominance rating for the existing PSNH line is "Weak" (14); the contrast-dominance under Alternative 2 would be "Moderate" (20), which indicates that the visual change would be clearly noticeable to a casual observer, and would likely be considered adverse.
- KOP ST-4 (Viewpoint ST-4c in **Appendix E**) is located on the Cohos Trail, where it crosses the PSNH corridor. The contrast-dominance rating for the existing PSNH line is "Strong" (29). The contrast-dominance rating under Alternative 2 would be "Severe" (42), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.

4.2.1.3 Alternative 3

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 3. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 3; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in a new or existing transmission route.

For approximately 40 miles in the Northern Section, Alternative 3 would be buried in a new transmission route. Vegetation would be cleared in this new transmission route, and ongoing vegetation management would prevent the regeneration of overstory vegetation. While this new transmission route would be visible from certain locations, because the cable would be buried, no infrastructure would be visible other than the transition station at the U.S./Canada border. Overstory vegetation removal in the existing PSNH transmission route would increase the viewshed of the existing PSNH transmission line by approximately 0.02 square mile (0.04 km^2).

The proposed Hydro-Québec project in Canada could be visible from locations in Vermont and New Hampshire under Alternative 3, as described in **Section 4.2.1.2**. Because Alternative 3 would be underground in the U.S., potential visibility of the Project from Canada would be limited to the transition station at the border crossing and vegetation removal for the new transmission corridor.

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the Northern Section under Alternative 3.

- KOP CL-1 (Viewpoint CL-1d in **Appendix E**) – New vegetation clearing would be visible from this viewpoint related to burial within the new transmission route.
- KOP DU-1 (Viewpoint DU-1d in **Appendix E**) – Alternative 3 would create a new cleared transmission corridor halfway up the hillside; the contrast dominance rating would be “Weak” (10), which indicates that the visual change would be noticeable, but so small as to be considered unimportant.
- KOP LA-2 (Viewpoint LA-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP SE-3 (Viewpoint SE-3d in **Appendix E**) – There would be no visible transmission facilities; the contrast-dominance rating under Alternative 3 would be “Negligible” (1), which indicates that the visual change would be likely to go unnoticed by a casual observer.
- KOP ST-3 (Viewpoint ST-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP ST-4 (Viewpoint ST-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.2.1.4 Alternative 4a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 4a; however, the Project would be located underground in existing roadway corridors (see **Section 4.1.1.2**). The transition station at the U.S./Canada border would impact visual resources in the long term.

The proposed Hydro-Québec project in Canada could be visible from locations in Vermont and New Hampshire under Alternative 4a, as described in **Section 4.2.1.2**. Because Alternative 4a would be underground in the U.S., potential visibility of the Project from Canada would be limited to the transition station at the border crossing and vegetation removal for the new transmission corridor.

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the Northern Section under Alternative 4a.

- KOP CL-1 (Viewpoint CL-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP DU-1 (Viewpoint DU-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LA-2 (Viewpoint LA-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP SE-3 (Viewpoint SE-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP ST-3 (Viewpoint ST-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP ST-4 (Viewpoint ST-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.2.1.5 Alternative 4b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.2.1.4**).

4.2.1.6 Alternative 4c

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.2.1.4**).

4.2.1.7 Alternative 5a

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.1.2**). Transboundary impacts under Alternative 5a would be identical to those under Alternative 2. See **Section 4.2.1.2** for a discussion of impacts to viewers in Vermont and Canada.

4.2.1.8 Alternative 5b

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.1.2**). Transboundary impacts under Alternative 5b would be identical to those under Alternative 2. See **Section 4.2.1.2** for a discussion of impacts to viewers in Vermont and Canada.

4.2.1.9 Alternative 5c

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.1.2**). Transboundary impacts under Alternative 5c would be identical to those under Alternative 2. See **Section 4.2.1.2** for a discussion of impacts to viewers in Vermont and Canada.

4.2.1.10 Alternative 6a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.2.1.4**).

4.2.1.11 Alternative 6b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those discussed above for Alternative 4a (see **Section 4.2.1.4**).

4.2.1.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 7. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing and the construction of a new transmission route would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 7 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.2.8.12** for a discussion of impacts to historic resources within the study area.

Transboundary impacts under Alternative 7 would be identical to those under Alternative 2. See **Section 4.2.1.2** for a discussion of impacts to viewers in Vermont and Canada.

Landscape Assessment

The area of visibility within 10 miles of Alternative 7 would be 164 percent larger than the area of visibility for the existing PSNH transmission line. Because Alternative 7 requires the clearing of a new transmission corridor in the Northern Section, this increase is relatively large compared to the other sections.

Alternative 7 would result in an additional 5 square miles (13 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 7 would increase the average visual magnitude from 1.25 to 1.56. However, the visual magnitude would remain at its current level of "Very Low to Low." Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 7 would result in an additional 0.34 square mile (0.9 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 7 would increase the average scenic impact from 1.01 to 1.15, indicating an increased visibility at sensitive locations. Even with the increase in visibility at sensitive locations, the scenic impact would remain at its current level of "Very Low to Low." A factor in this rating is the number of potential viewers: because this area is sparsely populated, the average scenic impact would remain relatively low. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-74 summarizes landscape assessment impacts in the Northern Section under Alternative 7.

Table 4-74. Landscape Assessment Impacts under Alternative 7 – Northern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Land Area within Viewshed	20 square miles ($52\ km^2$)	33 square miles ($85\ km^2$)	53 square miles ($137\ km^2$)
Average Visual Magnitude	1.25 (Very Low to Low)	0.31	1.56 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	0.3 square mile ($0.8\ km^2$)	0.34 square mile ($0.9\ km^2$)	0.64 square mile ($1.6\ km^2$)
Average Scenic Impact	1.01 (Very Low to Low)	0.14	1.15 (Very Low to Low)
Aggregate Scenic Impact	20.02	40.47	60.49

Roads-Based Analysis

Under Alternative 7, the Project's overhead structures would cross six publicly-accessible roads in addition to the 19 publicly-accessible roads crossed by the existing PSNH transmission line. The Project would be visible from approximately 22 miles (36 km) of roads in addition to the 21 miles (34 km) of roads with visibility of the existing PSNH transmission line.[78] Approximately 7 additional miles (13 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 4 miles (6 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 7 would increase the average visual magnitude for roads within the viewshed from 2.16 to 2.53. However, the visual magnitude would remain at its current level of "Low to Moderate."

Included in the 22 miles (35 km) of increased visibility from roads within the viewshed of Alternative 7 would be 9.5 miles (16 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 304 hours per day, from 269 hours per day to 573 hours per day. These impacts would primarily be to the Connecticut River National Scenic Byway (57 hours more per day), the state-designated Presidential Range Tour (74 hours more per day), the state-designated Moose Path Trail (142 hours more per day), and the state-designated Woodland Heritage Trail (31 hours more per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-75 summarizes roads-based analysis impacts in the Northern Section under Alternative 2.

Table 4-75. Roads-Based Analysis Impacts under Alternative 7 – Northern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Miles of Road within Viewshed	21 miles (34 km)	22 miles (35 km)	43 miles (69 km)
Average Visual Magnitude	2.16 (Low to Moderate)	0.37	2.53 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	6.8 miles (11 km)	9.5 miles (16 km)	16.4 miles (27 km)
Vehicle Exposure on Scenic Roads	269 hours per day	304 hours per day	573 hours per day

Viewpoint Assessment

A review of the six KOPs for the Northern Section in **Appendix E** gives an indication of how some existing views would change with the construction of Alternative 7. These KOPs represent the range of viewpoint characteristics and range of potential long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual

[78] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP CL-1 (Viewpoint CL-1e in **Appendix E**) represents the visual impact of a transition station near the center of the view, with additional structures visible in both the foreground and background. The existing condition does not include any transmission-related infrastructure at this location. The contrast-dominance rating would be "Strong" (27) under Alternative 7, which indicates that the visual change would be large and is likely to be considered adverse by a casual observer. Depending on the sensitivity of the setting, it may be considered unreasonable.
- KOP DU-1 (Viewpoint DU-1e in **Appendix E**) represents a view across water to a forested hillside. An existing generator lead line is visible at the foot of the hill creating a "Weak" (13) contrast-dominance rating. Alternative 7 would cut a new transmission corridor higher up the hillside and employ large lattice transmission structures. Alternative 7 would raise the contrast-dominance rating to "Strong" (33), which indicates that the visual change would be large and is likely to be considered adverse by a casual observer. Depending on the sensitivity of the setting, it may be considered unreasonable.
- KOP LA-2 (Viewpoint LA-2d in **Appendix E**) is a vista from Weeks State Park across a valley to snow-covered peaks in the far background. The contrast-dominance rating for the existing PSNH line is "Weak" (14). The contrast-dominance rating under Alternative 7 would be "Strong" (28), which indicates that the visual change would be large and is likely to be considered adverse by a casual observer. Depending on the sensitivity of the setting, it may be considered unreasonable.
- **KOP SE-3** (Viewpoint SE-3e in **Appendix E**) looks across Little Diamond Pond in Coleman State Park at a forested ridgeline. There are no visible transmission facilities in the existing view. The contrast-dominance rating under Alternative 7 would be "Moderate" (21), which indicates that the visual change would be clearly noticeable to a casual observer, and is likely to be considered adverse.
- KOP ST-3 (Viewpoint ST-3d in **Appendix E**) is an overlook located on a short trail spur off the Cohos Trail, just north of Christine Lake in Stark, NH. The contrast-dominance rating for the existing PSNH line is "Weak" (14); the contrast-dominance under Alternative 7 would be "Moderate" (21), which indicates that the visual change would be clearly noticeable to a casual observer, and is likely to be considered adverse.
- KOP ST-4 (Viewpoint ST-4d in **Appendix E**) is located on the Cohos Trail, where it crosses the existing PSNH transmission corridor. The contrast-dominance rating for the existing PSNH line is "Strong" (29). The contrast-dominance rating under Alternative 7 would be "Severe" (42), which indicates that the visual change would be very large, and in sensitive settings is likely considered unreasonably adverse by a casual observer.

4.2.2 SOCIOECONOMICS

Refer to **Section 4.1.2** for a discussion of general impacts common to all geographic sections.

4.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.2.2 Alternative 2

Property Taxes

Table 4-76 summarizes the anticipated property tax impacts from Alternative 2 in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 2 would be approximately $9.8 million for the communities within the Northern Section and approximately $29.8 million for the state. The **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) shows the analysis disaggregated by town and taxing jurisdiction (local, municipal, county, and state). For purposes of this analysis, it is assumed that current tax rates would remain unchanged during the construction and operation phases of the Project. If rates changed, then tax revenues could be different from those presented. Furthermore, this analysis assumes that assessed values within each jurisdiction would remain at these levels throughout the operating life of the Project. To the extent that any abatement occurs, tax revenues from the Project could be lower.

Table 4-76. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 2

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,087	$9.8	$29.8

In addition, the Project could result in a decline in assessed values (and, therefore, tax revenues) for properties located near the aboveground segments, due to adverse visual impacts. Potential decreases in property values are discussed below.

Economic Activity

Impacts to statewide economic activity under Alternative 2, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.2**.

Property Values

It is estimated that implementation of Alternative 2 could result in a reduction in taxable assessed residential property values of approximately $500,000 across the Northern Section. This could result in a reduction of residential tax revenue payments of approximately $14,000 per year. See **Section 4.1.2.2** for a description of how this potential reduction in residential property values was calculated. Additional information is available in the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project under Alternative 2 are discussed in **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 2 are discussed in **Section 4.1.2.2**.

4.2.2.3 Alternative 3

Property Taxes

Table 4-77 summarizes the anticipated property tax impacts in the Northern Section under Alternative 3. Increases in annual property tax collections within the Northern Section under Alternative 3 would be approximately $19.6 million for the communities within the Northern Section and approximately $57.9 million for the state.

Table 4-77. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 3

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$2,128	$19.6	$57.9

Economic Activity

Impacts to statewide economic activity under Alternative 3, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.3**.

Property Values

Because the Project would be buried under Alternative 3, no impacts to property values would be expected. It was assumed that the transition station and vegetation clearing in the new transmission route in the Northern Section would not impact property values as the majority of the infrastructure would be buried.

Tourism

No long-term impacts to tourism are anticipated under Alternative 3 because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 3 are discussed in **Section 4.1.2.3**.

4.2.2.4 Alternative 4a

Property Taxes

Table 4-78 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 4a would be approximately $19.7 million for the communities within the Northern Section and approximately $56.5 million for the state.

Table 4-78. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 4a

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$2,034	$19.7	$56.5

Economic Activity

Impacts to statewide economic activity under Alternative 4a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.4**.

Property Values

Because the Project would be buried under Alternative 4a, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4a because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4a are discussed in **Section 4.1.2.4**.

4.2.2.5 Alternative 4b

Property Taxes

Table 4-79 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 4b would be approximately $19.7 million for the communities within the Northern Section and approximately $59.1 million for the state.

Table 4-79. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 4b

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$2,163	$19.7	$59.1

Economic Activity

Impacts to statewide economic activity under Alternative 4b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.5**.

Property Values

Because the Project would be buried under Alternative 4b, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4b because the transmission cable would be buried. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4b are discussed in **Section 4.1.2.5**.

4.2.2.6 Alternative 4c

Property Taxes

Table 4-80 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 4c would be approximately $18.5 million for the communities within the Northern Section and approximately $58.0 million for the state.

Table 4-80. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 4c

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$2,094	$18.5	$58.0

Economic Activity

Impacts to statewide economic activity under Alternative 4c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.6**.

Property Values

Because the Project would be buried under Alternative 4c, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4c because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4c are discussed in **Section 4.1.2.6**.

4.2.2.7 Alternative 5a

Property Taxes

Table 4-81 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 5a would be approximately $7.8 million for the communities within the Northern Section and approximately $31.3 million for the state.

Table 4-81. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 5a

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,180	$7.8	$31.3

Economic Activity

Impacts to statewide economic activity under Alternative 5a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.7**.

Property Values

Impacts to property values under Alternative 5a would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.2.2**).

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5a are discussed in **Section 4.1.2.7**.

4.2.2.8 Alternative 5b

Property Taxes

Table 4-82 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 5b would be approximately $9.3 million for the communities within the Northern Section and approximately $32.9 million for the state.

Table 4-82. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 5b

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,252	$9.3	$32.9

Economic Activity

Impacts to statewide economic activity under Alternative 5b including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.8**.

Property Values

Impacts to property values under Alternative 5b would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.2.2**).

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5b are discussed in **Section 4.1.2.8**.

4.2.2.9 Alternative 5c

Property Taxes

Table 4-83 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 5c would be approximately $7.7 million for the communities within the Northern Section and approximately $32.2 million for the state.

Table 4-83. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 5c

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,227	$7.7	$32.2

Economic Activity

Impacts to statewide economic activity under Alternative 5c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.9**.

Property Values

Impacts to property values under Alternative 5c would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.2.2**).

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5c are discussed in **Section 4.1.2.9**.

4.2.2.10 Alternative 6a

Property Taxes

Table 4-84 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 6a would be approximately $19.8 million for the communities within the Northern Section and approximately $52.5 million for the state.

Table 4-84. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 6a

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,876	$19.8	$52.5

Economic Activity

Impacts to statewide economic activity under Alternative 6a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.10**.

Property Values

Within the Northern Section, no long-term impacts to property values would be expected under Alternative 6a because the transmission line would be buried.

Tourism

Impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6a are discussed in **Section 4.1.2.10**.

4.2.2.11 Alternative 6b

Property Taxes

Table 4-85 summarizes the anticipated property tax impacts in the Northern Section. Increases in annual property tax collections within the Northern Section under Alternative 6b would be approximately $19.7 million for the communities within the Northern Section and approximately $55.0 million for the state.

Table 4-85. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 6b

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$2,002	$19.7	$55.0

Economic Activity

Impacts to statewide economic activity under Alternative 6b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.11**.

Property Values

Within the Northern Section, no long-term impacts to property values would be expected under Alternative 6b because the transmission line would be buried.

Tourism

Impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6b are discussed in **Section 4.1.2.11**.

4.2.2.12 Alternative 7 – Proposed Action

Property Taxes

Table 4-86 summarizes the anticipated property tax impacts in the Northern Section under Alternative 7. Increases in annual property tax collections within the Northern Section under Alternative 7 would be approximately $7.7 million for the communities within the Northern Section and approximately $37.0 million for the state.

Table 4-86. Annual Property Tax Impact ($ million) in the Northern Section – Alternative 7

Total Construction Cost	Annual Property Tax Revenue	
	Northern	State
$1,410	$7.7	$37.0

In addition, the Project could result in a decline in assessed values (and, therefore, tax revenues) for properties located near the aboveground segments, due to adverse visual impacts. Potential decreases in property values are discussed below.

Economic Activity

Impacts to statewide economic activity under Alternative 7, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.12**.

Property Values

It is estimated that implementation of Alternative 7 could reduce taxable assessed residential property values by approximately $500,000 across the Northern Section, and thereby reduce residential tax revenue payments by approximately $15,000 per year. See **Section 4.1.2.2** for a description of how this potential reduction in residential property values was calculated. Additional information is available in the **Socioeconomics Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports). These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 7 are discussed in **Section 4.1.2.12**.

4.2.3 RECREATION

Refer to **Section 4.1.3** for a discussion of general impacts common to all geographic sections.

4.2.3.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.3.2 Alternative 2

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 2 in the Northern Section. Short-term, localized impacts due to construction activity would occur to one recreational point site (Lancaster Scenic Overlook), approximately 119 acres (48 ha) within recreational sites that have a spatial area, and approximately 0.4 mile (0.6 km) of trails. Alternative 2 would cross the following eligible federal Wild and Scenic Rivers as an overhead transmission line in the Northern Section: Phillips Brook, the Upper Ammonoosuc River, and the Israel River. Impacts to the recreational experience on those rivers would be relatively minor and incremental as there is an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 2: Kauffmann Forest, Nash Stream Forest, Percy State Forest, Cohos Trail, and the WMNF. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.[79]

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.2.1.2**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Sections 3.1.3, 3.2.3, 3.3.3, 3.4.3,** and **3.5.3**), long-term visual impacts would occur to eight additional recreational point sites, approximately 1,722 additional acres (697 ha) within recreational sites with that have a spatial area, and approximately 7 additional miles (11 km) of trails. The following examples of notable recreational resources are among those that would experience long-term visual impacts under

[79] Impacts to the Cohos Trail were not analyzed quantitatively, but are expected to be similar to those occurring at other locations.

Alternative 2: Kauffmann Forest, Nash Stream Forest, Percy State Forest, Silvio O'Conte National Fish and Wildlife Refuge, Weeks State Park, and the WMNF.

The recreation experience under Alternative 2 would be visually affected by the construction and operation of the Project because it would result in a modification to the natural environment. It is assumed that most users expect a scenic landscape, particularly given the character of the Northern Section. The implementation of the Project would alter the natural appearance of the landscape, thus impacting the recreation experience. Additionally, the construction of the new transmission route in the Northern Section could result in impacts to wildlife viewing and users' sense of solitude and personal challenge, among other impacts affecting the recreation experience.

4.2.3.3 Alternative 3

Impacts from Construction

Short-term impacts to recreation during the construction of Alternative 3 in the Northern Section would be similar to those discussed above for Alternative 2 (see **Section 4.2.3.2**). Impacts would occur to the same locations; however, as discussed in **Section 4.1.3.1**, the construction of underground transmission cable could require a longer period of construction and more intense disturbance, resulting in additional disturbance to the recreation experience.

As an underground transmission cable in the Northern Section, Alternative 3 would cross three eligible federal Wild and Scenic Rivers (Phillips Brook, the Upper Ammonoosuc River, and the Israel River) as an underground transmission cable in the Northern Section. Recreational impacts would be relatively minor and incremental as there is an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.2.1.3**, Alternative 3 would be located underground, and the construction and operation would result in long-term visual impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.2.3.4 Alternative 4a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4a in the Northern Section. Short-term, localized impacts due to construction activity would occur to approximately 12 acres (5 ha) within recreational sites that have a spatial area, and approximately 0.1 mile (0.1 km) of trails. Weeks State Park is an example of a notable resource that would experience short-term construction impacts under Alternative 4a. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route. As an underground transmission line in the Northern Section, Alternative 4a would cross the following eligible federal Wild and Scenic Rivers: the Ammonoosuc River, the Little River, and the Israel River. These crossings are not expected to impact the recreational experience, as there is an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.2.1.4**, Alternative 4a would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur, but would be due to limited aboveground structures.

4.2.3.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

4.2.3.6 Alternative 4c

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4c in the Northern Section. Short-term, localized impacts due to construction activity would occur to approximately 5 acres (2 ha) within recreational sites that have a spatial area, and approximately 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. Weeks State Park is an example of a notable resource that would experience short-term construction impacts under Alternative 4c. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than cable in a transmission route.

Alternative 4c would cross the Israel River as an underground transmission cable. The river is an eligible federal Wild and Scenic River in the Northern Section. However, this crossing is not expected to have recreational impacts as there is an existing road crossing in this location and the cable would likely be installed underneath the existing bridge. No other eligible or designated federal Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

As discussed in **Section 4.2.1.6**, Alternative 4c would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur, but would be due to limited aboveground structures.

4.2.3.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

4.2.3.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

4.2.3.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

4.2.3.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

4.2.3.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.3.4**).

4.2.3.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.3.2**).

4.2.4 HEALTH AND SAFETY

Refer to **Section 4.1.4** for a discussion of general impacts common to all geographic sections.

4.2.4.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.4.2 Alternative 2

Impacts from Construction

Regarding risks associated with exposing contaminated soils or groundwater, construction would occur on the PSNH Lost Nation Substation. Compliance with regulatory standards (described in **Section 4.1.4.1**) and implementation of the APMs (see **Appendix H**) would be expected to reduce the risk of unearthing pre-existing contamination or, if such materials are found, reducing the risk of spreading the contamination. If these measures are implemented, adverse impacts associated with unearthing contaminated soils or groundwater would be short-term and localized.

Alternative 2 would cross a natural gas pipeline at approximately MP 62. One new and one relocated tower are proposed to be installed on the south side of the pipeline corridor. Before any excavation could occur, the Applicant would be required to notify Dig Safe and wait to begin excavation until after underground utilities and pipelines are identified, as described in **Appendix H**. The same risks associated with this pipeline would exist during operation, maintenance, and emergency repair activities.

Fires could occur during construction. Measures to prevent fires are included in the NESC, which the Applicant is required to adopt (see **Appendix H**). Therefore, the likelihood of a fire is low. However, the lack of locally-available fire response services could mean that a fire could spread uncontrolled if not contained and put out at a transition station or along the transmission line. Mutual aid associations do not serve portions of the Northern Section; therefore, there are no established protocols for assistance from other towns if a fire were to occur in certain areas. As a result, there could be impacts from a fire in the Northern Section because of the lack of local firefighting resources.

The potential for accidents to the public or workers could increase where construction or maintenance activities would occur within roadways. Alternative 2 would result in the disturbance of approximately 6 miles (10 km) in the Northern Section near roadways for burial of the transmission cable. In addition, 41 roadways would be crossed by the overhead line, resulting in potential short-term lane closures during stringing. The potential for accidents would be minimized by the APMs (see **Appendix H**), including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

In order to minimize risks associated with petroleum products during operation and maintenance, the Applicant would be required to implement an SPCC plan (see **Appendix H)** at the transition stations in the Northern Section. There would be a risk associated with exposing contaminated soils or groundwater during operation, maintenance, and emergency repairs. The likelihood of encountering unknown contamination would be low because all work would be conducted in maintained corridors, which would have been investigated during initial construction.

Fires could occur during operation and maintenance. Measures to prevent fires are included in the NESC, which the Applicant is required to adopt (see **Appendix H)**. Therefore, the likelihood of a fire is low. However, the lack of locally-available fire response services could mean that a fire could spread uncontrolled if not contained and put out at a transition station or along the transmission line. Dixville, Dix's Grant, and Millsfield, NH are not included in mutual aid associations. Each has an agreement with a local fire department. Northumberland, NH also is not included in a mutual aid association, but has its own fire station. Since Mutual aid associations do not serve portions of the Northern Section, there are no established protocols for assistance from other towns if a fire were to occur in certain areas.

4.2.4.3 Alternative 3

Impacts from Construction

Because Alternative 3 would be buried, there could be an increased chance of encountering unanticipated subsurface contamination when compared to Alternative 2. Construction would occur on the PSNH Lost Nation Substation in Northumberland, NH. The likelihood of unearthing contaminated materials could be reduced through training and consultation before digging and could minimizing any impacts to the public or workers. Therefore, adverse impacts associated with unearthing contamination would be short-term and localized.

The Project under Alternative 3 would cross a natural gas pipeline at approximately MP 62. Before any digging occurred, Northern Pass would be required to notify Dig Safe to identify the location of any additional underground utilities and pipelines, and could not undertake excavation until an area was marked to identify the location of any utilities or pipelines (see **Appendix H**).

Potential construction impacts from fires under Alternative 3 would be identical to those described under Alternative 2.

Alternative 3 would result in the disturbance of approximately 6 miles (10 km) of roadway corridor for burial of the transmission cable. The potential for accidents would be minimized by the APMs (see **Appendix H**), including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

Since the transmission cable would be buried, health and safety risks associated with operations, maintenance, and emergency repairs under Alternative 3 would be reduced (see **Section 4.1.4.2**). The potential for breakage and falling of overhead transmission lines and structures during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 3. Although the likelihood of a fire during operation would be diminished because the transmission cable would be buried, any fire could have regional impacts in the Northern Section.

4.2.4.4 Alternative 4a

Impacts from Construction

Because Alternative 4a would be buried, there could be an increased chance of encountering subsurface contamination. Over 100 contaminated sites have been identified within 250 feet (76 m) of the disturbance areas associated with Alternative 4a. The construction contractor would report any contamination unearthed to NHDES based on the reporting requirements stated in Env-Or 600 (N.H. Admin Rules, Env-Or 600). The adverse effects of exposing contaminated materials would depend upon what was unearthed and precautions undertaken. With adequate planning, investigation, and training, this impact should be localized and short-term.

The Project under Alternative 4a would cross a buried pipeline at approximately MP 52. Before any digging occurred, the Applicant would be required to notify Dig Safe to identify the location of any additional underground utilities and pipelines, and could not undertake excavation until an area is marked to identify the location of any utilities or pipelines (see **Appendix H**).

Potential construction impacts from fires under Alternative 3 would be identical to those described under Alternative 2.

Under Alternative 4a, over 68 miles (109 km) of the Project would be constructed in roadways corridors, thereby increasing the potential for vehicular accidents. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

The Project would cross a natural gas pipeline at approximately MP 52. Steps would be taken to avoid damaging or interfering with underground utilities and pipelines.

Operation, maintenance, and emergency repairs of the Project under Alternative 4a would require digging, primarily in the existing roadway corridors. This activity could expose contaminated soils or groundwater. Potential impacts resulting from this exposure are discussed in **Section 4.1.4.**

Since the cable would be buried, the potential for lines breaking and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 4a. Although the likelihood of a fire during operation because the cable is buried, any uncontained fire could have regional impacts in the Northern Section.

4.2.4.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.4.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section.

4.2.4.6 Alternative 4c

Impacts from Construction

In the Northern Section, Alternative 4c would be installed in the same alignment as Alternatives 4a and 4b, north of Whitefield, NH. All construction impacts north of Whitefield, NH, would be similar to Alternative 4a. This alternative would avoid some potentially contaminated sites that would be within 250 feet (76 m) of Alternative 4a in Whitefield, NH, but would be in the vicinity of other potentially contaminated sites within Whitefield, NH. The potential for accidents to the public or workers could increase where construction or maintenance activities would occur within roadways. Approximately 61 miles (98 km) would be constructed in the roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from Alternative 4c would be identical to Alternative 4a (see **Section 4.2.4.4**).

4.2.4.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

4.2.4.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

4.2.4.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

4.2.4.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.4.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.4.4**).

4.2.4.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.4.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.4.4**).

4.2.4.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be similar to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be similar to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.4.2**).

4.2.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 4.1.5** for a discussion of general impacts common to all geographic sections.

4.2.5.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.5.2 Alternative 2

Impacts from Construction

The Project under Alternative 2 would impact 2 federal highways, 6 state roads and 53 local roads in the Northern Section. Impacts, including partial or full roadway or rail line closures, reductions in average speed, and changes in traffic patterns, would result from the stringing of overhead transmission lines across public roads and from the burial of some segments in roadway corridors. Construction of Project components that cross public roadways (i.e., overhead transmission lines) may require access to one or more roadway lanes be temporarily restricted.

The Project would result in the stringing of overhead transmission lines across public roads in 41 locations. In addition, the Project would involve 8 miles (13 km) of buried transmission cables, which would require the physical disturbance of approximately 6 miles (10 km) of roadway corridors for burial of the transmission cable. As discussed in **Section 4.1.5.1**, partial or full roadway closures would reduce average speed and affect traffic patterns.

The maximum increase in traffic volumes from construction vehicles on state roadways analyzed in the Northern Section, as included in the **Traffic and Transportation Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports), ranges from 6 percent on US Route 3 to 263 percent on VT Route 253 (in Canaan, VT). Factors such as the number of lanes, lane width, curve radius, grade and frequency of intersections affect the number of vehicles a road can handle. Roadways with existing low traffic volumes are likely to have additional capacity to handle a short-term increase in traffic volumes from construction vehicles. VT Route 263 currently has an average daily traffic volume of 240 vehicles and an increase in traffic volume of 263 percent would not affect the roadway's ability to handle the increase in traffic due to low existing volumes. However, this would result in an increased likelihood of accidents. Therefore, short-term and localized transportation impacts would result from the Project, but would cease once construction in the area is complete.

Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**, including the implementation of a transportation management plan. Impacts to traffic patterns due to potential roadway closures would result in short-term, localized inconvenience or delay and would not likely interrupt overall area traffic patterns and flow.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that the Mount Washington Regional Airport is located within the study area of the Project corridor in the Northern Section. Towers are expected to range in height from approximately 50 feet (15 m) to a maximum of approximately 155 feet (47 m). Northern Pass has consulted with the FAA regarding the proposed structures near the Mount Washington Regional Airport to confirm they would not exceed FAA obstruction standards. Northern Pass received a Determination of No Hazard (DNH) from the FAA in December of 2010; therefore, no impacts on the Mount Washington Regional Airport would be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Any adverse impact on public roadways that may occur during operation and maintenance would be short-term through the implementation of a transportation management plan (see **Appendix H**). See **Section 4.1.5.2** for more detailed discussion.

4.2.5.3 Alternative 3

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.2.5.2**; however, based on the type of construction equipment needed for other transmission line projects, fewer construction vehicles would be needed for burial of underground cable in the existing PSNH transmission route than would be needed for overhead transmission lines in the existing PSNH transmission route. The Project under Alternative 3 would cross 2 federal highways, 6 state roads and 53 local roads in the Northern Section.

Alternative 3 would result in the disturbance of approximately 6 miles (10 km) of roadway corridor for burial of the transmission cable. The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Northern Section ranges from 5 percent on US Route 3 to 154 percent on VT Route 253. The 154 percent increase in traffic volumes on VT Route 253 is an increase from an estimated 240 vehicles per day to 610 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project under Alternative 3 would not require any tower structures; therefore, impacts to the Mount Washington Regional Airport would not be expected under Alternative 3.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 3.

4.2.5.4 Alternative 4a

Impacts from Construction

The types of traffic impacts on public roadways that may occur during construction are described in **Section 4.1.5.1**; however, a greater length of roadway corridor would be disturbed for buried cables. The Project under Alternative 4a would be constructed within the US Route 3 roadway corridor in the Northern Section. The Project would cross 3 federal highways, 7 state routes, and 222 local roads in the Northern Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project under Alternative 4a would result in the disturbance of approximately 68 miles (109 km) of roadway corridor.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Northern Section ranges from 4 percent on US Route 2 to 154 percent on VT Route 253. The 154 percent increase in traffic volumes on VT Route 253 is an increase from an estimated 240 vehicles per day to 610 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project under Alternative 4a would not require any tower structures; therefore, impacts to the Mount Washington Regional Airport would not be expected under Alternative 4a.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4a.

4.2.5.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

4.2.5.6 Alternative 4c

Impacts from Construction

In the Northern Section, the Project under Alternative 4c would be installed in the same alignment as the Project under Alternatives 4a and 4b until Whitefield, NH. Therefore, all construction impacts would be similar to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**), as the alternatives would be similarly aligned throughout most of the Northern Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission cable would be buried in a public road corridor. Alternative 4c would be located within the US Route 3 roadway corridor (as would Alternatives 4a and 4b) until MP 60, after which it would be located within the NH Route 116 and NH Route 142 roadway corridors for less than 5 miles (8 km) in the Northern Section. Alternative 4c would cross 2 federal highways, 5 state routes, 205 local roads, and would require the disturbance of approximately 61 miles (98 km) of roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4c.

4.2.5.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

4.2.5.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those discussed for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

4.2.5.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

4.2.5.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

4.2.5.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.5.4**).

4.2.5.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.5.2**).

4.2.6 LAND USE

Refer to **Section 4.1.6** for a discussion of general impacts common to all geographic sections.

4.2.6.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.6.2 Alternative 2

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 2 in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Construction of Alternative 2 would convert approximately 454 acres (184 ha) of non-developed land in the Project corridor to Developed, Open Space, resulting from overstory vegetation removal, installation of aboveground structures, and construction of permanent roads and laydown areas in areas of the Project within a new transmission route (approximately 40 miles [65 km]).[80] This non-developed land is predominantly Forested Lands and Shrubland/Herbaceous Lands. Portions of the Project located in existing transmission routes (approximately 36 miles [57 km]) would not experience a land use conversion, as these areas would continue their existing use as transmission routes.

Approximately 4 percent (56 acres; 23 ha) of the Project corridor in the Northern Section is currently coded as a developed use. Almost all of the developed land has a land cover category of Rural Residential and Recreation Uses, with the remainder of the developed land in a Developed Residential, Commercial, and Industrial Use. Construction of Alternative 2 would not be expected to have a long-term impact on lands with a high development potential in the Northern Section. Because less than 0.1 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

[80] Developed, Open Space is defined as areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Under Alternative 2, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Both short-term and long-term construction impacts under Alternative 2 in the Northern Section would occur to approximately 176 acres (71 ha) of federal, state, county and private conservation land, as well as 13 acres (5 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

The Project could result in long-term impacts to the conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Northern Section of the study area. Alternative 2 would cross the eligible federal Wild and Scenic Rivers Phillips Brook, the Upper Ammonoosuc River and the Israel River as an overhead transmission line in the Northern Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Although Alternative 2 would cross the Connecticut River (a State-protected river) in the Northern Section, no structures or activities would be constructed within the river; therefore, no impacts would be expected to occur. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.2.3.2**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 36 miles (57 km) of the Project corridor in the Northern Section, would be located within the existing PSNH transmission route. The remaining 40 miles (65 km) of the Project in the Northern Section would be located within a new transmission route. A review of a representative sampling of the easements for the existing PSNH transmission route indicate that the Applicant has the ability to construct, operate, and maintain the Project using overhead transmission as outlined in Alternative 2 within the existing corridor. All agreements for the new transmission route provide the ability to construct, operate and maintain the Project as outlined in Alternative 2.

Road Crossings

Construction of Alternative 2 would require 41 aerial road crossings and 20 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.2.5.2** for a discussion of traffic and transportation impacts under Alternative 2.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. Construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project.

Public Roadway Corridor Ownership Status

Alternative 2 would be buried within 6 miles (10 km) of local roadway corridors and less than 1 mile (2 km) of state roadway corridors in the Northern Section. In order to construct the Project in public roadway corridors, the Applicant would be required to secure an authorization (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts.

4.2.6.3 Alternative 3

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 3 in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Construction of Alternative 3 would convert approximately 454 acres (184 ha) of non-developed land in the Project corridor to Developed, Open Space, resulting from overstory vegetation removal and construction of permanent roads and laydown areas in areas of the Project within a new transmission route (approximately 40 miles [65 km]). This non-developed land is predominantly Forested Lands and Shrubland/Herbaceous Lands. Portions of the Project located in existing transmission routes (approximately 36 miles [57 km]) would not experience a land use conversion, as these areas would continue their existing use as transmission routes.

Approximately 4 percent (56 acres; 23 ha) of the Alternative 3 Project corridor is currently coded as a developed use. More than 99 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, with less than 1 percent of the developed land in a Developed Residential, Commercial, and Industrial Use. Construction of Alternative 3 would not be expected to impact lands with a high development potential in the Northern Section. Because less than 0.1 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 3, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of the Project under Alternative 3 would impact approximately 176 acres (71 ha) of federal, state, county and private conservation land, as well as 13 acres (5 ha) of NFS lands. These impacts would result from ground disturbance associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.2**.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Northern Section of the study area. Alternative 3 would cross the eligible rivers Phillips Brook, the Upper Ammonoosuc River, and the Israel River as an underground transmission cable in the Northern Section. These underground crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Northern Section, Alternative 3 would cross the Connecticut River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.2.3.3**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 36 miles (57 km) of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route. The remaining 40 miles (65 km) would be located within a new transmission route. The portion of the Alternative 3 corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner. The analysis of Alternative 3, within this final EIS, ensures that the potential environmental impacts from any combination of above and below ground placement of the Project within the Proposed Action route is bounded by the analysis.

All agreements for the new transmission route (i.e., areas not within an existing transmission route) provide the ability to construct, operate, and maintain the Project as outlined in Alternative 3, including underground transmission. Considerations for new transmission route agreements would be identical to those identified in **Section 4.1.6.1**.

Road Crossings

Construction of Alternative 3 would require 61 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.2.5.3** for a discussion of traffic and transportation impacts under Alternative 3.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 3 would be buried under 6 miles (10 km) of local roadway corridors and less than 1 mile (2 km) of state roadway corridors in the Northern Section. In order to construct the Project in public roadway corridors, the Applicant would be required to secure an authorization (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts.

4.2.6.4 Alternative 4a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4a in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

The majority of the Project under Alternative 4a would be constructed as an underground transmission cable beneath US Route 3 from Clarksville to the Coös/Grafton county boundary at approximately MP 70. The remainder of the Project under Alternative 4a would follow the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH where Alternative 4a would be constructed as underground transmission facilities in a new transmission route.

Construction of Alternative 4a would convert approximately 28 acres (11 ha) of non-developed land in the Project corridor to Developed, Open Space, resulting from overstory vegetation removal and construction of permanent roads and laydown areas in areas of the Project within a new transmission route (from the U.S./Canada border crossing to US Route 3 in Clarksville). This non-developed land is predominantly Forested Lands and Shrubland/Herbaceous Lands. Portions of the Project located in existing roadway corridors would not experience a land use conversion, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 4a Project corridor would pass through a number of population centers, developed lands, and lands with development potential along US Route 3, construction of this alternative would not be expected to result in long-term impacts to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor. The portions of the Project buried in a new transmission route are not expected to impact developed lands under Alternative 4a because this area is largely undeveloped.

Under Alternative 4a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 4a in the Northern Section would impact approximately 11 acres (4 ha) of state, county, and private conservation land. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 4a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.2.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Northern Section of the study area. Alternative 4a would cross the eligible rivers the Ammonoosuc River, the Little River, and the Israel River as an underground transmission line in the Northern Section. These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Northern Section, Alternative 4a would cross the Connecticut River and the Ammonoosuc River (both State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.2.3.4**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4a Project corridor would be located within a new transmission route. While much of Alternative 4a would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 falls under the jurisdiction of the FHWA and NHDOT, and the Project would require an authorization from those agencies for this use.

Areas of new transmission route not within a public roadway corridor, including the portion of Alternative 4a that would be buried in the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH, would be subject to the individual agreements securing use of these lands. All agreements for the new transmission route provide the ability to construct, operate, and maintain the Project as outlined in Alternative 4a, including underground transmission. Considerations for new transmission route agreements would be identical to those identified in **Section 4.1.6.1**.

Road Crossings

Construction of Alternative 4a would require 232 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.2.5.4** for a discussion of traffic and transportation impacts under Alternative 4a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4a would be buried under less than 1 mile (2 km) of local roadway corridors, less than 1 mile (2 km) of state roadway corridors, and 68 miles (109 km) of US Highway in the Northern Section. In order to construct the Project in public roadway corridors, the Applicant would be required to secure an authorization (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts.

4.2.6.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

4.2.6.6 Alternative 4c

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4c in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

The majority of Alternative 4c would be constructed as an underground transmission cable beneath the US Route 3, NH Route 116, and NH Route 142 roadway corridors. The remainder of the Project under Alternative 4c would follow the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH, where Alternative 4a would be constructed as underground transmission facilities in a new transmission route.

Construction of Alternative 4c would convert approximately 28 acres (11 ha) of non-developed land in the Project corridor to Developed, Open Space, resulting from overstory vegetation removal and construction of permanent roads and laydown areas in areas of the Project within a new transmission route (from the U.S./Canada border crossing to US Route 3 in Clarksville). This non-developed land is predominantly Forested Lands and Shrubland/Herbaceous Lands. Portions of the Project located in existing roadway corridors would not experience a land use conversion, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 4c Project corridor would pass through a number of population centers, developed lands, and lands with development potential while following these routes, construction of this alternative is not expected to result in long-term impacts to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor. The portions of the Project buried under a new transmission route are not expected to impact developed lands under Alternative 4c because this area is largely undeveloped.

Under Alternative 4c, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 4c in the Northern Section would impact 7 acres (3 ha) of state, county, and private conservation land. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 4c could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.2.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Northern Section of the study area. Alternative 4c would cross the Israel River, which is an eligible Wild and Scenic River, in the Northern Section. This crossing is not expected to impact the potential future designation of the Israel River, as there is already an existing road crossing in this location, and the cable would likely be installed underneath the existing bridge. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Northern Section Alternative 4c would cross the Connecticut River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.2.3.6**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4c Project corridor would be located within a new transmission route. While much of Alternative 4c would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 falls under the jurisdiction of the FHWA and NHDOT. NH Routes 116 and 142 fall under the jurisdiction of NHDOT. The Project would require an authorization from these agencies for this use.

Areas of new transmission route not within a public roadway corridor, including the portion of Alternative 4c that would be buried in the Alternative 2 alignment from the U.S./Canada border crossing to US Route 3 in Clarksville, NH, would be subject to the individual agreements securing use of these lands. All agreements for the new transmission route provide the ability to construct, operate, and maintain the Project as outlined in Alternative 4c, including underground transmission. Considerations for new transmission route agreements would be identical to those identified in **Section 4.1.6.1**.

Road Crossings

Construction of Alternative 4c would require 212 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.2.5.6** for a discussion of traffic and transportation impacts under Alternative 4c.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridors Ownership Status

Alternative 4c would be buried under less than 1 mile (2 km) of local roadway corridors, 4 miles (6 km) of state roadway corridors, and 57 miles (92 km) of US Highway in the Northern Section. In order to construct the Project in public roadway corridors, the Applicant would be required to secure an authorization.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts.

4.2.6.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

4.2.6.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

4.2.6.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

4.2.6.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

4.2.6.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.2.6.4**).

4.2.6.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.2.6.2**).

4.2.7 NOISE

Refer to **Section 4.1.7** for a discussion of general impacts common to all geographic sections.

4.2.7.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.7.2 Alternative 2

Impacts from Construction

Construction of the Project in the Northern Section under Alternative 2 would affect 43 residences located within 50 feet (15 m) of disturbance areas. Residences located at these distances may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. Without mitigation, these impacts at 50 feet would be expected to be above USDOT guidelines and beyond 50 feet, noise levels would fall below USDOT guidelines. The USDOT guidelines serve as a benchmark in the absence of state or county noise regulations for the study area. With the implementation of the APMs (see **Appendix H**), such as limiting construction to daylight hours and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There are no hospitals, places of worship, libraries and schools, or daycare centers within 200 feet (61 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

The audible noise due to the corona effect of the overhead HVDC line would not exceed the EPA guidance level of Day-night Average Sound Level (Ldn) of 55 dBA for outdoor areas beyond the transmission route and would not present a long-term impact (see **Section 4.1.7.2**).

Ongoing maintenance activities related to the Project would include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. In addition, Northern Pass would conduct visual inspections via helicopter of the transmission lines periodically. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized. These operational noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

4.2.7.3 Alternative 3

Impacts from Construction

Construction of the Project in the Northern Section under Alternative 3 would include many of the construction activities discussed for Alternative 2 (see **Section 4.2.7.2**) with the exception of overhead transmission line construction because the transmission cables under Alternative 3 would be buried.

Under Alternative 3, 44 residences would be located within 50 feet (15 m) of disturbance areas in the Northern Section. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of the APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Project operation, maintenance, and emergency repairs under Alternative 3 in the Northern Section would also include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations. These operational noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Because the Project would be located underground, no long-term operational impacts would occur.

4.2.7.4 Alternative 4a

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 4a in the Northern Section, the noise levels would be expected to be identical to those discussed for the Project under Alternative 3 (see **Section 4.2.7.3**). However, this route would pass through more populated areas than the route for Alternative 3 when following roadway corridors. Under Alternative 4a, 813 residences would be located within 50 feet (15 m) of disturbance areas in the Northern Section. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of the APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be two daycare centers and one campground within 50 feet (15 m) of the disturbance areas that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4a in the Northern Section would be identical to those under Alternative 3.

4.2.7.5 Alternative 4b

Impacts from Construction

Construction-related noise impacts under Alternative 4b in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 4b in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

4.2.7.6 Alternative 4c

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 4c in the Northern Section, the noise levels would be expected to be identical to those described for the Project under Alternative 3 in the Northern Section (see **Section 4.2.7.3**). Under Alternative 4c, 798 residences would be located within 50 feet (15 m) of disturbance areas in the Northern Section. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of the APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be two daycare centers and one campground within 50 feet (15 m) of the disturbance areas that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4c in the Northern Section would be identical to those under Alternative 3.

4.2.7.7 Alternative 5a

Impacts from Construction

Construction-related noise impacts under Alternative 5a in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5a in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

4.2.7.8 Alternative 5b

Impacts from Construction

Construction-related noise impacts under Alternative 5b in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5b in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

4.2.7.9 Alternative 5c

Impacts from Construction

Construction-related noise impacts under Alternative 5c in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5c in the Northern Section would be identical to those under Alternative 2 (see **Section 4.2.7.2**).

4.2.7.10 Alternative 6a

Impacts from Construction

Construction-related noise impacts under Alternative 6a in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 6a in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

4.2.7.11 Alternative 6b

Impacts from Construction

Construction-related noise impacts under Alternative 6b in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 6b in the Northern Section would be identical to those under Alternative 4a (see **Section 4.2.7.4**).

4.2.7.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction-related noise impacts under Alternative 7 in the Northern Section would be identical to those described under Alternative 2 in the Northern Section (see **Section 4.2.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 (see **Section 4.2.7.2**).

4.2.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 4.1.8** for a discussion of general impacts common to all geographic sections. For more information about resource types and potential impacts, see **Section 3.2.8** and the **Cultural Resources Technical Report** (Sections 2.1 and 3.1).

Table 4-87 and **Table 4-88** summarize the number of archaeological resources (or sites) and archaeologically-sensitive areas within the direct APE (consisting of the entire width of the new transmission route and existing PSNH transmission route) that would be potentially affected by the Project in the Northern Section. Archaeological resources may consist of pre-Contact Native American archaeological sites, post-Contact Euro-American archaeological sites, and/or multi-component archaeological sites that contain pre-Contact Native American and post-Contact Euro-American archaeological remains (see Section 2.1.1.1 of the **Cultural Resources Technical Report**). Archaeologically sensitive areas are those areas that have the potential to contain archaeological resources, although no archaeological resources have been previously identified or were observed within these areas. These areas may be sensitive for containing pre-Contact Native American archaeological resources, post-Contact Euro-American archaeological resources, and/or multi-component (pre-Contact Native American and post-Contact Euro-American) archaeological resources (see Section 2.1.1.2 of the **Cultural Resources Technical Report**). These archaeological resources (sites) and archaeologically sensitive areas could be physically impacted by the Project.

Table 4-89 summarizes the number of architectural resources (buildings, structures, or other built resources) within both the indirect APE and direct APE that would be potentially affected by the Project in the Northern Section. Architectural resources may consist of individual buildings, structures, or other built resources (for example, residences; farm complexes [residences, barns, and other outbuildings]; religious buildings [churches, meeting houses, and chapels]; cabins and cottages; civic buildings [libraries, post offices, town halls, etc.]; cemeteries; bridges; railroads; and trails) (see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources may also include historic districts, which are groups of buildings, structures, and other built resources that are related physically and/or thematically (also see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources within the indirect APE (1 mile [1.6 km] on each side of alternative centerlines) could be visually impacted by the Project, while architectural resources within the direct APE could be physically impacted by the Project.

Table 4-87. Number of Archaeological Resources Potentially Impacted in the Northern Section during Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2	14	0	0	14
3	14	0	0	14
4a	17	0	0	17
4b	Identical to Alternative 4a			
4c	13	0	0	13
5a	Identical to Alternative 2			
5b	Identical to Alternative 2			
5c	Identical to Alternative 2			
6a	Identical to Alternative 4a			
6b	Identical to Alternative 4a			
7 (Proposed Action)	Identical to Alternative 2			

Source: Claesson et al. 2014a, 2015b; Freedman et al. 2015
Note: Includes resources in the WMNF.

Table 4-88. Number of Archaeologically Sensitive Areas Potentially Impacted in the Northern Section during Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	63	29 (12)
3	63	25 (10)
4a	94	101 (41)
4b	Identical to Alternative 4a	
4c	83	96 (39)
5a	Identical to Alternative 2	
5b	Identical to Alternative 2	
5c	Identical to Alternative 2	
6a	Identical to Alternative 4a	
6b	Identical to Alternative 4a	
7	Identical to Alternative 2	

Source: Claesson et al. 2014a, 2015b; Freedman et al. 2015
Note: Includes resources in the WMNF.

Table 4-89. Number of Architectural Resources Potentially Impacted in the Northern Section during Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)	--	--	--	--
2	108	8	4	104
3	108	8	4	104
4a	166	163	19	147
4b	Identical to Alternative 4a			
4c	172	164	23	149
5a	Identical to Alternative 2			
5b	Identical to Alternative 2			
5c	Identical to Alternative 2			
6a	Identical to Alternative 4a			
6b	Identical to Alternative 4a			
7	Identical to Alternative 2			

Source: Claesson et al. 2014b; Dunham et al. 2017; Higgins et al. 2015, 2016a, 2016b
Note: Includes resources in the WMNF and Vermont.

4.2.8.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.8.2 Alternative 2

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, approximately 906 acres (367 ha) of land in the Northern Section would be disturbed. The majority of the construction disturbance area (approximately 600 acres [243 ha]) would be associated with the construction of the new overhead HVDC transmission line or installation of the underground HVDC transmission cable in a new transmission corridor or existing PSNH transmission corridor, while the remainder of the construction disturbance area (approximately 306 acres [124 ha]) would be associated with access roads (approximately 295 [119 ha]) and transition stations (10 acres [4 ha]).

The archaeological investigations conducted for this analysis identified 14 archaeological sites within the direct APE for the Northern Section under Alternative 2. Of these 14 archaeological sites, two are located within the construction disturbance area for the Northern Section under Alternative 2. None of the 14 archaeological sites have been previously evaluated for NRHP eligibility (Claesson et al. 2014a, 2015b). Therefore, it is not known whether any are NRHP-eligible.

The archaeological investigation conducted for this analysis identified 63 archaeologically sensitive areas within the direct APE for the Northern Section under Alternative 2. Of these 63 archaeologically sensitive areas, 48 are located within the construction disturbance area for the Northern Section under Alternative 2, covering an approximate total land area of 29 acres (12 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 108 architectural resources within the indirect APE of the Northern Section under Alternative 2: 41 architectural resources within the indirect APE for the Northern Section of Alternative 2 in New Hampshire and 67 architectural resources within the indirect APE for the Northern Section of Alternative 2 in Vermont. The Project would be visible from these resources (Claesson et al. 2014b; Higgins 2016a, 2016b). Four of these resources have been determined to be NRHP-eligible. The remaining 104 resources are newly identified architectural resources that have not yet been evaluated for NRHP eligibility (Claesson et al. 2014b; Dunham et al. 2017).

The four NRHP-eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Eight of the 108 architectural resources, discussed above, are also located within the direct APE. All eight architectural resources in the direct APE are also located within the construction disturbance area for the Northern Section under Alternative 2 (Claesson et al. 2014b).

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, operation of the Northern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Normal operation activities would result in long-term visual impacts to the 108 architectural resources located within the APE for the Northern Section under Alternative 2, resulting from overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.2.8.3 Alternative 3

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, approximately 594 acres (240 ha) in the Northern Section would be disturbed. The majority of the construction disturbance area (325 acres [132 ha]) would be associated with the installation of the underground HVDC transmission cable while the remainder of the construction disturbance area (269 acres [109 ha]) would be for new or improved access roads, and the border crossing transition station.

The archaeological resources for the Northern Section under Alternative 3 are identical to those under Alternative 2 (see **Section 4.2.8.2**).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 108 architectural resources within the indirect APE of the Northern Section under Alternative 3: 41 architectural resources within the indirect APE for the Northern Section of Alternative 2 in New Hampshire and 67 architectural resources within the indirect APE for the Northern Section of Alternative 2 in Vermont. Four of these resources are previously identified architectural resources that have been determined to be NRHP-eligible. These resources are described in **Section 4.2.8.2**. The remaining 104 resources are newly identified architectural resources that have not yet been evaluated for NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015, Dunham et al. 2017).

The Four NRHP-eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Eight of the 108 architectural resources are also located within the direct APE (Claesson et al. 2014b, Higgins et al. 2015). These eight architectural resources are described in **Section 4.2.8.2**.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Operation activities would have no potential to impact the archaeological sites located within the direct APE for the Northern Section under Alternative 3, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts to the 108 architectural resources located within the APE for the Northern Section under Alternative 3. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources. Alternative 3 would include limited aboveground structures; the adverse effects would primarily be due to new vegetation clearing impacts.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.2.8.4 Alternative 4a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, approximately 96 acres (39 ha) in the Northern Section would be disturbed. The construction disturbance area would be associated with the installation of the underground transmission cable within the new transmission route and existing roadway corridors, and would generally be expected to be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified 17 archaeological sites within the direct APE for the Northern Section under Alternative 4a. None of these 17 archaeological sites are located within the construction disturbance area for the Northern Section under Alternative 4a. These 17 archaeological sites have not been previously evaluated for NRHP eligibility (Freedman et al. 2015). Therefore, it is not known whether any are NRHP-eligible.

The archaeological investigation identified 94 archaeologically sensitive areas within the direct APE for the Northern Section under Alternative 4a (Freedman et al. 2015). Of these 94 archaeologically sensitive areas, 92 are located within the construction disturbance area for the Northern Section under Alternative 4a, covering an approximate total land area of 101 acres (41 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 166 architectural resources within the indirect APE of the Northern Section under Alternative 4a. Nineteen of these resources are previously identified architectural resources that were evaluated for NRHP eligibility and either listed, or determined eligible for listing, in the NRHP. Therefore, these 19 previously identified NRHP-eligible architectural resources are considered historic properties. The remaining 147 architectural resources have either not yet been evaluated for NRHP-eligibility or require additional information in order to determine NRHP-eligibility (Higgins et al. 2015).

The 19 NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Of the 166 architectural resources within the indirect APE, 163 are also located within the direct APE, including all 19 NRHP-listed or -eligible resources. Five of these 163 architectural resources, consisting of four NRHP-eligible resources and one architectural resource that was previously determined not NRHP-eligible, are also located within the disturbance area for the Northern Section of Alternative 4a (Higgins et al. 2015). Long-term construction impacts could occur to resources located in the disturbance area, resulting from surface and subsurface ground disturbance.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, operation of the Northern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Long-term, adverse impacts on architectural resources within the study area for the indirect APE would be limited to the first approximately 2 miles (3 km) of Alternative 4a where a roadway corridor does not exist. The remainder of this alternative would be located underground. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.2.8.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

4.2.8.6 Alternative 4c

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4c, approximately 89 acres (36 ha) in the Northern Section would be disturbed. The construction disturbance area would be associated with the installation of the underground transmission cable within new transmission route and existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified 13 archaeological sites within the direct APE for the Northern Section under Alternative 4c. None of these 13 archaeological sites are located within the construction disturbance area for the Northern Section under Alternative 4c. None of these 13 archaeological sites have been previously evaluated for NRHP eligibility (Freedman et al. 2015). Therefore, it is not known whether any are NRHP-eligible.

The archaeological investigation identified 83 archaeologically sensitive areas within the direct APE for the Northern Section under Alternative 4c (Freedman et al. 2015). Of these 83 archaeologically sensitive areas, 80 are located within the construction disturbance area for the Northern Section under Alternative 4c, covering an approximate total land area of 96 acres (39 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 172 architectural resources within the indirect APE of the Northern Section under Alternative 4c. Of these, 23 were previously evaluated for NRHP eligibility and either listed, or determined eligible for listing, in the NRHP. Therefore, these 23 previously identified NRHP-eligible architectural resources are considered historic properties. The remaining 149 architectural resources have either been previously determined not NRHP-eligible, have not yet been evaluated for NRHP-eligibility, or require additional information in order to determine NRHP-eligibility (Higgins et al. 2015).

The 23 NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Of the 172 architectural resources in the indirect APE, 164 are also located within the direct APE for the Northern Section of Alternative 4c. These 164 architectural resources consist of 22 NRHP-listed or -eligible architectural resources, one resource that was previously determined not NRHP-eligible, and 141 resources for which NRHP-eligibility is unknown because they have not yet been evaluated for NRHP-eligibility or require additional information in order to determine NRHP-eligibility (Higgins et al. 2015). Four of these 164 architectural resources, consisting of three NRHP-eligible resources and one architectural resource that was previously determined not NRHP-eligible, are also located within the disturbance area for the Northern Section of Alternative 4c. Long-term construction impacts could occur to the resource located in the disturbance area, resulting from surface and subsurface ground disturbance.

Impacts from Operations, Maintenance, and Emergency Repairs

In the Northern Section, impacts from operations, maintenance, and emergency repairs under Alternative 4c would be identical to those under Alternative 4a (see **Section 4.2.8.4**).

4.2.8.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

4.2.8.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

4.2.8.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

4.2.8.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

4.2.8.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.8.4**).

4.2.8.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.8.2**).

4.2.9 ENVIRONMENTAL JUSTICE

Refer to **Section 4.1.9** for a discussion of general impacts common to all geographic sections.

4.2.9.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.9.2 Alternative 2

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 2 (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected population) in the Northern Section. **Table 4-90** summarizes the demographic characteristics of potentially affected populations. There is a slightly lower percentage of minorities living among the potentially affected population compared to the unaffected population, and that minority population has slightly lower median household income. The percentage of families living below the poverty level is the same between the affected and unaffected populations. These data indicate that the potentially affected residents have similar demographic characteristics to unaffected residents in the Northern Section.

Table 4-90. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Northern Section – Alternative 2

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	10,843	3%	$35,000 to $39,999	9%
Unaffected	21,359	5%	$40,000 to $44,999	9%

Source: U.S. Census Bureau 2016a, 2016c, and 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 2.

in compliance with EO 12898, no disproportionately high and adverse human health or environmental effects to minority or low-income populations would be expected to occur under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 2, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering

EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.2.9.3 Alternative 3

Impacts from Construction

Under Alternative 3, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 3, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

4.2.9.4 Alternative 4a

Impacts from Construction

Both short- and long-term environmental justice impacts would occur during the construction of Alternative 4a in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.9.1**.

The Census block groups located within 1,000 feet (305 m) of Alternative 4a (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected populations) in the Northern Section. **Table 4-91** summarizes the demographic characteristics of potentially affected populations. There is a slightly lower percentage of minorities living among the potentially affected population compared to the unaffected population, and that minority population has the same median household income as the affected populations. The percentage of families living below the poverty level is the same between the affected and unaffected populations.

Table 4-91. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Northern Section – Alternative 4a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	15,488	3%	$40,000 to $44,999	9%
Unaffected	16,754	6%	$40,000 to $44,999	9%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.2.9.5 Alternative 4b

Impacts from Construction

Under Alternative 4b, construction impacts relating to environmental justice would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

4.2.9.6 Alternative 4c

Impacts from Construction

Both short- and long-term environmental justice impacts would occur during the construction of Alternative 4c in the Northern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.9.1**.

The Census block groups located within 1,000 feet (305 m) of Alternative 4c (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected population) in the Northern Section. **Table 4-92** summarizes the demographic characteristics of potentially affected populations. There is a slightly lower percentage of minorities living among the potentially affected population compared to the unaffected population, and that minority population has a lower median household income. The percentage of families living below the poverty level is the same between the affected and unaffected populations.

Table 4-92. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Northern Section – Alternative 4c

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	14,471	3%	$35,000 to $39,999	9%
Unaffected	18,185	5%	$40,000 to $44,999	9%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4c.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4c, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.2.9.7 Alternative 5a

Impacts from Construction

Under Alternative 5a, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5a, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

4.2.9.8 Alternative 5b

Impacts from Construction

Under Alternative 5b, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

4.2.9.9 Alternative 5c

Impacts from Construction

Under Alternative 5c, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5c, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

4.2.9.10 Alternative 6a

Impacts from Construction

Under Alternative 6a, construction impacts relating to environmental justice would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6a, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

4.2.9.11 Alternative 6b

Impacts from Construction

Under Alternative 6b, construction impacts relating to environmental justice would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 4a in the Northern Section (see **Section 4.2.9.4**).

4.2.9.12 Alternative 7 – Proposed Action

Impacts from Construction

Under Alternative 7, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 7, impacts relating to environmental justice from operations, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Northern Section (see **Section 4.2.9.2**).

4.2.10 AIR QUALITY

Refer to **Section 4.1.10** for a discussion of general impacts common to all geographic sections.

The Northern Section of the study area, located in Coös County, is in attainment for all NAAQS; therefore, General Conformity does not apply (see **Section 3.1.10.1**). Project related construction would result in short-term impacts to air quality in the Northern Section. Emissions would be lower for the portions of the Project with underground cable compared to the aboveground lines because of the use of different types of equipment, fewer pieces of equipment, and less overall vehicle activity. The Project would also result in the loss of forested areas in this section and, therefore, some loss of carbon sequestration capacity. The changes to the forest carbon sink would be adverse, long-term, and regional.

4.2.10.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.10.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 76 miles of the Project would be in the Northern Section. The first 40 miles of the Project would require the clearance of a new transmission corridor and would include 32 miles of an overhead transmission line and approximately 8 miles of underground cable. Eight segments of the underground cable, totaling approximately 1 mile, would be installed with "jack and bore" and horizontal directional drilling. This installation would require trenchless installation areas and construction of underground sending and receiving pits. The remaining 36 miles would be overhead transmission line constructed on an existing cleared transmission corridor. **Table 4-93** shows total emissions from the construction activities within the Northern Section of the Project under Alternative 2. Construction emissions would result in localized, short-term impacts to air quality.

Table 4-93. Alternative 2 Construction Emissions in the Northern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Northern Section	181.51	16.01	116.36	2.41	379.53	62.74	44,664.43

Construction emissions would be short-term, and the changes to the carbon sink, although long-term, would be minimal in the Northern Section.

Construction of the Project under Alternative 2 within the Northern Section would require the removal of approximately 165 acres (67 ha) of deciduous forest, 55 acres (22 ha) of conifer forest, and 177 acres (72 ha) of mixed forest. The loss of sequestration capacity is estimated at 30,874 metric tons of carbon, which is the equivalent of 113,309 metric tons of CO_2. This would also result in the equivalent loss of 558 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line would be a small fraction of the Project's short-term emissions from construction described above. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10.2**.

4.2.10.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the Northern Section, the transmission cable would be installed underground, following the same route as Alternative 2. Construction would require the creation of a new cleared transmission route for the first 40 miles (64 km) of the Project. Approximately 1 mile (1.6 km) of the first 40 miles (64 km) would be HDD construction. The remaining 36 miles (58 km) would be trenched within the existing PSNH transmission route. **Table 4-94** shows total emissions from the construction activities within the Northern Section of the Project under Alternative 3. Construction emissions would be localized and short-term.

Table 4-94. Alternative 3 Construction Emissions in the Northern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Northern Section	73.52	7.50	65.78	0.17	201.80	29.21	15,072.56

Construction emissions would be short-term, and the changes to the carbon sink, although long-term, would be minimal in the Northern Section.

Construction of the Project within the Northern Section under Alternative 3 would require the removal of approximately 71 acres (29 ha) of deciduous forest, 22 acres (9 ha) of conifer forest, and 71 acres (28 ha) of mixed forest. The loss of sequestration capacity is estimated at 12,700 metric tons of carbon, which is the equivalent of 46,610 metric tons of CO_2. This would also result in the equivalent loss of 231 metric tons of CO_2 uptake per year, which is less than half that of Alternative 2 due primarily to the use of a narrower construction corridor for the underground cable. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction described above. Maintenance requirements would also be lower for the underground cable in Alternative 3 compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10.2**.

4.2.10.4 Alternative 4a

Impacts from Construction

Under Alternative 4a in the Northern Section, the transmission cable would be installed underground. Construction would require the creation of a new transmission route for the first 2 miles (3 km) of the Project, and then the underground cable would be placed along existing roadway corridors for the remaining 68 miles (109 km). **Table 4-95** shows total emissions from the construction activities within the Northern Section under Alternative 4a. Construction emissions would be localized and short-term.

Table 4-95. Alternative 4a Construction Emissions in the Northern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Northern Section	46.83	4.88	42.70	0.10	124.72	17.78	9,491.79

Construction emissions would be short-term, and the changes to the carbon sink, although long-term, would be minimal in the Northern Section.

Construction of the Project within the Northern Section for Alternative 4a would require the removal of less than an acre of deciduous and conifer forest, and 10 acres (4 ha) of mixed forest. The loss of sequestration capacity is estimated at 808 metric tons of carbon, which is the equivalent of 2,966 metric tons of CO_2. This would also result in the equivalent loss of 13 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction described above. Maintenance requirements would also be lower for the underground cable in Alternative 4a compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10.2**.

4.2.10.5 Alternative 4b

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

4.2.10.6 Alternative 4c

Impacts from Construction

In the Northern Section, the Project under Alternative 4c would be similar to the Project under Alternative 4a, except it would follow a slightly different alignment south of Whitefield, NH. All construction impacts to air quality would be similar to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Although the two alternatives would follow a slightly different alignment, impacts to air quality from operation, maintenance, and emergency repairs under Alternative 4c would be similar to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**). The impacts would occur in different locations south of Whitefield, NH, but the types of impacts would be similar.

4.2.10.7 Alternative 5a

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

4.2.10.8 Alternative 5b

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

4.2.10.9 Alternative 5c

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

4.2.10.10 Alternative 6a

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

4.2.10.11 Alternative 6b

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.10.4**).

4.2.10.12 Alternative 7 – Proposed Action

Impacts from Construction

In the Northern Section, construction impacts to air quality under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.10.2**).

4.2.11 WILDLIFE

Refer to **Section 4.1.11** for a discussion of general impacts common to all geographic sections.

The Project has the potential to impact wildlife. **Table 4-65** and **Table 4-66** in **Section 4.1.11** present a summary of Project-wide effects to federally- and state-listed species and the determination for federally-listed species. Because the nature of impacts to federally- and state-listed species is similar to that for non-listed species, all impacts are discussed in the General Wildlife discussion.

4.2.11.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.11.2 Alternative 2

Impacts from Construction

Alternative 2 in the Northern Section would result in the creation of a new transmission route for approximately 40 miles (64 km). This is a unique impact that is limited to the Northern Section, as the other geographic sections under Alternative 2 are all located within the existing PSNH transmission corridor. Consequently, the extent of forest removal within the Northern Section is the highest, compared to other sections. Additional discussion is provided in the subsequent section.

Aquatic Species

Impacts to aquatic species could result from direct mortality or injury to individuals and sensory disturbance. In addition, indirect impacts could occur to aquatic species downstream due to disturbance to habitat or impairments to water quality such as the resuspension of sediments, which were transported downstream.

Clearing in the new transmission corridor would result in the short-term, localized disturbance to aquatic biota dependent upon the existing riparian communities. For areas that are currently forested or contain shrub communities, thermal loading (from the removal of vegetation shade) in coldwater systems such as headwater streams, or spring-fed drainages, could occur, which could adversely affect coldwater species such as the Eastern brook trout. The tree and shrub clearing along the edges of streams or spring-fed open water areas would allow greater light penetration, which could result in localized warming of the stream channel. However, these impacts are expected to be minor, based on the small size of the transmission corridor clearings, in relation to the entire riparian corridor along the perennial streams that support these species. In addition, scrub-shrub communities would develop along these corridors, which would result in a decrease in the thermal load during operation of the Project.

With implementation of the APMs listed in **Appendix H**, such as the implementation of a SWPPP, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction, impacts to aquatic species as a whole would be minimized.

Terrestrial Species

Impacts to terrestrial species could result from direct mortality or injury to individuals, sensory disturbance, and increased depredation. During construction, any mobile terrestrial wildlife (e.g., white-tailed deer, birds) would be expected to flush or flee the area prior to construction equipment physically clearing vegetation. Impacts would be short-term (wildlife would return to the Project corridor following construction, particularly as vegetation returns) and localized to regional (depending upon the extent of active construction activities). The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase causing increased mortalities and/or injuries.

Additionally, construction of the Project under Alternative 2 would result in habitat loss and modification. Habitat loss and/or modification of existing habitats in the study area during construction would also have adverse impacts on wildlife resources. Forest interior dwelling species would experience long-term adverse effects based on habitat loss and fragmentation as discussed under “Habitat Connectivity,” below. Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience short-term habitat loss while the Project corridor revegetated in areas of short-term disturbance. As construction would occur over a limited time period, the duration of the impacts to those species would be short-term for herbaceous and scrub-shrub communities, and long-term for forest-interior species.

Alternative 2 would result in the disturbance of approximately 906 acres (367 ha) of wildlife habitat in the Northern Section. The majority of the habitat disturbance (637 acres [258 ha]) would occur from vegetation clearing to create the new transmission route. Disturbances due to activity within the existing PSNH transmission route would account for approximately 268 acres (108 ha) of impacted wildlife habitats. Of this 268 acres (108 ha), 65 acres (26 ha) of disturbance would result from widening the existing PSNH transmission route, with 20 acres (8 ha) of this widening impacting forestlands.

Bat species may also be impacted by fragmentation and removal of forest and woodland habitats. The creation of additional edge habitats may result in a long-term beneficial effect on potential summer foraging habitat in Coös County, NH. However, the loss of forestland would further reduce summer roosting habitat in the County. Potential impacts on summer roosting habitat are expected to be long-term. However, the approximately 1 million acres (404,858 ha) of forestland in Coös County, NH that would remain undisturbed during construction would continue to provide suitable habitat. Project-specific surveys identified possible Indiana bats within the Northern Section, although, no historical records regarding the Indiana bat exist for Coös County (NHFG 2005a), and the state of New Hampshire does not consider this species to occur within the state (NHFG 2015). The Applicant has committed to conducting tree clearing activities during the bat hibernation period (see APMs in **Appendix H**), and, therefore, avoid impacts due to direct mortality or injury.

Regarding other mammal species, the removal of approximately 463 acres (187 ha) of forest lands to create the new transmission corridor, which include portions of forest interior habitats, would have a long-term adverse effect on forest-dwelling species such as the American marten. The construction of a new transmission route within the Northern Section would not affect lynx movements due to the width of clearing necessary and the lack of human use that would occur on a regular basis into the future. As the Canada lynx is a wide-ranging species, the loss of a small percentage of existing forest habitat would not adversely affect this species, including denning or foraging habitats. Population-level effects would not occur because the lynx that may occur in the area are considered transient individuals.

The federally-listed species potentially present in the study area in the Northern Section include: the dwarf wedgemussel (endangered), Canada lynx (threatened), Indiana bat (endangered), and northern long-eared bat (threatened); two of these species were potentially detected in the Northern Section, the Indiana bat and the northern long-eared bat. The only federally-listed species potentially detected in the study area during Project-specific surveys was the Indiana bat. For state-listed species, the following were observed during Project-specific field surveys: American marten, American kestrel, bald eagle, bobolink, Canada warbler, chimney swift, common loon, Eastern towhee, field sparrow, olive-sided flycatcher, purple finch, ruffed grouse, scarlet tanager, veery, and wood thrush. The state-listed northern harrier has also been recorded in the Northern Section (NHB 2014). With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding potential disturbance to listed wildlife populations.

Habitat Connectivity

As stated above, Alternative 2 in the Northern Section would involve the creation of a new transmission route for approximately 40 miles (64 km). This would result in habitat fragmentation and impacts to interior forest habitat. For the new transmission corridor portion in the Northern Section, Alternative 2 would remove 463 acres (187 ha) of forest lands (including Appalachian oak pine, floodplain forest, hemlock-hardwood pine, high-elevation spruce-fir, low-elevation spruce-fir, and northern hardwood conifer forest types, based on NHWAP data). A portion of this area would be considered forest interior habitats, which provide habitat and habitat connectivity for forest interior species. For the existing PSNH transmission route portion of the Northern Section in the southern portion of Coös County, 20 acres (8 ha) of forested habitats would be removed. The greatest extent of forest interior loss would be in the Millsfield, NH area. Forest habitat fragmentation would be caused by the installation of a new transmission route which would break up existing large blocks of forest habitat into smaller ones. This additional edge exposure along the transmission route may lead to the introduction of invasive species, possible interruption of migration corridors, and increase in nest predation and/or parasitism. With the implementation of APMs (see **Appendix H**), impacts resulting from the introduction of invasive species would be minimized.

The removal of forestlands would result in adverse impacts to forest interior species through the loss of interior forestlands and habitat fragmentation.

<u>Impacts from Operations, Maintenance, and Emergency Repairs</u>

Impacts from operation, maintenance, and emergency repair activities would be similar to those discussed for construction, except that these impacts would occur for shorter durations throughout the life of the

Project. The impacts include direct mortality or injury to individuals (including collision and electrocution of birds), sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation.

The impacts of habitat loss, type conversion, and fragmentation described for construction would persist in the long term due to vegetation management. Habitat loss and/or modification of existing habitats in the study area during the operation of the Project would also have adverse impacts. In particular, forest interior dwelling species would experience long-term adverse effects based on habitat loss and fragmentation of forest blocks within the area of new transmission route (approximately 463 acres [187 ha]) in the Northern Section. Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience long-term, beneficial effects through the increase in these habitat types in the Northern Section throughout the operation of the Project.

Additional long-term habitat losses during operation of the Project in the Northern Section would be associated with the new or widened transmission routes for the portion of the Project in the existing PSNH transmission route, access roads, and new transition stations.

Because Alternative 2 would largely avoid in-water work, aquatic habitat for game species, such as the smallmouth bass fisheries, would largely remain unaffected through the operation of the Project.

4.2.11.3 Alternative 3

Impacts from Construction

Aquatic Species

Construction-related impacts to aquatic wildlife associated with habitat loss/modification would be similar to those discussed in Alternative 2, although at a reduced scale based on the smaller disturbance area for Alternative 3 which would have a narrower construction corridor. Impacts to waterbody crossings would be greater than under Alternative 2 because of the need excavate banks and channels for cable installation. Impacts would include habitat disturbance in the trench area and suspension of sediments, resulting in short-term, adverse impacts at the specific waterbody crossings. HDD could be used in waterbody crossings to minimize impacts. See **Section 4.2.13.3** for impacts to water resources.

Terrestrial Species

Under Alternative 3, approximately 594 acres (240 ha) of wildlife habitat would be impacted by the Project. Of these 594 acres (240 ha) of wildlife habitat, impacts would occur to approximately 164 acres (66 ha) of forested habitats. The remaining acreage of wildlife habitat types that would be affected include wetlands, agricultural, grassland, mowed ROW, open water, and scrub-shrub. The disturbance would primarily result from the construction activity within the 40-mile (65 km) section of a new 40-foot (12-m) wide transmission route, the trench area in the sections using the existing PSNH transmission route, and new access roads. Most species would experience short-term displacement from the transmission route during construction. Because clearing and grading activities would be confined to the transmission route and other work areas, suitable habitat for many wildlife species would remain undisturbed in habitats adjacent to the transmission route for the duration of construction.

Construction-related impacts associated with habitat fragmentation would be similar to those discussed in Alternative 2, although at a reduced scale based on the smaller disturbance area for Alternative 3.

The removal of approximately 164 acres (66 ha) of forestland is associated with Alternative 3. Effects of forest fragmentation on terrestrial species would be identical to those discussed under Alternative 2 (see **Section 4.2.11.2**), but would occur over less land area.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to impacts discussed under Alternative 2 (see **Section 4.2.11.2**). However, the Alternative 3 corridor is narrower, with 367 acres (149 ha) of disturbance in a new transmission route (compared to 637 acres [258 ha] of new transmission route for Alternative 2) and no proposed widening in the existing PSNH transmission route. This results in an overall lower level of removal of forested habitats, which promote habitat connectivity for the sensitive biodiversity of the forested habitats in the State of New Hampshire. For example, high elevation spruce-fir forests contain species such as the Canada Lynx (*Lynx canadensis*) or the Bicknell's thrush (*Catharus bicknelli*) that are threatened largely by habitat loss and other anthropogenic factors.

Impacts from Operations, Maintenance, and Emergency Repairs

Potential impacts related to operation and maintenance equipment, vehicles, and personnel would generally be similar to those occurring during the construction phase of the Project. Other, long-term impacts resulting from the Project would generally be similar to those discussed for Alternative 2 (see **Section 4.2.11.2**) although the cable would be buried, eliminating the operational effects related to an overhead transmission line.

Impacts due to habitat fragmentation would be identical to those discussed for Alternative 2, but would occur over less land area.

4.2.11.4 Alternative 4a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2; however, Alternative 4a would be located underground along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

Because Alternative 4a would involve a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.2.11.3**). However, adverse impacts would be expected to be reduced as compared to Alternative 3 because this alternative would parallel an existing roadway (except for a small northern portion from the border crossing in Pittsburg to US Route 3 in Clarksville, NH), which currently provides limited wildlife habitat.

Under Alternative 4a, approximately 96 acres (39 ha) of wildlife habitat would be impacted by the Project. Impacts would occur to approximately 82 acres (33 ha) of developed lands, 10 acres (4 ha) of forested habitats, and 2 acres (0.8 ha) of wetland habitat. The remaining 2 acres (0.8 ha) of impacts would occur in other habitat types.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 4a would require vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 3 (see **Section 4.2.11.3**), although adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

4.2.11.5 Alternative 4b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

4.2.11.6 Alternative 4c

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2. However, Alternative 4c would be located underground along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

Because Alternative 4c would involve a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.2.11.3**). However, adverse impacts would be reduced because as this alternative would parallel an existing roadway (except for a small northern portion from the border crossing in Pittsburg to US Route 3 in Clarksville, NH), which currently provides limited wildlife habitat.

Under Alternative 4c, approximately 89 acres (36 ha) of wildlife habitats would be impacted by the Project. Impacts would occur to approximately 74 acres (30 ha) of developed lands, 10 acres (4 ha) of forested habitats, and 2 acres (0.8 ha) of scrub-shrub habitat. The remaining 3 acres (1 ha) of impacts would occur in other habitat types.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would could occur; however, the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 4c would require vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be similar to those discussed for Alternative 4a (see **Section 4.2.11.4**). These activities under Alternative 4c would result in slightly more habitat disturbance compared with Alternatives 4a and 4b because there would be slightly higher levels of disturbance associated with Alternative 4c.

4.2.11.7 Alternative 5a

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

4.2.11.8 Alternative 5b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

4.2.11.9 Alternative 5c

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

4.2.11.10 Alternative 6a

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

4.2.11.11 Alternative 6b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.2.11.4**).

4.2.11.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.2.11.2**).

4.2.12 VEGETATION

Refer to **Section 4.1.12** for a discussion of general impacts common to all geographic sections.

4.2.12.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.12.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 775 acres (314 ha) of vegetated habitats would be impacted by the Project, with 511 acres (207 ha) of disturbance occurring within the new transmission route. Of the 511 acres (207 ha) of disturbance resulting from the new transmission route, 372 acres (151 ha) of forestlands would be cleared. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling or early to mid-successional forest state, providing many important functions of wildlife habitat. Forested wetland communities would be converted to scrub-shrub or herbaceous wetland communities.

Any young woodlands that are subject to clearing would result in the future loss of succession to future mature forest stands. One example is the potential loss of future high-elevation mature woodlands in Sugar Hill, NH. This area, along with other areas that occur on narrower ridgelines and steeper terrain at higher elevations, contain unique biological communities. In addition, these areas are typically less likely to be affected by other commercial forestry operations because of their inaccessibility. These areas typically occur at an elevation of approximately 3,000 feet and display characteristics of unharvested high-elevation spruce-fir forests. While this impact would be long-term and adverse, it is not expected to be significant because of the large amount of similar habitat in the region; based on the NHWAP data, Coös County has approximately 214,000 acres of high-elevation spruce-fir forests. Alternative 2 would remove approximately 76 acres of high-elevation spruce-fir forest community, which represents less than 0.05 percent of the existing community within the county.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 2 would be associated with construction of access roads and the installation of HVDC towers and transition stations for the underground portion and would affect approximately 188 acres (76 ha) of vegetated habitats. Forestlands or wetlands (if filled) would be permanently removed in the disturbance areas and footprints of these facilities.

The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Northern Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. A single state-listed beaked sedge was potentially observed during Project-specific surveys in 2013 and 2014. Short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions. Refer to **Section 4.1.12.2** for impacts on vegetation from operation, maintenance and emergency repairs. Loss of forest cover in the transmission route could result in a potential long-term loss of biodiversity (as described in **Section 4.1.12.2**).

Fragmentation of contiguous vegetation communities or mature forest blocks is a concern for the portions of new transmission route proposed in Coös County, NH, the only portion of the Project involving a new transmission corridor. The new transmission route would be relatively narrow compared to the extent of surrounding forestland with similar stands and species composition, which comprises 92 percent of the land area of Coös County, NH. While the edges of new transmission route would be expected to result in some changes in species composition due to light penetration, wind, and humidity, this would not be expected to influence conditions of the interior forests beyond the vicinity of the transmission route edges. Fragmentation associated with the Project would not result in any population-level effects. See **Section 4.1.12.2** for a discussion of fragmentation.

4.2.12.3 Alternative 3

Impacts from Construction

Under Alternative 3, approximately 466 acres (189 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 164 acres (66 ha) of forested habitats. The disturbance would primarily result from the construction activity within the 40-mile (64 km) section of new 40-foot (12-m) wide transmission route, construction pads and the trench area in the existing PSNH transmission route, and new access roads.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

In these areas of disturbance, forestlands would be removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted to scrub-shrub or herbaceous wetland communities. The removal of forestlands is largely associated with the 40-mile (64 km) section of new transmission route where forest clearing would occur throughout the entire disturbance area. In contrast, the construction of the portion within the existing PSNH transmission route would require minimal tree clearing.

The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Northern Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. A single state-listed beaked sedge was potentially observed during Project-specific surveys in 2013 and 2014. Short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions. Refer to **Section 4.1.12.2** for impacts on vegetation from operation, maintenance and emergency repairs.

4.2.12.4 Alternative 4a

Impacts from Construction

Under Alternative 4a, approximately 14 acres (6 ha) of vegetated habitats would be impacted by the Project. Impacts would result from burying the cable in the corridor (3 acres [1 ha]), including in the trench (3 acres [1 ha]) and from trenchless installation (<0.1 acre [0.3 ha]), access roads (4 acres [2 ha]), and vegetation clearing in the corridor (7 acres [3 ha]). Of this, impacts would occur to approximately 10 acres (4 ha) of forested habitats, and 2 acres (0.8 ha) of wetlands.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4a the Project would be located underground in roadway corridors, and no long-term impacts would result from operation (see **Section 4.1.12.2**).

4.2.12.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.12.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.12.4**).

4.2.12.6 Alternative 4c

Impacts from Construction

Under Alternative 4c, approximately 14 acres (6 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 10 acres (4 ha) of forested habitats, and 2 acres (0.8 ha) of wetland habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4c, the Project would be located underground in roadway corridors, and no long-term impacts would result from operation (see **Section 4.1.12.2**).

4.2.12.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a in the Northern Section would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

4.2.12.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b in the Northern Section would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

4.2.12.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c in the Northern Section would be identical to those described for the Project under Alternative 2 (see **Section 4.2.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

4.2.12.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a in the Northern Section would be identical to those described for the Project under Alternative 4a (see **Section 4.2.12.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.12.4**).

4.2.12.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b in the Northern Section would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.12.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.12.4**).

4.2.12.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 in the Northern Section would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Northern Section (see **Section 4.2.12.2**).

4.2.13 WATER RESOURCES

Refer to **Section 4.1.13** for a discussion of general impacts common to all geographic sections. As discussed in **Section 4.1.13**, short-term and long-term impacts to water resources would result from construction of the Project. In general, construction activities including overstory vegetation removal and installation of aboveground and underground facilities would result in ground disturbance and associated impacts to water quality including erosion and sedimentation. With APMs listed in **Appendix H** such as developing an EPSC Plan, short-term and long-term impacts would be avoided or minimized from construction, operation, maintenance, and emergency repairs.

Table 4-96 presents direct, temporary and secondary wetland impacts in the Northern Section for all alternatives. Direct disturbance includes the permanent loss from placement of structures such as towers, substations, and converter and transitions stations within wetlands. Temporary disturbance includes alteration of wetlands such as cutting trees and use of swamp mats during construction. Secondary disturbance includes the permanent conversion of forested wetlands to either scrub-shrub or emergent wetland. Refer to the **Water Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for impacts to wetlands by type (e.g., PEM, PFO, and PSS).

Table 4-96. Wetlands Impacts within the Study Area of the Northern Section

Alternatives	Direct Disturbance acres (ha)	Temporary Disturbance acres (ha)	Secondary Disturbance acres (ha)
1 (No Action)	0 (0)	0 (0)	0 (0)
2	1 (<0.5)	131 (53)	34 (14)
3	0.5 (<0.5)	108 (44)	14 (6)
4a	<0.5 (<0.5)	2 (0.7)	<0.5 (<0.5)
4b	<0.5 (<0.5)	2 (0.7)	<0.5 (<0.5)
4c	<0.5 (<0.5)	2 (0.7)	<0.5 (<0.5)
5a	1 (<0.5)	131 (53)	34 (14)
5b	1 (<0.5)	131 (53)	34 (14)
5c	1 (<0.5)	131 (53)	34 (14)

Table 4-96. Wetlands Impacts within the Study Area of the Northern Section

Alternatives	Direct Disturbance acres (ha)	Temporary Disturbance acres (ha)	Secondary Disturbance acres (ha)
6a	<0.5 (<0.5)	2 (0.7)	<0.5 (<0.5)
6b	<0.5 (<0.5)	2 (0.7)	<0.5 (<0.5)
7 (Proposed Action)	1 (<0.5)	131 (53)	34 (14)

4.2.13.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.13.2 Alternative 2

Impacts from Construction

Watersheds

Under Alternative 2, the Project would affect 87 acres (35 ha) of the Nathan Pond Brook-Swift Diamond River Watershed, 93 acres (38 ha) of the Clear Stream Watershed, and 182 acres (74 ha) of the Bog Brook-Androscoggin River Watershed, among other smaller subwatersheds. Approximately 16 acres (6 ha) of Halls Stream, a tributary of the Connecticut River located in Canaan, VT, would be disturbed as well.

Surface Water

The Alternative 2 study area in the Northern Section includes multiple artificial paths, intermittent streams, and perennial waterbodies.[81] No Wild and Scenic Designated Rivers (see **Section 4.2.6.2**) are within the study area for Alternative 2, but one river—the Upper Ammonoosuc River—is listed by the New Hampshire RMPP as a Designated River. No Outstanding Resource Waters (ORW) occur within the study area for Alternative 2 in the Northern Section.

Under Alternative 2, approximately 6 miles (10 km) of waterbodies would be crossed by the Project in the Northern Section. Of this amount, less than 0.5 mile (0.8 km) is considered impaired based on New Hampshire's CWA 303(d) list. With the application of APMs, such as EPSC Plan, identified in **Appendix H**, Alternative 2 would not further impair this waterbody and adverse impacts to surface waters would be short-term and localized.

In addition, removal of up to 36 acres (15 ha) of various forest types, including conifer, deciduous and mixed hard/softwood forests, within 100 feet (30 m) of a stream would result in secondary impacts to surface waters. Alteration of riparian areas could lead to adverse effects related to sun exposure and an increase in stream water temperatures. With the implementation of a SWPPP, and avoidance of in-stream disturbance, impacts to surface water would be minimized.

Groundwater

Under Alternative 2, approximately 44 acres (18 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources because of minimal ground disturbance and blasting needed for overhead transmission lines;

[81] For this analysis, the artificial path was considered the predicted flow pathway, based on topography and elevation change, even though the floodplain it passes through exist as a non-linear, non-distinct, amorphous water resource.

however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 2 in the Northern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 401 acres (162 ha) of disturbance would occur in SWPAs under Alternative 2 in the Northern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 8 acres (3 ha) of disturbance would occur in WHPAs.

Floodplains

Under Alternative 2, approximately 906 acres (367 ha) of disturbance would occur in FEMA Flood Zones: 9 acres (4 ha) of Zone A; 2 acres (<0.5 ha) of Zone AE; and 895 acres (362 ha) of Zone X.[82]

Wetlands

Approximately 1 acre (0.4 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers and transition stations. Temporary, short-term impacts would affect approximately 131 acres (53 ha) of wetlands (see **Section 4.1.13.1**). Of the 131 acres (53 ha) of temporary impacts, approximately 70 acres (28 ha) would be to PEM wetlands and 61 acres (25 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 34 acres (14 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal. Other secondary impacts would result during construction where approximately 164 acres (66 ha) of upland forest is removed within 100 feet (30 m) of a wetland.

To minimize wetland impacts, Alternative 2 includes implementation of APMs listed in **Appendix H** for containment of trench material and minimizing sedimentation to the adjacent portions of a wetland, and APMs for restoring wetland contours and hydrology following transmission cable installation.

Vernal Pools

Under Alternative 2, two vernal pools would be impacted. Less than 0.5 acre (<0.5 ha) of direct impacts to vernal pools would be expected. This impact would be associated with construction of the proposed towers. The Project would have a localized, long-term effect on this valued resource because the vernal pool community within the Project footprint would be removed, unless adjustments were made to tower placement to avoid vernal pools. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.2.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts from operations, maintenance and emergency repairs would be similar to short-term construction activities but would occur for shorter durations over the life of the Project. Long-term impacts on water resources from the normal operation of the Project are not anticipated.

[82] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

4.2.13.3 Alternative 3

Impacts from Construction

Watersheds

Under Alternative 3, construction disturbance in the Northern Section would impact multiple watersheds, including 106 acres (43 ha) of the Bog Brook-Androscoggin River Watershed and 63 acres (25 ha) of the Upper Ammonoosuc River Watershed, which are the two watersheds with the largest potential disturbance areas in the Northern Section.

Surface Water

The Alternative 3 study area in the Northern Section includes multiple artificial paths, intermittent streams, and perennial waterbodies. No Wild and Scenic Designated Rivers (see **Section 4.2.6.3**) are within the study area for this alternative, but one river—the Upper Ammonoosuc River—is listed by New Hampshire RMPP as a Designated River. No ORW are within the study area for Alternative 3 in the Northern Section.

Under Alternative 3, approximately 3 miles (5 km) of waterbodies would be crossed by the Project in the Northern Section. Of this amount, approximately less than 0.5 mile (<0.8 km) are impaired waterbodies on the state 303(d) list. With the application of APMs, such as EPSC Plan, identified in **Appendix H**, Alternative 3 would not further impair this waterbody and adverse impacts to surface waters would be short-term and localized.

In addition, removal of 3 acres (1 ha) of various forest types, including conifer, deciduous and mixed hard/softwood forests, within 100 feet (30 m) of a stream, would result in secondary impacts to surface waters.

Groundwater

Under Alternative 3, approximately 43 acres (17 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. Potential impacts to groundwater would include blasting and/or inadvertent chemical releases (see **Section 4.1.13**). Installation and long-term use of the underground transmission lines would not be expected to have a detrimental effect on groundwater resources because of the relatively limited amount of ground disturbance that would occur over local aquifers during trenching. However, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 3 in the Northern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 292 acres (118 ha) of disturbance would occur in SWPAs under Alternative 3 in the Northern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 5 acres (2 ha) of disturbance would occur in WHPAs as a result of cable burial activities.

Floodplains

Under Alternative 3, approximately 594 acres (240 ha) of disturbance would occur in FEMA Flood Zones: 9 acres (4 ha) of Zone A; 2 acres (1 ha) of Zone AE; and 582 acres (236 ha) of Zone X.

Wetlands

Approximately 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of the transition station under Alternative 3. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 108 acres (44 ha) of wetlands (see **Section 4.1.13.1**). Of the 108 acres of temporary impacts, approximately 55 acres (22 ha) would be to PEM wetlands and 52 acres (21 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 14 acres (6 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

To minimize wetland impacts, Alternative 3 includes implementation of APMs listed in **Appendix H** for containment of trench material and minimizing sedimentation to the adjacent portions of a wetland, and APMs for restoring wetland contours and hydrology following transmission cable installation.

Vernal Pools

Under Alternative 3, three vernal pools would be impacted. Less than 0.5 acre (<0.5 ha) of direct impacts to vernal pools would be expected. This impact would be associated with construction of the underground cable. The Project would have a localized, long-term effect on this valued resource because the vernal pool community within the Project footprint would be removed, unless adjustments were made to avoid vernal pools. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.2.11.3**).

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term operation, maintenance and emergency repair impacts on water resources are not anticipated from underground cables because operation of the line would not result in impacts; however, maintenance and emergency repairs could result in similar short-term impacts as construction, such as erosion and sedimentation from ground disturbance or vehicle use.

4.2.13.4 Alternative 4a

Impacts from Construction

Watersheds

Under Alternative 4a, construction disturbance in the Northern Section would impact multiple watersheds including 13 acres (5 ha) of the Dennis Pond Brook-Connecticut River Watershed, 13 acres (5 ha) of the Johns River Watershed, and 12 acres (5 ha) of the Willard Stream-Connecticut River Watershed.

Surface Water

Under Alternative 4a, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Northern Section. Of this amount, less than 0.1 mile (0.2 km) are impaired waterbodies on the 303(d) list. With the application of APMs, such as an EPSC Plan, identified in **Appendix H**, Alternative 4a would not further impair these waterbodies and adverse impact surface waters.

Groundwater

Under Alternative 4a in the Northern Section, approximately 55 acres (22 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. There would be no disturbance in locations overlying bedrock aquifers. Installation and long-term use of the underground transmission lines would not be expected to have a detrimental effect on groundwater resources because of the relatively limited amount of ground disturbance that would occur over local aquifers during trenching.

However, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4a in the Northern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 101 acres (41 ha) of disturbance would occur in SWPAs under Alternative 4a in the Northern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 10 acres (4 ha) of disturbance would occur in WHPAs as a result of cable burial activities under Alternative 4a in the Northern Section.

Floodplains

Under Alternative 4a, up to 96 acres (39 ha) of floodplain disturbance would occur in FEMA Flood Zones: 2 acres (1 ha) of Zone A; 5 acres (2 ha) of Zone AE; and 89 acres (36 ha) of Zone X.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of the transition station under Alternative 4a. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 2 acres (0.7 ha) of wetlands (see **Section 4.1.13.1**). Of the approximately 2 acres (0.7 ha) of temporary impacts, approximately 1 acre (0.6 ha) would be to PEM wetlands and 0.5 acre (<0.5 ha) would be to PSS wetlands. Secondary impacts would occur to less than 0.5 acre (<0.5 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

No vernal pools were identified in the Alternative 4a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4a would be similar to those described for the Project under Alternative 3 in the Northern Section (see **Section 4.2.13.3**), as the Project would be underground for both alternatives. However, impacts under Alternative 4a would occur along roadway corridors which would allow for easier access and fewer impacts to water resources.

4.2.13.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.13.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a (see **Section 4.2.13.4**).

4.2.13.6 Alternative 4c

Impacts from Construction

Watersheds

Under Alternative 4c, construction disturbance in the Northern Section would impact multiple watersheds including up to 13 acres (5 ha) of the Dennis Pond Brook-Connecticut River Watershed, and up to 12 acres (5 ha) of the Willard Stream-Connecticut River Watershed.

Surface Water

Under Alternative 4c, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Northern Section. Of this amount, less than 0.1 mile (0.2 km) are impaired waterbodies on the 303(d) list. With the application of APMs, such as an EPSC Plan, identified in **Appendix H**, Alternative 4c would not further impair these waterbodies and adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 4c in the Northern Section, approximately 48 acres (19 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits, while no disturbance would occur in locations overlying bedrock aquifers. Installation and long-term use of the underground transmission lines would not be expected to have a detrimental effect on groundwater resources because of the relatively limited amount of ground disturbance that would occur over local aquifers during trenching. However, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4c in the Northern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 89 acres (36 ha) of disturbance would occur in SWPAs under Alternative 4c in the Northern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 12 acres (5 ha) of disturbance would occur in WHPAs as a result of cable burial activities under Alternative 4c in the Northern Section.

Floodplains

Under Alternative 4c, up to 96 acres (39 ha) of floodplain disturbance would occur in FEMA Flood Zones: 2 acres (1 ha) of Zone A; 5 acres (2 ha) of Zone AE; and 89 acres (36 ha) of Zone X.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of the transition station under Alternative 4c. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 2 acres (0.7 ha) of wetlands (see **Section 4.1.13.1**). Of the approximately 1.8 acres (0.7 ha) of temporary impacts, approximately 1 acre (0.6 ha) would be to PEM wetlands and 0.5 acre (<0.5 ha) would be to PSS wetlands. Secondary impacts would occur to less than 0.5 acre (<0.5 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

No vernal pools were identified in the Alternative 4c Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Northern Section (see **Section 4.2.13.4**).

4.2.13.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

4.2.13.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

4.2.13.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

4.2.13.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those described for the Project under Alternative 4a (see **Section 4.2.13.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a (see **Section 4.2.13.4**).

4.2.13.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 4a (see **Section 4.2.13.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4a (see **Section 4.2.13.4**).

4.2.13.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 (see **Section 4.2.13.2**).

4.2.14 GEOLOGY AND SOILS

Refer to **Section 4.1.14** for a discussion of general impacts common to all geographic sections.

4.2.14.1 Alternative 1

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.2.14.2 Alternative 2

Impacts from Construction

Under Alternative 2, the Project would result in disturbance of approximately 906 acres (367 ha) of surface soils in the Northern Section. The majority of the disturbance (356 acres [144 ha]) would be from a new or widened transmission route. The remaining acreages (549 acres [222 ha]) would be associated with access roads, construction pads, tower removal, transition stations, or burial of cable. The impacts to surficial geology represent a total disturbance area; however, the actual surficial geology impact would be expected to be less because not all portions of the transmission route would require grading and/or excavation of soil. Permanent features would result in long-term construction impacts from the conversion of soils to another use; however, impacts from trenching would result in additional erosion potential, but would be short-term impacts.

Cable burial would result in disturbance of approximately 9 acres (4 ha). Impacts on surficial geology during construction of the underground cable are expected to be short term and regional. The majority of underground construction would be in areas of existing roads where previous disturbance to surficial geology and soils has occurred. Unless blasting is required, the impacts of construction of a construction pad are 193 acres (78 ha) of disturbance and access roads are 295 acres (119 ha) of disturbance.

No earthquakes have been documented within the disturbance areas. Fourteen faults would be crossed by Alternative 2 in 20 separate locations within the disturbance areas; however, these faults are considered inactive by New Hampshire's state geologist (Boudette 1994a). Approximately 160 acres (65 ha) of Alternative 2 disturbance in the Northern Section have a high susceptibility to landsliding and low landslide incidence. All other areas of the Project in the Northern Section for Alternative 2 (746 acres [302 ha]) are considered to have low susceptibility to landsliding. With the implementation of APMs (see **Appendix H**), construction of the Project is not anticipated to affect or be affected by landslides.

Under Alternative 2, about 906 acres (367 ha) of land would impacted in the Northern Section. These consist of approximately 30 acres (12 ha) of all hydric soils, 718 acres (291 ha) of partially hydric soils, and 158 acres (64 ha) of unknown soils. Of the 906 acres (367 ha), approximately 11 acres (4 ha) are Prime Farmland, 10 acres (4 ha) are Farmland of Statewide Importance, and 85 acres (34 ha) are Farmland of Local Importance.

Approximately 232 acres (94 ha) of land would be impacted by the construction of towers in the Northern Section. Impacts would be localized and short-term and would occur within the existing PSNH transmission route. Where impacts would occur to Prime Farmland, Farmland of Statewide Importance, and Farmland of Local Importance, these various types of farmland soils would be permanently converted and would lose the ability to serve their purpose, and thus are considered adverse impacts. Impacts on soil during construction of the underground cable are expected to be short term.

Construction and modifications of aboveground features and other disturbance areas such as the new/widened transmission routes and new/improved off transmission route access roads would impact soils by approximately 906 acres (367 ha) resulting in increased erosion; however, these impacts are expected to be short-term impacts.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts primarily resulting in erosion from maintenance and emergency repairs. These impacts would occur for a shorter duration than construction impacts, but would occur over the life of the Project. Long-term impacts are not anticipated, except for permeant access roads or structures are needed. Short-term or long-term impacts are not anticipated on geology and soils from the operation of the Project under Alternative 2.

4.2.14.3 Alternative 3

Impacts from Construction

Alternative 3 would result in the surface soil disturbance of approximately 594 acres (240 ha) in the Northern Section. The majority of disturbance (268 acres [108 ha]) would result from access roads, potentially a long-term impact if the access road is not rehabilitated after construction. The remainder of the disturbance would be from construction pads, new/widened ROWs, cable burial, all short-term impacts to soils primarily from erosion. Impacts from underground activities would mainly be caused by the digging of the trench area, which accounts for 89 acres (36 ha) of the 91 acres (37 ha) that would be disturbed by cable burial. Underground cable installation would require more grading, trenching, and other excavation along with backfilling compared to aboveground installation resulting in more soil disturbance and exposure to erosion during construction (see **Section 4.1.14.1**).

No earthquakes have been documented within the disturbance areas. Fourteen faults would be crossed by Alternative 3 in 24 specific locations. Approximately 63 acres (26 ha) of disturbance areas within the Northern Section have a high susceptibility to landsliding and low landslide incidence. All other areas of the Project for the Northern Section under Alternative 3 (328 acres [133 ha]) are considered to have low susceptibility to landsliding. With the implementation of APMs (see **Appendix H**), construction of the Project is not anticipated to affect or be affected by landslides.

Under Alternative 3, about 594 acres (240 ha) of land would be impacted in the Northern Section. The main disturbance to land would be caused by the access roads which accounts for 268 acres (108 ha) of the impacted area. Approximately 30 acres (12 ha) of all hydric soils, 460 acres (186 ha) of partially hydric soils, and about 103 acres (42 ha) of unknown soils would be affected by disturbance areas under Alternative 3 in the Northern Section. Of the 594 acres (240 ha), approximately 9 acres (4 ha) of Prime Farmland, 8 acres (3 ha) of Farmland of Statewide Importance, and 62 acres (25 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 3 in the Northern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

The entirety of Alternative 3 would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required; however, burial of the transmission cable traditionally limits the need for maintenance in general and as a result it is not anticipated to impact on soils.

4.2.14.4 Alternative 4a

Impacts from Construction

Under Alternative 4a, approximately 96 acres (39 ha) would be in the total surface soils disturbance area in the Northern Section. Burial of cable along the Project corridor or roadways would result in a short-term impact to soils primarily from erosion. The majority of underground construction would be under or adjacent to existing roadways; therefore, in areas of previous disturbance to surficial geology and soils.

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; however, three faults, including the Ammonoosuc Fault, would be crossed in 3 locations within the disturbance areas. These faults are likely inactive according to the New Hampshire's state geologist. The entire disturbance area under Alternative 4a within the Northern Section has a low landslide incidence.

Under Alternative 4a, approximately 96 acres (39 ha) of soil would be impacted in the Northern Section. Approximately 1 acre (0.4 ha) of all hydric soils, 51 acres (21 ha) of partially hydric soils, and about 44 acres (18 ha) of not hydric or unknown soils would be affected by disturbance areas under Alternative 4a in the Northern Section. Of the 96 acres (39 ha), approximately 8 acres (3 ha) of Prime Farmland, 10 acres (4 ha) of Farmland of Statewide Importance, and 33 acres (13 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 4a in the Northern Section. About 45 acres (18 ha) of disturbance areas under Alternative 4a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

The entirety of Alternative 4a would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required; however, burial of the transmission cable traditionally limits the need for maintenance in general.

4.2.14.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

4.2.14.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

4.2.14.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

4.2.14.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

4.2.14.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

4.2.14.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

4.2.14.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those under Alternative 4a (see **Section 4.2.14.4**).

4.2.14.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those under Alternative 2 (see **Section 4.2.14.2**).

4.3 CENTRAL SECTION

4.3.1 VISUAL RESOURCES

Refer to **Section 4.1.1** for a discussion of general impacts common to all geographic sections.

4.3.1.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.1.2 Alternative 2

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 2. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing would result in long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 2 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.2** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 2 would be approximately 6 square miles (15.5 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 2 would be approximately 26 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 2 would result in an additional 3.7 square miles (9.5 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 2 would increase the average visual magnitude from 1.69 to 2.06, indicating an increase in the number of visible structures. The visual magnitude would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 2 would result in an additional 1.53 square miles (4 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 2 would increase the average scenic impact from 1.63 to 1.8, indicating an increased visibility at sensitive locations. The scenic impact would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-97 summarizes landscape assessment impacts in the Central Section under Alternative 2.

Table 4-97. Landscape Assessment Impacts under Alternative 2 – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Land Area within Viewshed	25 square miles (65 km^2)	6 square miles (15.5 km^2)	31 square miles (80 km^2)
Average Visual Magnitude	1.69 (Very Low to Low)	0.37	2.06
Land Area with "High or Very High" Scenic Impact	2.97 square miles (8 km^2)	1.53 square miles (4 km^2)	4.5 square miles (12 km^2)
Average Scenic Impact	1.63 (Very Low to Low)	0.17	1.80
Aggregate Scenic Impact	39.86	15.94	55.8

Roads-Based Analysis

Under Alternative 2, the Project's overhead structures would not cross any publicly-accessible roads that are not crossed by the existing PSNH transmission line (0 additional road crossings). The Project would be visible from approximately 16 miles (24 km) of roads in addition to the 79 miles (127 km) of roads with visibility of the existing PSNH transmission line.[83] Approximately 20 additional miles (32 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 13 miles (21 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 2 would increase the average visual magnitude for roads within the viewshed from 2.05 to 2.84, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current level of "Low to Moderate."

Included in the 15 miles (24 km) of increased visibility from roads within the viewshed would be 5.6 miles (9 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 160 hours per day from 243 hours per day to 403 hours per day. These

[83] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

impacts would primarily be to the White Mountain Trail National Scenic Byway (8 hours per day), Presidential Range Tour (85 hours per day), the state-designated River Heritage Tour (50 hours per day), and the state designated Lakes Region Tour (17 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-98 summarizes roads-based analysis impacts in the Central Section under Alternative 2.[84]

Table 4-98. Roads-Based Analysis Impacts under Alternative 2 – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Miles of Road within Viewshed	79 miles (127 km)	16 miles (26 km)	95 miles (153 km)
Average Visual Magnitude	2.05 (Low)	0.79	2.84 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	14 miles (23 km)	5.6 miles (9 km)	19.6 miles (32 km)
Vehicle Exposure on Scenic Roads	243 hours per day	160 hours per day	403 hours per day

Viewpoint Assessment

A review of the twelve KOPs in **Appendix E** for the Central Section gives an indication of how some existing views would change with the construction of Alternative 2. Impacts to visual resources in the WMNF, including the ANST, are discussed in detail in **Section 4.5.1.2**. These KOPs represent the range of viewpoint characteristics and range of long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP BT-1 (Viewpoint BT-1c in **Appendix E**) is on NH Route 302 at Rocks Edge Road in Bethlehem, NH, and is part of the Presidential Range Tour. It shows the existing PSNH transmission route crossing a road 500 feet (152 m) ahead. An existing H-frame structure is located in an open field near the road; the existing contrast-dominance rating is "Moderate" (24). Alternative 2 would include a new lattice structure to be located next to the road. Under Alternative 2, the contrast-dominance rating would be "Severe" (40), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP BT-6 (Viewpoint BT-6c in **Appendix E**) is located on Route 116 between Whitefield Road and Wing Road in Bethlehem, NH. The contrast-dominance rating is "Strong" (27) for the existing PSNH transmission line. The contrast-dominance rating under Alternative 2 would be "Severe" (40), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP CA-1 (Viewpoint CA-1c in **Appendix E**) is of a retail use in a rural setting on the River Heritage Tour (NH Route 49 in Campton, NH). The existing H-frame structures are screened by trees as they come down the hillside; the existing contrast-dominance rating is "Moderate" (21). Vegetation clearing under Alternative 2 would expose the new lattice structures. Under Alternative 2, the contrast-dominance rating would be "Severe" (39), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.

[84] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

- KOP EA-3 (Viewpoint EA-3c in **Appendix E**) is a view looking southeast along the existing PSNH transmission route as it crosses Easton Valley Road, which is part of the River Heritage Tour (NH Route 116 in Easton, NH). It shows the existing PSNH transmission route at a road crossing in flat forested land; the existing contrast-dominance rating is "Strong" (32). Under Alternative 2, the contrast-dominance rating would be "Severe" (43), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP FR-2 (Viewpoint FR-2c in **Appendix E**) is a winter vista from the top of Mount Lafayette, on the ANST in Franconia, NH. It shows the existing PSNH transmission route in the far distance; the existing contrast-dominance rating is "Negligible" (7). Under Alternative 2, the contrast-dominance rating would be "Weak" (11), which indicates that the visual change would be noticeable, but so small as to be considered unimportant.
- KOP LI-2 (Viewpoint LI-2c in **Appendix E**) is from the White Mountain Trail National Scenic Byway (I-93 northbound in Lincoln, NH). It shows a view toward the WMNF and existing PSNH transmission route from an expressway; the existing contrast-dominance rating is "Weak" (10). Under Alternative 2, the contrast-dominance rating would remain "Weak" (17), which indicates that the visual change would be noticeable, but so small as to be considered unimportant.
- KOP LI-4 (Viewpoint LI-4c in **Appendix E**) shows the existing PSNH transmission route crossing the ANST; the existing contrast-dominance rating is "Severe" (36). Under Alternative 2, the contrast-dominance rating would be "Severe" (44), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP LI-5 (Viewpoint LI-5c in **Appendix E**) is a vista located near the top of South Kinsman Mountain on the ANST looking down into the Bog Pond area. It shows a summer mountain-top vista of a valley with the existing PSNH transmission route; the existing contrast-dominance rating is "Moderate" (25). Under Alternative 2, the contrast-dominance rating would be "Strong" (27), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP NH-2 (Viewpoint NH-2c in **Appendix E**) is located on I-93 Northbound just south of mile marker 72 in New Hampton, NH. The contrast-dominance rating for the existing PSNH transmission line is "Moderate" (20). The contrast-dominance rating under Alternative 2 would be "Strong" (34), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP NH-3 (Viewpoint NH-3c in **Appendix E**) is located where the existing PSNH transmission corridor crosses over the Pemigewasset River in an area that is also within the Army Corps of Engineers' Franklin Falls Dam, at the border between the towns of Hill and New Hampton, NH. The contrast-dominance rating for the existing PSNH transmission line is "Moderate" (26). The contrast-dominance rating under Alternative 2 would be "Severe" (40), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP WD-3 (Viewpoint WD-3c in **Appendix E**) is from I-93 North at I-93 mile marker 97.4 in Woodstock, NH. It shows a view from an expressway with the PSNH transmission route climbing a hillside in the foreground; the existing contrast-dominance rating is "Moderate" (21). Alternative 2 would introduce large lattice structures next to the wooden H-frame structures. Under Alternative 2, the contrast-dominance rating would be "Strong" (32), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.

- KOP WD-4 (Viewpoint WD-4c in **Appendix E**) shows a fall view of the existing PSNH transmission route from the Gordon Pond Trail crossing; the existing contrast-dominance rating is "Strong" (28). Under Alternative 2, the contrast-dominance rating would be "Severe" (41), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.

4.3.1.3 Alternative 3

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 3. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 3; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in the existing PSNH transmission route. Vegetation management would increase the viewshed of the existing PSNH transmission line by approximately 0.02 square mile (0.05 km^2).

Viewpoint Assessment

The following potential impacts would occur relative to the twelve KOPs in the Central Section under Alternative 3.

- KOP BT-1 (Viewpoint BT-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP BT-2 (Viewpoint BT-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP CA-1 (Viewpoint CA-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-3 (Viewpoint NH-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-3 (Viewpoint WD-3b in **Appendix E**) – There would be no visible change from the existing condition.

- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.1.4 Alternative 4a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 4a; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in existing roadway corridors.

Viewpoint Assessment

The following potential impacts would occur relative to the twelve KOPs in the Central Section under Alternative 4a.

- KOP BT-1 (Viewpoint BT-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP BT-6 (Viewpoint BT-6b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP CA-1 (Viewpoint CA-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-3 (Viewpoint NH-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-3 (Viewpoint WD-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.1.5 Alternative 4b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.3.1.4**).

4.3.1.6 Alternative 4c

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.3.1.4**).

4.3.1.7 Alternative 5a

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5a and are discussed in **Section 4.1.1.2**.

For underground portions of Alternative 5a, long-term operation impacts would occur; however, the Project would be located underground in existing roadway corridors (see **Section 4.1.1.2**). The visual effects of the overhead portions of Alternative 5a would be identical to the corresponding portions of Alternative 2. The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing and the installation of aboveground transition structures would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 5a could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.7** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5a would be approximately 5 square miles (13 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5a would be 21 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5a would result in an additional 2 square miles (5 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 5a would increase the average visual magnitude from 1.69 to 1.9, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current value of "Very Low to Low." Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5a would result in an additional 1 square mile (2.5 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 5a would increase the average scenic impact from 1.63 to 1.7, indicating an increased visibility at sensitive locations. The scenic impact would not increase from its current value of "Very Low to Low." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-99 summarizes landscape assessment impacts in the Central Section under Alternative 5a.

Table 4-99. Landscape Assessment Impacts under Alternative 5a – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5a)
Land Area within Viewshed	25 square miles (65 km^2)	5 square miles (13 km^2)	30 square miles (78 km^2)
Average Visual Magnitude	1.69 (Very Low to Low)	0.21	1.9 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	2.97 square miles (7.5 km^2)	1.03 square miles (2.5 km^2)	4 square miles (10 km^2)
Average Scenic Impact	1.63 (Very Low to Low)	0.07	1.7
Aggregate Scenic Impact	39.86	10.7	50.56

Roads-Based Analysis

Under Alternative 5a, the Project's overhead structures would cross 49 publicly-accessible roads in addition to the 66 roads crossed by the existing PSNH transmission line. The Project would be visible from approximately 13.6 miles (22 km) of roads in addition to the 79 miles (127 km) of roads with visibility of the existing PSNH transmission line.[85] Within the viewshed, 17.5 miles (28 km) of roads would have a visual magnitude rating of "High or Very High," in addition to the 13 miles (21 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 5a would increase the average visual magnitude for roads within the viewshed from 2.05 to 2.72, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current value of "Low to Moderate."

Included in the 13.6 miles (22 km) of increased visibility from roads within the viewshed would be 4.6 miles (7.4 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 134 hours per day from 243 hours per day to 377 hours per day. These impacts would primarily be felt on the state-designated Presidential Range Tour (85 hours per day), the state-designated River Heritage Tour (31 hours per day), and the state-designated Lakes Region Tour (18 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

[85] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

Table 4-100 summarizes roads-based analysis impacts in the Central Section under Alternative 5a.[86]

Table 4-100. Roads-Based Analysis Impacts under Alternative 5a – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5a)
Miles of Road within Viewshed	79 miles (127 km)	13.6 miles (22 km)	92.6 miles (149 km)
Average Visual Magnitude	2.05 (Low)	0.67	2.72 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	14 miles (22.5 km)	4.6 miles (7.4 km)	18.6 miles (30 km)
Vehicle Exposure on Scenic Roads	243 hours per day	134 hours per day	377 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the twelve KOPs in the Central Section under Alternative 5a.

- KOP BT-1 (Viewpoint BT-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP BT-6 (Viewpoint BT-6c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2. KOP CA-1 (Viewpoint CA-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP NH-3 (Viewpoint NH-3c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-3 (Viewpoint WD-3c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.1.8 Alternative 5b

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

[86] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5b and are discussed in **Section 4.1.1.2**.

For underground portions of Alternative 5b, long-term operational impacts would occur; however, the Project would be located beneath existing roadway corridors (see **Section 4.1.1.2**). The visual effects of the overhead portions of Alternative 5b would be identical to the corresponding portions of Alternative 2. The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing and the installation of aboveground transition structures would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 5b could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.8** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5b would be approximately 6 square miles (16 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5b would be 26 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5b would result in an additional 1.4 square miles (9 km^2) of the viewshed with a visual magnitude rating of “High or Very High.” Alternative 5b would increase the average visual magnitude from 1.69 to 2.02, indicating an increase in the number of visible structures. The visual magnitude would be “Low to Moderate,” compared with the rating of “Very Low to Low” for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5b would result in an additional 1.4 square miles (5 km^2) of the viewshed with a scenic impact rating of “High or Very High.” Alternative 5b would increase the average scenic impact from 1.63 to 1.77, indicating an increased visibility at sensitive locations. The scenic impact would be “Low to Moderate,” compared with the rating of “Very Low to Low” for the existing condition. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-101 summarizes landscape assessment impacts in the Central Section under Alternative 5b.

Table 4-101. Landscape Assessment Impacts under Alternative 5b – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5b)
Land Area within Viewshed	25 square miles (65 km^2)	6 square miles (16 km^2)	31 square miles (80 km^2)
Average Visual Magnitude	1.69 (Very Low to Low)	0.33	2.02 (Low)
Land Area with “High or Very High” Scenic Impact	2.97 square miles (7.5 km^2)	1.4 square miles (5 km^2)	4.3 square miles (13 km^2)
Average Scenic Impact	1.63 (Very Low to Low)	0.14	1.77
Aggregate Scenic Impact	39.86	14.5	54.37

Roads-Based Analysis

Under Alternative 5b, the Project's overhead structures would create 66 new road crossings, in addition to the 66 publicly accessible roads crossed by the existing PSNH transmission line. The Project would be visible from approximately 9 miles (14 km) of roads in addition to the 79 miles (127 km) of roads with visibility of the existing PSNH transmission line.[87] Approximately 30.4 miles (49 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 13 miles (21 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 5b would increase the average visual magnitude for roads within the viewshed from 2.05 to 2.81, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current rating of "Low to Moderate."

Included in the 16 miles (26 km) of increased visibility from roads within the viewshed would be 5.2 miles (8.5 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 147 hours per day from 243 hours per day to 390 hours per day.[88] These impacts would primarily be to the White Mountain Trail National Scenic Byway (3.3 hours per day), the state-designated Presidential Range Tour (85 hours per day), the state-designated River Heritage Tour (41 hours per day), and the state designated Lakes Region Tour (18 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-102 summarizes roads-based analysis impacts in the Central Section under Alternative 5b.

Table 4-102. Roads-Based Analysis Impacts under Alternative 5b – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5b)
Miles of Road within Viewshed	79 miles (127 km)	9 miles (14 km)	88 miles (142 km)
Average Visual Magnitude	2.05 (Low)	0.76	2.81 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	14 miles (23 km)	5.2 miles (8.5 km)	19.2 miles (31 km)
Vehicle Exposure on Scenic Roads	243 hours per day	147 hours per day	390 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the twelve KOPs in the Central Section under Alternative 5b.

- KOP BT-1 (Viewpoint BT-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP BT-6 (Viewpoint BT-6c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP CA-1 (Viewpoint CA-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.

[87] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[88] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-3 (Viewpoint WD-3c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.1.9 Alternative 5c

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5c and are discussed in **Section 4.1.1.2**.

For underground portions of Alternative 5c, long-term operational impacts would occur; however, the Project would be located underground in existing roadway corridors (see **Section 4.1.1.2**). The visual effects of the overhead portions of Alternative 5c would be identical to the corresponding portions of Alternative 2. The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing and the installation of aboveground transition structures would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 5c could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.9** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5c would be 5.6 square miles (14.5 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5c would be 23 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5c would result in an additional 2.1 square miles (5.5 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 5c would increase the average visual magnitude from 1.69 to 1.98, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current rating of "Very Low to Low." Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5c would result in an additional 1.2 square miles (3.1 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 5c would increase the average scenic impact from 1.63 to 1.74, indicating an increased visibility at sensitive locations. The scenic impact would remain "Very Low to Low." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-103 summarizes landscape assessment impacts in the Central Section under Alternative 5c.

Table 4-103. Landscape Assessment Impacts under Alternative 5c – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5c)
Land Area within Viewshed	25 square miles (65 km^2)	5.6 square miles (14.5 km^2)	30.6 square miles (79.5 km^2)
Average Visual Magnitude	1.69 (Very Low to Low)	0.29	1.98 (Low)
Land Area with "High or Very High" Scenic Impact	2.97 square miles (7.5 km^2)	1.2 square miles (3.1 km^2)	4 square miles (11 km^2)
Average Scenic Impact	1.63 (Very Low to Low)	0.11	1.74 (Very Low to Low)
Aggregate Scenic Impact	39.86	12.42	52.28

Roads-Based Analysis

Under Alternative 5c, the Project's overhead structures would cross 52 additional publicly-accessible roads that are not crossed by the existing PSNH transmission line. The Project would be visible from approximately 14.2 miles (23 km) of roads in addition to the 79 miles (127 km) of roads with visibility of the existing PSNH transmission line.[89] Approximately 19 additional miles (31 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 13 miles (21 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 5c would increase the average visual magnitude for roads within the viewshed from 2.05 to 2.78, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current rating of "Low to Moderate."

Included in the 14.2 miles (23 km) of increased visibility from roads within the viewshed would be 4.9 miles (8 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 137 hours per day from 243 hours per day to 380 hours per day.[90] These impacts would primarily be felt on the White Mountain Trail National Scenic Byway (1.3 hours per day), the state-designated Presidential Range Tour (85 hours per day), the state-designated River Heritage Tour (33.5 hours per day), and the state designated Lakes Region Tour (18 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

[89] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[90] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Table 4-104 summarizes roads-based analysis impacts in the Central Section under Alternative 5c.

Table 4-104. Roads-Based Analysis Impacts under Alternative 5c – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5c)
Miles of Road within Viewshed	79 miles (127 km)	14.2 miles (23 km)	93.2 miles (150 km)
Average Visual Magnitude	2.05 (Low)	0.73	2.78 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	14 miles (23 km)	4.9 miles (8 km)	18.9 miles (31 km)
Vehicle Exposure on Scenic Roads	243 hours per day	137 hours per day	380 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the twelve KOPs in the Central Section under Alternative 5c.

- KOP BT-1 (Viewpoint BT-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP BT-6 (Viewpoint BT-6c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP CA-1 (Viewpoint CA-1c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-3 (Viewpoint WD-3c in **Appendix E**) – Impacts relative to this viewpoint would be identical to those under Alternative 2.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.1.10 Alternative 6a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be similar to those discussed above for Alternative 4a (see **Section 4.3.1.4**). However, overhead co-located HVAC structures could be visible from properties listed on the NRHP Central Section. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.10** for a discussion of impacts to historic resources within the study area.

4.3.1.11 Alternative 6b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those discussed above for Alternative 4a (see **Section 4.3.1.4**). However, overhead co-located HVAC structures could be visible from properties listed on the NRHP Central Section. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.11** for a discussion of impacts to historic resources within the study area.

4.3.1.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 7. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing would result in long-term visual impacts. These long-term impacts are discussed below.

The Project under Alternative 7 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.3.8.2** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 7 would be approximately 3.7 square miles (9.6 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 7 would be approximately 15 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 7 would result in an additional 0.8 square mile (2.1 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 7 would increase the average visual magnitude from 1.69 to 1.74, indicating an increase in the number of visible structures. The visual magnitude rating would remain "Very Low to Low" as for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 7 would result in an additional 0.8 square mile (2 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 7 would decrease the average scenic impact from 1.63 to 1.62. The scenic impact would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-105 summarizes landscape assessment impacts in the Central Section under Alternative 7.

Table 4-105. Landscape Assessment Impacts under Alternative 7 – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Land Area within Viewshed	25 square miles (65 km^2)	3.7 square miles (9.6 km^2)	28.7 square miles (74 km^2)
Average Visual Magnitude	1.69 (Very Low to Low)	0.05	1.74 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	2.97 square miles (7.5 km^2)	0.8 square mile (2.1 km^2)	3.3 square miles (9 km^2)
Average Scenic Impact	1.63 (Very Low to Low)	-0.01	1.62 (Very Low to Low)
Aggregate Scenic Impact	39.86	5.72	45.58

Roads-Based Analysis

Under Alternative 7, the Project's overhead structures would not cross any additional publicly-accessible roads that are not crossed by the existing PSNH transmission line. The Project would be visible from approximately 8.7 miles (14 km) of roads in addition to the 79 miles (127 km) of roads with visibility of the existing PSNH transmission line.[91] Approximately 5.8 additional miles (9.4 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 13 miles (21 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 7 would increase the average visual magnitude for roads within the viewshed from 2.05 to 2.28, indicating an increase in the number of visible structures. The average visual magnitude rating would increase from its current level of "Low" to "Low to Moderate."

Included in the 15 miles (24 km) of increased visibility from roads within the viewshed would be 5.5 miles (9 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 153 hours per day from 243 hours per day to 397 hours per day. These impacts would primarily be to the Presidential Range Tour (103.5 hours per day) and state-designated River Heritage Tour (81 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-106 summarizes roads-based analysis impacts in the Central Section under Alternative 7.[92]

[91] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[92] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Table 4-106. Roads-Based Analysis Impacts under Alternative 7 – Central Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Miles of Road within Viewshed	79 miles (127 km)	9 miles (14 km)	88 miles (141 km)
Average Visual Magnitude	2.05 (Low)	0.23	2.28 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	14 miles (23 km)	5.5 miles (9 km)	19.7 miles (32 km)
Vehicle Exposure on Scenic Roads	243 hours per day	153 hours per day	397 hours per day

Viewpoint Assessment

A review of the twelve KOPs in **Appendix E** for the Central Section gives an indication of how some existing views would change with the construction of Alternative 7. Impacts to visual resources in the WMNF, including the ANST, are discussed in detail in **Section 4.5.1.2**. These KOPs represent the range of viewpoint characteristics and range of long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP BT-1 (Viewpoint BT-1d in **Appendix E**) – The proposed Alternative 7 condition would include a new transition station next to the road, which would raise the contrast-dominance rating to “Strong” (30), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP BT-6 (Viewpoint BT-6d in **Appendix E**) –The contrast-dominance rating is “Strong” (27) for the existing PSNH transmission line. The contrast-dominance rating under Alternative 7 would be “Severe” (42), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP CA-1 (Viewpoint CA-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP NH-2 (Viewpoint NH-2d in **Appendix E**) – The contrast-dominance rating for the existing PSNH transmission line is “Moderate” (20). The contrast-dominance rating under Alternative 7 would be “Strong” (33), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP NH-3 (Viewpoint NH-3d in **Appendix E**) – The contrast-dominance rating for the existing PSNH transmission line is “Moderate” (26). The contrast-dominance rating under Alternative 7

would be "Severe" (41), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.

- KOP WD-3 (Viewpoint WD-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.3.2 SOCIOECONOMICS

Refer to **Section 4.1.2** for a discussion of general impacts common to all geographic sections.

4.3.2.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.2.2 Alternative 2

Property Taxes

Table 4-107 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 2 would be approximately $3.3 million.

Table 4-107. Annual Property Tax Impact ($ million) in the Central Section – Alternative 2

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,087	$3.3	$29.8

Economic Activity

Impacts to statewide economic activity under Alternative 2, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.2**.

Property Values

It is estimated that implementation of Alternative 2, could result in a reduction in taxable assessed residential property values of approximately $4.7 million across the Central Section. This could result in a reduction of residential tax revenue payments of approximately $126,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 2 are discussed in **Section 4.1.2.2**.

4.3.2.3 Alternative 3

Property Taxes

Table 4-108 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 3 would be approximately $13.7 million.

Table 4-108. Annual Property Tax Impact ($ million) in the Central Section – Alternative 3

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$2,128	$13.7	$57.9

Economic Activity

Impacts to statewide economic activity under Alternative 3, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.3**.

Property Values

Because the Project would be buried under Alternative 3, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 3 because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 3 are discussed in **Section 4.1.2.3**.

4.3.2.4 Alternative 4a

Property Taxes

Table 4-109 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 4a would be approximately $13.6 million.

Table 4-109. Annual Property Tax Impact ($ million) in the Central Section – Alternative 4a

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$2,034	$13.6	$56.5

Economic Activity

Impacts to statewide economic activity under Alternative 4a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.4**.

Property Values

Because the Project would be buried under Alternative 4a, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4a because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4a are discussed in **Section 4.1.2.4**.

4.3.2.5 Alternative 4b

Property Taxes

Table 4-110 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 4b would be approximately $16.2 million.

Table 4-110. Annual Property Tax Impact ($ million) in the Central Section – Alternative 4b

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$2,163	$16.2	$59.1

Economic Activity

Impacts to statewide economic activity under Alternative 4b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.5**.

Property Values

Because the Project would be buried under Alternative 4b, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4b because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4b are discussed in **Section 4.1.2.5**.

4.3.2.6 Alternative 4c

Property Taxes

Table 4-111 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 4c would be approximately $16.3 million.

Table 4-111. Annual Property Tax Impact ($ million) in the Central Section – Alternative 4c

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$2,094	$16.3	$58.0

Economic Activity

Impacts to statewide economic activity under Alternative 4c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.6**.

Property Values

Because the Project would be buried under Alternative 4c, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4c because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4c are discussed in **Section 4.1.2.6**.

4.3.2.7 Alternative 5a

Property Taxes

Table 4-112 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 5a would be approximately $6.4 million.

Table 4-112. Annual Property Tax Impact ($ million) in the Central Section – Alternative 5a

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,180	$6.4	$31.3

Economic Activity

Impacts to statewide economic activity under Alternative 5a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.7**.

Property Values

It is estimated that implementation of Alternative 5a, could result in a reduction in taxable assessed residential property values of approximately $3.6 million across the Central Section. This could result in a reduction of residential tax revenue payments of approximately $98,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5a are discussed in **Section 4.1.2.7**.

4.3.2.8 Alternative 5b

Property Taxes

Table 4-113 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 5b would be approximately $7.0 million.

Table 4-113. Annual Property Tax Impact ($ million) in the Central Section – Alternative 5b

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,252	$7.0	$32.9

Economic Activity

Impacts to statewide economic activity under Alternative 5b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.8**.

Property Values

It is estimated that implementation of Alternative 5b, could result in a reduction in taxable assessed residential property values of approximately $4.3 million across the Central Section. This could result in a reduction of residential tax revenue payments of approximately $117,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5b are discussed in **Section 4.1.2.8**.

4.3.2.9 Alternative 5c

Property Taxes

Table 4-114 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 5c would be approximately $7.4 million.

Table 4-114. Annual Property Tax Impact ($ million) in the Central Section – Alternative 5c

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,227	$7.4	$32.2

Economic Activity

Impacts to statewide economic activity under Alternative 5c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.9.**

Property Values

It is estimated that implementation of Alternative 5c, could result in a reduction in taxable assessed residential property values of approximately $3.7 million across the Central Section. This could result in a reduction of residential tax revenue payments of approximately $99,000 per year.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5c are discussed in **Section 4.1.2.9**.

4.3.2.10 Alternative 6a

Property Taxes

Table 4-115 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 6a would be approximately $13.1 million.

Table 4-115. Annual Property Tax Impact ($ million) in the Central Section – Alternative 6a

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,876	$13.1	$52.5

Economic Activity

Impacts to statewide economic activity under Alternative 6a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.10**.

Property Values

Within the Central Section, no impacts to property values would be expected under Alternative 6a.

Tourism

No long-term impacts to tourism are anticipated under Alternative 6a because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6a are discussed in **Section 4.1.2.10**.

4.3.2.11 Alternative 6b

Property Taxes

Table 4-116 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 6b would be approximately $15.7 million.

Table 4-116. Annual Property Tax Impact ($ million) in the Central Section – Alternative 6b

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$2,002	$15.7	$55.0

Economic Activity

Impacts to statewide economic activity under Alternative 6b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.11**.

Property Values

Within the Central Section, no impacts to property values would be expected under Alternative 6b.

Tourism

No long-term impacts to tourism are anticipated under Alternative 6b because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6b are discussed in **Section 4.1.2.11**.

4.3.2.12 Alternative 7 – Proposed Action

Property Taxes

Table 4-117 summarizes the anticipated property tax impacts in the Central Section. Increases in annual property tax collections within the Central Section under Alternative 7 would be approximately $12.2 million.

Table 4-117. Annual Property Tax Impact ($ million) in the Central Section – Alternative 7

Total Construction Cost	Annual Property Tax Revenue	
	Central	State
$1,410	$12.2	$37.0

Economic Activity

Impacts to statewide economic activity under Alternative 7, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.2**.

Property Values

Alternative 7 could reduce taxable assessed residential property values by approximately $1.6 million across the Central Section, and thereby reduce residential tax revenue payments by approximately $44,000 per year. These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Under Alternative 7, potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and potential impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 7 are discussed in **Section 4.1.2.2**.

4.3.3 RECREATION

Refer to **Section 4.1.3** for a discussion of general impacts common to all geographic sections.

4.3.3.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.3.2 Alternative 2

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 2 in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 293 acres (118 ha) within recreational sites that have a spatial area, and approximately 5 miles (8 km) of trails. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 2: Franklin Falls Reservoir, Sugar Hill Town Forest, the WMNF, Reel Brook Trail, and Kinsman Ridge Trail/ANST. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. Alternative 2 would cross three eligible federal Wild and Scenic Rivers (the Ammonoosuc River, Mill Brook, and the Mad River) as an overhead transmission line in the Central Section. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Short-term construction impacts to the ANST, such as the presence of machinery and potential short-term closures of the trail, would detract from the experience of users. Additionally, long-term impacts to the visual character would detract from this experience (see discussion below). The experience of through-hikers, in particular, could be adversely impacted by the construction and operation of the Project since these users are generally seeking a more-primitive experience. The ANST is crossed by numerous transmission lines (and roads) along its entire length. Therefore, the experience of through-hikers is already being impacted by these facilities. Impacts to the ANST under Alternative 2 would be located in the vicinity of the existing crossing of the PSNH transmission line.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.1.3.2**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to three additional recreational point sites, approximately 246 additional acres (100 ha) within recreational sites that have a spatial area, and approximately 1 additional mile (2 km) of trails. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 2: Franklin Falls Reservoir, Franconia Notch State Park, Edwin MacEwan Memorial Tennis Court, Sunset Hill Golf Course, the WMNF, Mount Moosilauke, Reel Brook Trail, Mount Kinsman Trail, Beaver Brook Trail/ANST, Franconia Ridge Trail/ANST, Garfield Ridge Trail/ANST, and Kinsman Ridge Trail/ANST.

The recreation experience under Alternative 2 would be visually affected by the construction and operation of the Project because it would result in a modification to the natural environment. It is assumed that most users expect a scenic landscape, particularly given the character of the Central Section. The implementation of the Project would alter the natural appearance of the landscape, thus impacting the recreation experience. The larger, taller metal towers would result in the Project being visible from more locations than the existing transmission line. The type of structures proposed (i.e., metal, lattice-type towers) could also impact the recreation experience when compared with the existing wooden structures because they would appear less compatible with the natural environment.

4.3.3.3 Alternative 3

Impacts from Construction

Short-term impacts to recreation during the construction of Alternative 3 in the Central Section would be similar to those discussed above for Alternative 2 (see **Section 4.3.3.2**). Impacts would occur to the same locations. However, as discussed in **Section 4.1.3.1**, the construction of underground transmission cable could require a longer period of construction and more intense disturbance, resulting in additional disturbance to the recreation experience.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.3**, Alternative 3 would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures. Approximately 0.9 additional acre (0.4 ha) of recreational sites would be visually impacted by the Project.

Alternative 3 would cross three eligible federal Wild and Scenic Rivers (the Ammonoosuc River, Mill Brook, and the Mad River) as an underground transmission cable in the Central Section. Impacts to the recreational experience on these rivers would be relatively minor and incremental as there is already an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

4.3.3.4 Alternative 4a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4a in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 91 acres (37 ha) within recreational sites that have a spatial area, and approximately 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 4a: Franconia Notch

State Park, the WMNF, and Cascade Brook Trail/ANST. Impacts to Franconia Notch State Park and the ANST would occur where these resources intersect the existing I-93 corridor. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route.

Alternative 4a would cross two eligible federal Wild and Scenic Rivers (the Pemigewasset River and the Mad River) as an underground transmission cable in the Central Section. Recreational impacts are not expected, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

A portion of the Cascade Brook Trail/ANST in the Franconia Notch area would be impacted by the Project under Alternative 4a. Although this impact would occur in a previously-impacted area (along I-93), construction activities could alter the recreation experience on this portion of the ANST.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.4**, Alternative 4a would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.3.3.5 Alternative 4b

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4b in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 120 acres (48 ha) within recreational sites that have a spatial area and less than 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 4b: the WMNF and Beaver Brook Trail/ANST. Impacts to the ANST would occur where it intersects the existing NH Route 112 corridor. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route.

Alternative 4b would cross three eligible federal Wild and Scenic Rivers (the Pemigewasset River, the Wild Ammonoosuc River, and the Mad River) as an underground transmission cable in the Central Section. Recreational impacts are not expected, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 4b. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.3.3.4**).

4.3.3.6 Alternative 4c

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4c in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 68 acres (27 ha) within recreational sites that have a spatial area and less than less than 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 4c: the WMNF and Beaver Brook Trail/ANST. Impacts to the ANST would occur where it intersects the existing NH Route 112 corridor. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route.

Alternative 4c would cross three eligible federal Wild and Scenic Rivers (the Wild Ammonoosuc River, the Ammonoosuc River, and the Baker River) as an underground transmission cable in the Central Section. Recreational impacts are not expected, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 4c. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.3.3.4**).

4.3.3.7 Alternative 5a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5a in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 109 acres (44 ha) within recreational sites that have a spatial area and approximately 0.3 mile (0.4 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 5a: Franklin Falls Reservoir, Franconia Notch State Park, the WMNF, and Cascade Brook Trail/ANST. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. Alternative 5a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section where there is already an existing road crossing and the cable would likely be installed underneath existing bridges. It would also cross the Ammonoosuc River, an eligible federal Wild and Scenic River, as an overhead transmission line where there is already an existing transmission line crossing. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

A portion of the Cascade Brook Trail/ANST in the Franconia Notch area would be impacted by the Project under Alternative 5a. Although this impact would occur in a previously-impacted area (along I-93), construction activities could alter the recreation experience on this portion of the ANST.

The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Visual impacts to the ANST resulting from the Project would detract from this experience. The transmission cable would be buried where it crosses the ANST under Alternative 5a but aboveground portions outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.7**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 97 additional acres (39 ha) within recreational sites that have a spatial area, and approximately 0.5 additional mile (0.8 km) of trails. Impacts would occur to one additional recreation point site. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 5a: Franconia Notch State Park, Franklin Falls Reservoir, Mount Moosilauke, the WMNF, Beaver Brook Trail/ANST, Franconia Ridge Trail/ANST, and Garfield Ridge Trail/ANST.

The recreation experience under Alternative 5a would be affected by the construction and operation of the Project because it would result in a modification to the natural environment. The types of impacts would be similar to those under Alternative 2 but, because the transmission cable would be buried for a portion of the Central Section, visual impacts would be less than those that occur under Alternative 2. However, where the transmission line is located aboveground, impacts to the recreation experience would be expected under Alternative 5a.

4.3.3.8 Alternative 5b

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5b in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 207 acres (84 ha) within recreational sites that have a spatial area and less than less than 0.3 mile (0.5 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 5b: Franklin Falls Reservoir, the WMNF, and Sugar Hill Town Forest. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. Alternative 5b would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section, where there is already an existing road crossing, and the cable would likely be installed underneath existing bridges. Alternative 5b would cross three additional eligible federal Wild and Scenic Rivers (the Ammonoosuc River, Mill Brook, and the Mad River) as an overhead transmission line in the Central Section. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 5b. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Visual impacts to the ANST resulting from the Project would detract from this experience. The transmission cable would be buried where it crosses the ANST under Alternative 5b but aboveground portions outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5b and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.8**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 183 additional acres (74 ha) within recreational sites that have a spatial area, and approximately 0.7 additional mile (1.1 km) of trails. Impacts would occur to two additional recreation point sites. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 5b: Franconia Notch State Park, Franklin Falls Reservoir, Mount Moosilauke, Sugar Hill Town Forest, the WMNF, Beaver Brook Trail/ANST, Franconia Ridge Trail/ANST, and Garfield Ridge Trail/ANST.

The recreation experience under Alternative 5b would be affected by the construction of the Project because it would result in a modification to the natural environment. The types of impacts would be similar to those under Alternative 2 but, because the transmission cable would be buried for a portion of the Central Section, visual impacts would be less than those that occur under Alternative 2. However, where the transmission line is located aboveground, impacts to the recreation experience would be expected under Alternative 5b.

4.3.3.9 Alternative 5c

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5c in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 132 acres (53 ha) within recreational sites that have a spatial area and less than less than 0.3 mile (0.5 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 5c: Franklin Falls Reservoir, the WMNF, and Coffin Pond in the Sugar Hill. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. Alternative 5c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section where there is already an existing road crossing, and the cable would likely be installed underneath existing bridges. Alternative 5c would cross three additional eligible federal Wild and Scenic Rivers (the Ammonoosuc River, Mill Brook, and the Mad River) as an overhead transmission line in the Central Section. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted. A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 5c. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Visual impacts to the ANST resulting from the Project would detract from this experience. The transmission cable would be buried where it crosses the ANST under Alternative 5c but aboveground portions outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5c and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.9**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 137 additional acres (55 ha) within recreational sites that have a spatial area, and approximately 0.6 additional mile (1 km) of trails. Impacts would occur to two additional recreation point sites. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 5c: Franconia Notch State Park, Franklin Falls Reservoir, Mount Moosilauke, Sugar Hill Town Forest, the WMNF, Beaver Brook Trail/ANST, Franconia Ridge Trail/ANST, and Garfield Ridge Trail/ANST.

The recreation experience under Alternative 5c would be affected by the construction of the Project because it would result in a modification to the natural environment. The types of impacts would be similar to those under Alternative 2 but, because the transmission cable would be buried for a portion of the Central Section, visual impacts would be less than those that occur under Alternative 2. However, where the transmission line is located aboveground, impacts to the recreation experience would be expected under Alternative 5c.

4.3.3.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.3.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.3.3.4**).

4.3.3.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 4b (see **Section 4.3.3.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4b (see **Section 4.3.3.5**).

4.3.3.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 7 in the Central Section. Short-term, localized impacts due to construction activity would occur to approximately 92 acres (37 ha) within recreational sites that have a spatial area and less than less than 0.2 mile (0.3 km) of trails. Impacts would occur to one additional recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 7: Franklin Falls Reservoir and Coffin Pond in the Sugar Hill. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 7 would cross the Wild Ammonoosuc River, an eligible federal Wild and Scenic River, as an underground transmission cable in the Central Section where there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 7 would also cross one eligible federal Wild and Scenic River (the Ammonoosuc River) as an overhead transmission line. However, impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in this location. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 7. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Visual impacts to the ANST resulting from the Project would detract from this experience. The transmission cable would be buried where it crosses the ANST under Alternative 7 but aboveground portions outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.3.1.9**, construction and operation of overhead portions of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 41 additional acres (17 ha) within recreational sites that have a spatial area, and approximately 0.5 mile (0.8 km) of trails. Impacts would occur to one additional recreation point site. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 7: Franklin Falls Reservoir, the WMNF, and Garfield Ridge Trail/ANST.

The recreation experience under Alternative 7 would be affected by the construction of the Project because it would result in a modification to the natural environment. The types of impacts would be similar to those under Alternative 2 but, because the transmission cable would be buried for a portion of the Central Section, visual impacts would be less than those that would occur under Alternative 2. However, where the transmission line is located aboveground, impacts to the recreation experience would be expected under Alternative 7.

4.3.4 HEALTH AND SAFETY

Refer to **Section 4.1.4** for a discussion of general impacts common to all geographic sections.

In general, impacts in the Central Section would be similar to those in the Northern Section for both construction and operation except that there would be no transition stations in the Central Section and there are no known pipelines or utilities that would be crossed by any alternative. In addition, there are more towns in the Central Section and, as a result, there are more resources to fight fires than in the Northern Section.

4.3.4.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.4.2 Alternative 2

Impacts from Construction

The Project under Alternative 2 would be aboveground, but there could be a chance of encountering subsurface contamination. Six known sites with potential contamination are located within 250 feet (76 m) of disturbance areas. The closest are the Ashland Sand and Gravel Division and Ashland Municipal Landfill, in Ashland, NH. The impact of unearthing or mobilizing contamination during construction would depend upon what was encountered; however, with the proper planning, precautions, and training, impacts could be short-term and localized. No known pipelines or utilities would be crossed by Alternative 2 in the Central Section and no transition or converter stations would be located in the Central Section.

Impacts relating to hazardous materials and waste management are discussed in **Section 4.1.4.1**. If a fire were to occur during construction in the Central Section, any local fire department would be supported by its mutual aid association to decrease the potential of fire spreading and resulting in a regional impact. NESC codes would be implemented to reduce the risks, and the available fire support services.

To construct Alternative 2, a total of 78 roadways would be crossed by the overhead line, resulting in potential short-term lane closures during stringing. The potential for accidents on roadways would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

There would be a risk associated with exposing contaminated soils or groundwater during operation, maintenance, and emergency repairs. The likelihood of encountering unknown contamination would be low because all work would be conducted in maintained corridors, which would have been investigated during initial construction.

No provisions would be needed for underground pipelines or utilities because none are known to be located in the corridor. In addition, there would be no transition stations in Central Section.

4.3.4.3 Alternative 3

Impacts from Construction

Because Alternative 3 would be buried, there could be an increased chance of encountering contaminated soils and groundwater than under Alternative 2. Five known sites with potential contamination would be located within 250 feet (76 m) of disturbance areas. The closest is the Ashland Municipal Landfill, in Ashland, NH. The impact of unearthing or mobilizing contamination during construction would be dependent upon what was encountered; however, with the proper planning, precautions, and training, impacts could be short-term and localized. In the Central Section, Alternative 3 would cross no known pipelines; therefore, no provisions would be made for them.

Impacts relating to hazardous materials and waste management are discussed in **Section 4.1.4.1**. If a fire were to occur during construction in the Central Section, any local fire department would be supported by its mutual aid association to decrease the potential of fire spreading and resulting in a regional impact. NESC codes would be implemented to reduce the risks, and the available fire support services.

During construction in roadways, no portion of this alternative would be buried in a roadway; therefore, there would be no impact to public associated with burial of the cable within roadways.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

Many public safety hazards associated with accident conditions of the overhead transmission lines would be reduced by burying the transmission cable. Since the transmission cable would be buried, the potential for breakage and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 3. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

4.3.4.4 Alternative 4a

Impacts from Construction

There could be an increased chance of encountering contaminated soils and groundwater under Alternative 4a. There are two known sites with potential contamination and each is located over 200 feet (61 m) from potential disturbance areas; therefore, there would be a decreased likelihood of encountering contamination during construction.

Impacts relating to hazardous materials and waste management are discussed in **Section 4.1.4.1**. If a fire were to occur during construction in the Central Section, any local fire department would be supported by its mutual aid association to decrease the potential of fire spreading and resulting in a regional impact. NESC codes would be implemented to reduce the risks, and the available fire support services.

Under Alternative 4a, there would be a greater potential for accidents on roadways than exists under Alternative 2 or Alternative 3. Approximately 64 miles (103 km) of Alternative 4a would be constructed in a roadway in the Central Section. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repairs of the Project under Alternative 4a would require digging, primarily in the existing roadway corridors. This activity could expose contaminated soils or groundwater. There would be a decreased likelihood of encountering contamination because fewer known sites with contamination exist in the vicinity of the Project corridor. Potential impacts resulting from this exposure are discussed in **Section 4.1.4**.

Since the cable would be buried, the potential for public safety hazards such as lines breaking and falling during extreme weather events or from an object falling on the line would be eliminated, thus minimizing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 4a. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

4.3.4.5 Alternative 4b

Impacts from Construction

Construction impacts from the Project under Alternative 4b with respect to hazardous materials/waste management, spills, and fires in the Central Section would be similar to the impacts described for the Project under Alternative 4a in the Central Section. Although these alternatives would follow different alignments, the types of impacts would be identical.

There could be a chance of encountering contaminated soils and groundwater under Alternative 4b. This alternative would pass through four towns: North Woodstock, Woodstock, Franconia, and Lincoln, NH. Franconia, NH has many businesses with underground storage tanks that would be located very close to the disturbance areas.

Approximately 79 miles (127 km) of this alternative would be constructed in an existing roadway corridor in the Central Section and could result in the potential for accidents on roadways. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4b would be similar to those described for the Project under Alternative 4a in the Central Section (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.4.6 Alternative 4c

Impacts from Construction

Construction impacts from the Project under Alternative 4c with respect to hazardous materials/waste management, spills, and fires in the Central Section would be similar to the impacts described for the Project under Alternative 4a in the Central Section. Although these alternatives would follow different alignments, the types of impacts would be identical.

There could be a chance of encountering contaminated soils and groundwater under Alternative 4c. This alternative would pass through six towns: Bethlehem, Campton, Plymouth, North Woodstock, Woodstock, and Franconia, NH. All of these towns have sites with potential contamination that are estimated to be within 25 feet (8 m) of potential disturbance area, although no subsurface contamination is known and the exact locations of the sites are not certain.

Approximately 77 miles (124 km) of this alternative would be constructed in an existing roadway corridor in the Central Section and could result in the potential for vehicular accidents on roadways. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

No long-term impacts are anticipated to occur as a result of construction activities.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4c would be similar to those described for the Project under Alternative 4a in the Central Section (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.4.7 Alternative 5a

Impacts from Construction

Since the transmission line would be installed overhead and underground for distances of approximately 43 miles (69 km) and 20 miles (62 km), respectively, the Project's construction impacts under Alternative 5a would be similar to those described for the Project under Alternatives 2 (for aboveground portions) and 3 (for buried portions) in the Central Section with respect to impacts associated with management of hazardous materials/waste.

All sites with potential contamination are estimated to be at least 40 feet (12 m) from disturbance areas; therefore, the potential for unearthing contamination would be less than for other alternatives that pass closer to sites with potential contamination.

If a fire were to occur during construction in the Central Section, any local fire department would be supported by its mutual aid association to decrease the potential of fire spreading and resulting in a regional impact. NESC codes would be implemented to reduce the risks, and the available fire support services.

Approximately 20 miles (32 km) of this alternative would be buried in an existing roadway corridor in the Central Section and could result in the potential for accidents on roadways. This alternative would have 57 overhead roadway crossings. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.4.2**), and effects for underground portions would be similar to those described for Alternative 4a (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.4.8 Alternative 5b

Impacts from Construction

The types of construction impacts with management of hazardous materials/waste and fire would be similar to both Alternatives 2 (for aboveground portions) and 3 (for buried portions) in the Central Section because the transmission line would be installed both overhead and underground for distances of approximately 56 miles (90 km) and 13 miles (21 km), respectively.

There could be a chance of encountering contaminated soils and groundwater under Alternative 5b. Two sites with potential contamination on Lost River Road in Woodstock and North Woodstock, NH are co-located or immediately adjacent to disturbance areas; therefore, there would be a potential for unearthing contamination.

Approximately 13 miles (21 km) of this alternative would be constructed in an existing roadway corridor in the Central Section and could result in the potential for accidents on roadways. This alternative would have 73 road crossings. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.4.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.4.9 Alternative 5c

Impacts from Construction

Construction impacts associated with the management of hazardous materials/waste and fire would be similar to both Alternatives 2 (for aboveground portions) and 3 (for buried portions) in the Central Section because the transmission line or cable would be installed overhead and underground for distances of approximately 44 miles (71 km) and 25 miles (40 km), respectively. Multiple sites with potential subsurface contamination are co-located or immediately adjacent to disturbance areas in North Woodstock, Woodstock, and Franconia, NH; therefore, there would be a potential for unearthing contamination. These sites warrant further investigation and the precautions should be implemented to ensure a protocol is established in order to reduce any impacts to being short-term and localized.

Approximately 25 miles (40 km) of Alternative 5c would be constructed in a roadway in the Central Section and could result in the potential for accidents on roadways. This alternative would have 58 overhead roadway crossings. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.4.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.4.10 Alternative 6a

Impacts from Construction

Construction impacts with respect to hazardous materials/waste management, potential spills, and fire would be similar to Alternative 3 in the Central Section because the transmission line would be installed underground, though an existing roadway corridor instead of the existing PSNH transmission route. Two sites with potential contamination on New Hampton Road in Sanbornton, NH would be immediately adjacent to disturbance areas; therefore, there would be a potential for unearthing contamination.

Under Alternative 6a, the Project would result in the potential for accidents on roadways. Approximately 61 miles (98 km) of Alternative 6a would be constructed in an existing roadway corridor in the Central Section. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be identical to those described for Alternative 4a (see **Section 4.3.4.4**).

4.3.4.11 Alternative 6b

Impacts from Construction

Construction impacts with respect to the management of hazardous materials/waste, potential spills, and fire would be similar to Alternative 3 in the Central Section because the cable would be installed underground, though an existing roadway corridor instead of the existing PSNH transmission route. Multiple sites in North Woodstock, Woodstock, Franconia, and Sanbornton, NH with potential contamination would be co-located or immediately adjacent to disturbance areas; therefore, there would be a potential for unearthing contamination.

Under Alternative 6b, the Project would result in the potential for vehicular accidents. For Alternative 6a, approximately 76 miles (122 km) of this alternative would be constructed in an existing roadway corridor in the Central Section. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be identical to those described for Alternative 4a (see **Section 4.3.4.4**).

4.3.4.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction impacts associated with the management of hazardous materials/waste and fire would be similar to both Alternatives 2 (for aboveground portions) and 3 (for buried portions) in the Central Section because the transmission line or cable would be installed overhead and underground for distances of approximately 19 miles (6 km) and 52 miles (16 km), respectively. Multiple sites with potential subsurface contamination are co-located or immediately adjacent to disturbance areas in North Woodstock, Woodstock, and Franconia, NH; therefore, there would be a potential for unearthing contamination. These sites warrant further investigation and the precautions would be implemented to ensure that impacts from unearthing contamination would be short-term and localized.

Approximately 52 miles (16 km) of Alternative 7 would be constructed in a roadway in the Central Section and could result in the potential for accidents on roadways. This alternative would have 20 overhead roadway crossings. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.4.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.3.4.4**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.3.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 4.1.5** for a discussion of general impacts common to all geographic sections.

4.3.5.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.5.2 Alternative 2

Impacts from Construction

The Project under Alternative 2 would impact 1 interstate highway, 2 federal highways, 8 state roads, and 67 local roads in the Central Section. These impacts would result from the stringing of overhead transmission lines across public roads. Construction of Project components that cross public roadways (i.e., overhead transmission lines) may require access to one or more roadway lanes to be temporarily restricted. The Project would result in the stringing of overhead transmission lines across public roads in 78 locations. As discussed in **Section 4.1.5.1**, partial or full roadway closures could reduce average speed and affect traffic patterns.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section would range from 3 percent on I-93 in Ashland, NH to 156 percent on NH Route 116 in Easton, NH. NH Route 175 in Woodstock, NH would also see an increase in traffic volumes from construction vehicles (100 percent). Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**, including a transportation management plan. Impacts to traffic patterns due to potential roadway closures would result in short-term, localized inconvenience or delay and would not likely interrupt overall area traffic patterns and flow.

While some of the towns and roads would see an increase in the percent of traffic volume, the large percentage increase is due to the overall low existing volume of traffic. NH Route 116 in Easton, NH is predicted to experience a 156 percent increase in traffic volumes from construction vehicles; however, that increase is from an estimated 290 vehicles per day to 742 vehicles per day. While this represents an increase in traffic volumes to this roadway, it does not necessarily reflect the ability of the roadway to absorb the increased traffic. Factors such as the number of lanes, lane width, curve radius, grade and frequency of intersections affect the number of vehicles a road can handle. Roadways with existing low traffic volumes are likely to have additional capacity to handle a short-term increase in traffic volumes from construction vehicles. Therefore, short-term and localized transportation impacts would result from the Project, but would cease once construction in the area is complete.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that three airfields are located within 20,000 feet (6,096 m) of the Project corridor in the Central Section and the approximate height threshold that would require Northern Pass to consult with the FAA. Northern Pass would need to consult with the FAA for structures 38 feet (12 m) or higher near Bradley Field. Northern Pass would need to work with the FAA and local airfields to site structures in such a way as to minimize impacts to air operations.

Impacts from Operations, Maintenance, and Emergency Repairs

Any adverse impact on public roadways that may occur during operation and maintenance would be short-term through the implementation of a transportation management plan (see **Appendix H**). See **Section 4.1.5.2** for more detailed discussion.

4.3.5.3 Alternative 3

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 (see **Section 4.3.5.2**); however, fewer construction vehicles would be needed for burial of underground cable in the existing PSNH transmission route than would be needed for overhead transmission lines in the existing PSNH transmission route. The Project under Alternative 3 would cross 1 interstate highway, 2 federal highways, 8 state roads, and 67 local roads in the Central Section.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 2 percent on I-93 to 128 percent on NH Route 116 in Easton, NH. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. Short-term, localized transportation impacts would result from the Project during construction. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project under Alternative 3 would not require any tower structures; therefore, impacts to airfields would not be expected under Alternative 3.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 3.

4.3.5.4 Alternative 4a

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.3.5.2**; however, a greater length of roadway corridor would be disturbed for buried cables. The Project under Alternative 4a would be located within the I-93 and US Route 3 roadway corridors in the Central Section. Alternative 4a would cross 1 interstate, 1 federal highway, 9 state routes and 89 local roads in the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project under Alternative 4a would result in the disturbance of approximately 64 miles (103 km) of roadway corridors for burial of the transmission cable.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 1 percent on US Route 3 to 168 percent on NH Route 141. The 153 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would not require any tower structures; therefore, impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4a.

4.3.5.5 Alternative 4b

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described in for the Project under Alternative 4a (see **Section 4.3.5.4**), with a slight difference in alignment. The Project under Alternative 4b would be located within the I-93, US Route 3, NH Route 18, NH Route 112, NH Route 116, and NH Route 141 roadway corridors in the Central Section. Alternative 4b would cross 1 interstate, 1 federal highway, 12 state routes, and 148 local roads in the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project under Alternative 4b would result in the disturbance of approximately 79 miles (127 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 1 percent on US Route 3 to 168 percent on NH Route 141. The 153 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would not require any tower structures; therefore, potential impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4b.

4.3.5.6 Alternative 4c

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 4a in **Section 4.3.5.4**, with a slight difference in alignment. The Project under Alternative 4c would be located within the I-93, US Route 3, NH Route 18, NH Route 112, NH Route 116, and NH Route 142 roadway corridors in the Central Section. Alternative 4c would cross 1 interstate, 2 federal highways, 11 state routes, and 240 local roads in the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the disturbance of approximately 77 miles (124 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 1 percent on US Route 3 to 128 percent on NH Route 116. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. Short-term, localized, adverse transportation impacts would result from the Project during construction. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would not require any tower structures; therefore, potential impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4c.

4.3.5.7 Alternative 5a

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 for overhead portions and Alternative 4a for underground portions. The Project under Alternative 5a would cross 1 interstate highway, 2 federal highways, 8 state routes, and 89 local roads in the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the stringing of overhead transmission lines across public roads in 57 locations, and would result in the disturbance of approximately 20 miles (32 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 3 percent on I-93 to 168 percent on NH Route 141. The 168 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. Short-term, localized, adverse transportation impacts would result from the Project during construction. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that three are located within 20,000 feet (6,096 m) of the Project corridor in the Central Section and the approximate height threshold that would require Northern Pass to consult with the FAA. Northern Pass would need to consult with the FAA for structures 160 feet (49 m) or higher near Franconia Airport and 38 feet (12 m) or higher near Bradley Field. Northern Pass would need to work with the FAA and local airfields to site structures to minimize impacts to air operations.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5a.

4.3.5.8 Alternative 5b

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 for overhead portions and Alternative 4b for underground portions. The Project under Alternative 5b would be located in the NH Route 112 and NH Route 116 roadway corridors for a portion of the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would cross 1 interstate, 2 federal highways, 8 state routes, and 80 local roads in the Central Section. The Project would result in the stringing of overhead transmission lines across public roads in 73 locations, and would result in the disturbance of approximately 13 miles (21 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 3 percent on I-93 to 128 percent on NH Route 116. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Under Alternative 5b, impacts to air fields would be similar to those described for the Project under Alternative 2 (see **Section 4.3.5.2**), because this alternative would follow the Alternative 2 alignment where it is located aboveground. Because Alternative 5b includes buried components in the Central Section, impacts to airfields would be expected to be less than those under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5b.

4.3.5.9 Alternative 5c

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 for overhead portions and Alternative 4c for underground portions. The Project under Alternative 5c would be located in the US Route 3, NH Route 112, and NH Route 116 roadway corridors for a portion of the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would cross 1 interstate, 2 federal highways, 8 state routes, and 128 local roads in the Central Section. The Project would result in the stringing of overhead transmission lines across public roads in 58 locations, and would result in the disturbance of approximately 25 miles (40 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 3 percent on I-93 to 128 percent on NH Route 116. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that three airfields are located within 20,000 feet (6,096 m) of the Project corridor in the Central Section and the approximate height threshold that would require Northern Pass to consult with the FAA. The Project under Alternative 5c would be located immediately adjacent to the Franconia Airport and would require consultation with the FAA for structures 3 feet (1 m) or higher near Franconia Airport and 38 feet (12 m) or higher near Bradley Field based on the imaginary slope. Northern Pass would need to consult with the FAA on the proposed structures near the Franconia Airport to ensure they comply with FAA requirements.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5c.

4.3.5.10 Alternative 6a

Impacts from Construction

Because the Project would be buried in roadway corridors under Alternative 6a, the types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 4a in **Section 4.3.5.4**. However, the Project under Alternative 6a would follow a slightly different alignment, and would be located within the I-93, US Route 3, and NH Route 127 roadway corridors.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would cross 1 interstate, 1 federal highway, 9 state routes and 92 local roads in the Central Section. The Project would result in the disturbance of approximately 61 miles (98 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 2 percent on I-93 to 168 percent on NH Route 141. The 168 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 6a.

4.3.5.11 Alternative 6b

Impacts from Construction

Because the Project would be buried in roadway corridors under Alternative 6b, the types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 4a in **Section 4.3.5.4**. However, the Project under Alternative 6b would follow a slightly different alignment and would be located within the I-93, US Route 3, NH Route 18, NH Route 112, NH Route 116, and NH Route 141 roadway corridors.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would cross 1 interstate, 1 federal highway, 12 state routes and 151 local roads in the Central Section. The Project would result in the disturbance of approximately 76 miles (122 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 2 percent on I-93 to 168 percent on NH Route 141. The 168 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 6b.

4.3.5.12 Alternative 7 – Proposed Action

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 for overhead portions and Alternative 4c for underground portions with a slight difference in alignment near Bethlehem, NH. The Project under Alternative 7 would be located in the US Route 302, US Route 3, NH Route 112, and NH Route 116/NH Route 18 roadway corridors for a portion of the Central Section. Alternative 7 would cross 1 interstate, 2 federal highways, 8 state routes, and 164 local roads in the Central Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the disturbance of approximately 52 miles (84 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Central Section ranges from 2 percent on I-93 to 128 percent on NH Route 116. The 128 percent increase in traffic volumes on NH Route 116 would be an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity.

Short-term, localized, adverse transportation impacts would result from the Project during construction. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would require tower structures for a 5-mile segment in the Central Section, but the towers would not be located near any airfields; therefore, potential impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 7.

4.3.6 LAND USE

Refer to **Section 4.1.6** for a discussion of general impacts common to all geographic sections.

4.3.6.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.6.2 Alternative 2

All impacts of Alternative 2 in the Central Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 2 in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the Central Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 2.

Approximately 7 percent (123 acres; 50 ha) of the Alternative 2 Project corridor is currently coded as a developed use. More than 92 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, with less than 8 percent of the developed land in a Developed Residential, Commercial, and Industrial Use. Construction of Alternative 2 would not be expected to result in long-term impacts to lands with a high development potential in the Central Section. Because approximately 0.2 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 2, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Both short-term and long-term construction impacts under Alternative 2 in the Central Section would occur to approximately 125 acres (51 ha) of federal, state, county and private conservation land, as well as 168 acres (68 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 2 would cross the eligible federal Wild and Scenic Rivers the Ammonoosuc River, Mill Brook, and the Mad River as an overhead transmission line in the Central Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 2 would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an aboveground transmission cable; however, no structures or activities are proposed within either river. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.2**.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the Central Section. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 2 within the existing corridor.

Road Crossings

Construction of Alternative 2 would require 78 aerial road crossings, and no underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur.

Refer to **Section 4.3.5.2** for a discussion of traffic and transportation impacts under Alternative 2.

Public Roadway Corridor Ownership Status

Alternative 2 would not be buried within any public roadway corridors in the Central Section. Therefore, no impacts would be expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.3 Alternative 3

All impacts of Alternative 3 in the Central Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 3 in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route in the Central Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes. Although the new transmission line would be located underground, rather than overhead, the lands within the existing PSNH transmission route would continue to be subject to similar restrictions in use as they currently are.

Approximately 7 percent (123 acres; 50 ha) of the Alternative 3 Project corridor is currently coded as a developed use. More than 92 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, with less than 8 percent of the developed land in a Developed Residential, Commercial, and Industrial Use. Construction of Alternative 3 would not be expected to create a long-term impact to lands with a high development potential in the Central Section. Because approximately 0.2 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 3, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 3 in the Central Section would impact approximately 125 acres (51 ha) of federal, state, county and private conservation land, as well as 168 acres (68 ha) of NFS lands. These impacts would result from ground disturbance associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 3 would cross the eligible federal Wild and Scenic Rivers the Ammonoosuc River, Mill Brook, and the Mad River as an underground transmission cable in the Central Section. These underground crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 3 would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.3**.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route in the Central Section. The portion of the Alternative 3 corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner. The analysis of Alternative 3, within this final EIS, ensures that the potential environmental impacts from any combination of above and below ground placement of the Project within the Proposed Action route is bounded by the analysis.

Road Crossings

Construction of Alternative 3 would require 78 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.3** for a discussion of traffic and transportation impacts under Alternative 3.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 3 would not be buried within any public roadway corridors in the Central Section. Therefore, no impacts would be expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.4 Alternative 4a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4a in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4a would be constructed underground within the US Route 3 and I-93 roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 4a Project corridor would pass through a number of population centers, developed lands, and lands with development potential, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 4a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the 17 acres (7 ha) of state conservation lands and the 9 acres (4 ha) of NFS lands in the Alternative 4a Central Section Project corridor. Alternative 4a would intersect with each of these conservation lands in the alignment buried within the US Route 3 or I-93 corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 4a would cross the eligible federal Wild and Scenic Rivers the Pemigewasset River and the Mad River as an underground transmission cable in the Central Section. These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 4a would cross the Pemigewasset River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.4**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4a corridor would be located within a new transmission route in the Central Section. While Alternative 4a would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 and I-93 fall under the jurisdiction of the FHWA and NHDOT, and the Project would require authorizations for this use.

Road Crossings

Construction of Alternative 4a would require 100 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.4** for a discussion of traffic and transportation impacts under Alternative 4a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4a would be buried under less than 1 mile (2 km) of local roadway corridors, less than 1 mile (2 km) of state roadway corridors, and 64 miles (103 km) of US Highway and Interstate in the Central Section. In order to construct the Project, the Applicant would be required to secure authorizations (see **Section 4.1.6.1**).

Franconia Notch State Park and I-93 Memorandum of Agreement

In the Central Section, Alternative 4a would be buried within the I-93 roadway corridor through Franconia Notch State Park. This section of I-93 is subject to the MOA discussed in **Section 3.3.6**. As a result, unified planning between NHDOT and NHDRED would have to occur for the Project to assure that Parkway design and State Park facility designs are consistent with each other. The agreements would also require the State of New Hampshire to seek the input of the Appalachian Mountain Club and SPNHF on the Project in conjunction with the original MOAs and amendments.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.5 Alternative 4b

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4b in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4b would be constructed underground within the US Route 3, I-93, NH Route 116, and NH Route 112 roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 4b Project corridor would pass through a number of population centers, developed lands, and lands with development potential while following roadway corridors, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 4b, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the 3 acres (1 ha) of state, county, and private conservation land and the 30 acres (12 ha) of NFS lands in the Alternative 4b Central Section Project corridor. Alternative 4b would intersect with each of these conservation lands in the alignment buried within roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 4b would cross the eligible federal Wild and Scenic Rivers the Pemigewasset River, the Wild Ammonoosuc River, and the Mad River as an underground transmission cable in the Central Section. These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 4b would cross the Pemigewasset River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.5**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4b Project corridor would be located within a new transmission route in the Central Section. While Alternative 4b would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 and I-93 fall under the jurisdiction of the FHWA and NHDOT. NH Routes 116 and 112 fall under the jurisdiction of NHDOT. The Project would require authorizations for this use.

Road Crossings

Construction of Alternative 4b would require 162 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.5** for a discussion of traffic and transportation impacts under Alternative 4b.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4b would be buried under less than 1 mile (2 km) of local roadway corridors, 26 miles (42 km) of state roadway corridors, and 53 miles (85 km) of US Highway and Interstate in the Central Section. In order to construct the Project, the Applicant would be required to secure authorizations (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.6 Alternative 4c

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4c in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4c would be constructed as underground transmission facilities within the NH Route 142, NH Route 18, NH Route 116, NH Route 112, US Route 3, and I-93 roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although Alternative 4c corridor would pass through a number of population centers, developed lands, and lands with development potential while following roadway corridors, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 4c, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the approximately 3 acres (1 ha) of state and private conservation land or the 22 acres (9 ha) of NFS lands in the Alternative 4c Central Section Project corridor. Alternative 4c would intersect with each of these conservation lands in the alignment buried within roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 4c would cross the eligible federal Wild and Scenic Rivers the Wild Ammonoosuc River, the Ammonoosuc River, and the Baker River as an underground transmission cable in the Central Section. These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 4c would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.6**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4c Project corridor would be located within a new transmission route in the Central Section. While Alternative 4c would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 and I-93 fall under the jurisdiction of the FHWA and NHDOT. NH Routes 18, 116, and 112 fall under the jurisdiction of NHDOT. The Project would require authorizations for this use.

Road Crossings

Construction of Alternative 4c would require 254 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.6** for a discussion of traffic and transportation impacts under Alternative 4c.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4c would be buried under less than 1 mile (2 km) of local roadway corridors, 33 miles (53 km) of state roadway corridors, and 44 miles (71 km) of US Highway and Interstate in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.7 Alternative 5a

Where Alternative 5a would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5a would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5a in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

In the Central Section, Alternative 5a would follow the Alternative 2 alignment as an overhead HVDC line in the existing PSNH transmission route, except between MPs 83 and 103, where it would be buried in the I-93 roadway corridor. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 5a.

Approximately 12 percent (154 acres; 449 ha) of the Alternative 5a Project corridor is currently coded as a developed use. Approximately 83 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, and about 17 percent of the developed land is in a Developed Residential, Commercial, and Industrial Use. The majority of the land in a Developed Residential, Commercial, and Industrial Use, is located along the portion of the Project that would be buried within the I-93 roadway corridor. Although Alternative 5a would pass through a number of population centers, developed lands, and lands with development potential, construction of this alternative is not expected to create a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor. Construction of Alternative 5a would not be expected to result in a long-term impact to lands with a high development potential in the Central Section. Because approximately 0.5 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 5a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 5a in the Central Section would impact approximately 77 acres (31 ha) of federal, state and private conservation land, as well as 8 acres (3 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 5a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 5a would cross the eligible federal Wild and Scenic Rivers the Ammonoosuc River, Mill Brook, and the Mad River as an overhead transmission line in the Central Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 5a would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an aboveground transmission line. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.7**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 43 miles (69 km) of the Project corridor of Alternative 5a would be located within the existing PSNH transmission route in the Central Section. Approximately 20 miles (32 km) of the Project in the Central Section would be located within a new transmission route within roadway corridors.

In order to accommodate the installation of the Project in the existing corridor, the actions described in **Section 4.1.6** would have to be taken. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5a within the existing corridor. I-93 falls under the jurisdiction of the FHWA and NHDOT, and the Project would require authorizations for this use.

Road Crossings

Construction of Alternative 5a would require 57 aerial road crossings and 43 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.7** for a discussion of traffic and transportation impacts under Alternative 5a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 5a would be buried under less than 1 mile (2 km) of local roadway corridors, less than 1 mile (2 km) of state roadway corridors, and 21 miles (34 km) of US Highway and Interstate in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Franconia Notch State Park and I-93 Memorandum of Agreement

See **Section 4.3.6.4** for a discussion of the actions required under this MOA.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.8 Alternative 5b

Alternative 5b would follow the Alternative 2 alignment as an overhead HVDC line, except where it would be buried in the NH Routes 116 and 112 roadway corridors. Where Alternative 5b would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5b would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5b in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

In the Central Section, Alternative 5b would follow the Alternative 2 alignment as an overhead HVDC line in the existing PSNH transmission route, except where it would be buried in the NH Routes 116 and 112 roadway corridors. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 5b.

Approximately 10 percent (165 acres; 67 ha) of the Alternative 5b Project corridor is currently coded as a developed use. Approximately 93 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, and about 7 percent of the developed land is in a Developed Residential, Commercial, and Industrial Use. Although Alternative 5b would pass through a number of population centers, developed lands, and lands with development potential, construction of this alternative is not expected to create a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor. Construction of Alternative 5b would not be expected to result in a long-term impact to lands with a high development potential in the Central Section. Because approximately 0.2 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 5b, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 5b in the Central Section would impact approximately 128 acres (52 ha) of federal, state, county and private conservation land, as well as 52 acres (21 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5b could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 5b would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 5b would cross the eligible federal Wild and Scenic Rivers the Ammonoosuc River, Mill Brook, and the Mad River as an overhead transmission line in the Central Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 5b would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an aboveground transmission line The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.8**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 56 miles (91 km) of the Project corridor of Alternative 5b would be located within the existing PSNH transmission route in the Central Section. Approximately 13 miles (21 km) of the Project in the Central Section would be located within a new transmission route within roadway corridors.

In order to accommodate the installation of the Project in the existing corridor, the actions described in **Section 4.1.6.1** would have to be taken. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5b within the existing corridor. NH Routes 116 and 112 fall under the jurisdiction of NHDOT, and the Project would require an authorization for this use.

Road Crossings

Construction of Alternative 5b would require 73 aerial road crossings, and 18 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.8** for a discussion of traffic and transportation impacts under Alternative 5b.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 5b would be buried under 13 miles (21 km) of state roadway corridors, and no local roads or US Highways. In order to construct the Project, the Applicant would be required to secure an authorization (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.9 Alternative 5c

Where Alternative 5c would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5c would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5c in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

In the Central Section, Alternative 5c would follow the Alternative 2 alignment as an overhead HVDC line in the existing PSNH transmission route, except where it would be buried in NH Route 18, NH Route 116, NH Route 112, and US Route 3 roadway corridors. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 5c.

Approximately 19 percent (266 acres; 108 ha) of the Alternative 5c Project corridor is currently coded as a developed use. Approximately 93 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, and about 7 percent of the developed land is in a Developed Residential, Commercial, and Industrial Use. The majority of the land in a Developed Residential, Commercial, and Industrial Use, is located along the portion of the Project that would be buried within the roadway corridors. Although the Alternative 5c Project corridor would pass through a number of population centers, developed lands, and lands with development potential while within roadway corridors, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor. Construction of Alternative 5c would not be expected to result in a long-term impact to lands with a high development potential in the Central Section. Because approximately 0.3 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 5c, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 5c in the Central Section would impact approximately 67 acres (27 ha) of federal, state, county and private conservation land, as well as 43 acres (17 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5c could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 5c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 5c would cross the eligible federal Wild and Scenic Rivers the Ammonoosuc River, Mill Brook, and the Mad River as an overhead transmission line in the Central Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 5c would cross the Ammonoosuc River and the Pemigewasset River (both State-protected rivers) as an aboveground transmission line. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.9**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 44 miles (72 km) of the Project corridor of Alternative 5c would be located within the existing PSNH transmission route in the Central Section. Approximately 25 miles (41 km) of the Project in the Central Section would be located within a new transmission route within roadway corridors.

In order to accommodate the installation of the Project in the existing corridor, the actions described in **Section 4.1.6.1** would have to be taken. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5c within the existing corridor. NH Routes 18, 116, and 112 fall under the jurisdiction of NHDOT. US Route 3 falls under the jurisdiction of the FHWA and NHDOT. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 5c would require 58 aerial road crossings, and 81 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.9** for a discussion of traffic and transportation impacts under Alternative 5c.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 5c would be buried under 24 miles (39 km) of state roadway corridors, less than 2 miles (3 km) of US Highway, and no local roadway corridors in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.10 Alternative 6a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 6a in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 6a would be constructed underground within the US Route 3, I-93, and NH Route 127 roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 6a Project corridor would pass through a number of population centers, developed lands, and lands with development potential while within roadway corridors, construction of this alternative is not expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 6a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the 17 acres (7 ha) of state conservation land and the 9 acres (4 ha) of NFS lands in the Alternative 6a Central Section Project corridor. Alternative 6a would intersect with each of these conservation lands in the alignment buried within the US Route 3 or I-93 corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 6a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 6a would cross the Mad River (an eligible federal Wild and Scenic River) as an overhead transmission line in the Central Section. This crossing may impact the potential future designation of this eligible river; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in this locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 6a would cross the Pemigewasset River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.10**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 6a Project corridor would be located within a new transmission route in the Central Section. While Alternative 6a would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. NH Route 127 falls under the jurisdiction of NHDOT. US Route 3 and I-93 fall under the jurisdiction of the FHWA and NHDOT. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 6a would require 103 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.10** for a discussion of traffic and transportation impacts under Alternative 6a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 6a would be buried under less than 1 mile (2 km) of local roadway corridors, 2 miles (3 km) of state roadway corridors, and 60 miles (97 km) of US Highway and Interstate in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Franconia Notch State Park and I-93 Memorandum of Agreement

See **Section 4.3.6.4** for a discussion of the actions required under this MOA.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.11 Alternative 6b

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 6b in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 6b would be constructed underground in the US Route 3, I-93, NH Route 116, NH Route 112, and NH Route 127 roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 6b Project corridor would pass through a number of population centers, developed lands, and lands with development potential while following roadway corridors, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 6b, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the 3 acres (1 ha) of state, county and private conservation land and the 30 acres (9 ha) of NFS lands in the Alternative 6b Central Section Project corridor. Alternative 6b would intersect with each of these conservation lands in the alignment buried within roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

There are no designated or eligible federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 6b would cross the eligible federal Wild and Scenic Rivers the Pemigewasset River and the Wild Ammonoosuc River as an underground transmission cable in the Central Section. These crossings are not expected to impact the potential future designation of these rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. Alternative 6b would cross the Mad River (an eligible federal Wild and Scenic River) as an overhead transmission line in the Central Section. This crossing may impact the potential future designation of this eligible river; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in this location. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section Alternative 6b would cross the Pemigewasset River (a State-protected river) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.11**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 6b Project corridor would be located within a new transmission route in the Central Section. While Alternative 6b would be constructed as underground transmission facilities within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. US Route 3 and I-93 fall under the jurisdiction of the FHWA and NHDOT. NH Routes 116, 112, and 127 fall under the jurisdiction of NHDOT. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 6b would require 165 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.11** for a discussion of traffic and transportation impacts under Alternative 6b.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 6b would be buried under 1 mile (2 km) of local roadway corridors, 28 miles (45 km) of state roadway corridors, and 48 miles (77 km) of US Highway and Interstate in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.6.12 Alternative 7 – Proposed Action

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 7 in the Central Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

In the Central Section, Alternative 7 would follow the Alternative 2 alignment as an overhead HVDC line in the existing PSNH transmission route, except between MPs 81 to 133 where it would be buried within the US Route 302, NH Route 18, NH Route 116, NH Route 112, and US Route 3 roadway corridors. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 7.

Approximately 42 percent (374 acres [151 ha]) of the Alternative 7 Project corridor is currently coded as a developed use. Approximately 91 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, and about 9 percent of the developed land is in a Developed Residential, Commercial, and Industrial Use. Construction of Alternative 7 is expected to create a minimal impact to lands with a high development potential in the Central Section, as approximately 0.49 percent of the corridor experienced development activity between 2001 and 2011. The presence of the transmission corridor would likely reduce the development potential of these lands that have been experiencing development activity, but the impact would highly localized.

Under Alternative 7, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 7 in the Central Section would impact approximately 34 acres (14 ha) of federal, state and private conservation land, as well as 55 acres (22 ha) of NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 7 could result in long-term impacts to the conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

There are no designated federal Wild and Scenic Rivers in the Central Section of the study area. Alternative 7 would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Central Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 7 would also cross one eligible federal Wild and Scenic River (the Ammonoosuc River) as an overhead transmission line in the Central Section. This crossing may impact the potential future designation of this eligible river; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in this location. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Central Section, Alternative 7 would cross the Ammonoosuc River and the Pemigewasset River (both state-protected rivers) as an aboveground transmission cable; however, no structures or activities are proposed within either river. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. No other state-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.3.3.11**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 18 miles (29 kilometers) of the Alternative 7 corridor would be located within the existing PSNH transmission corridor in the Central Section. Approximately 52 miles (84 kilometers) of Alternative 7 in the Central Section would be located within a new transmission route within roadway corridors.

In order to accommodate the installation of Alternative 7 in the existing corridor, the actions described in **Section 4.1.6.1** would have to be taken. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as proposed in Alternative 7 within the existing corridor. NH Routes 18, 116, and 112 fall under the jurisdiction of NHDOT. US Routes 3 and 302 fall under the jurisdiction of the FHWA and NHDOT. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 7 would require 20 aerial road crossings, and 155 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.3.5.12** for a discussion of traffic and transportation impacts under Alternative 7.

The construction of the Project under Alternative 7 in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, which would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 7 would be buried under 27 miles (43 km) of state roadway corridors and 26 miles (41 km) of US highway corridors in the Central Section. The Project would require authorizations for this use (see **Section 4.1.6.1**). No local roadway corridors would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.3.7 NOISE

Refer to **Section 4.1.7** for a discussion of general impacts common to all geographic sections.

4.3.7.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.7.2 Alternative 2

Impacts from Construction

Under Alternative 2 in the Central Section, 26 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There are no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

In the Central Section, the Project may also use helicopters for conductor stringing operations or for transport and erection of structure sections. A small single-rotor helicopter typically produces a maximum sound level of 77 dBA at a distance of 500 feet (152 m) under level flight conditions. This corresponds to a sound level of about 97 dBA at 50 feet (15 m), while a larger helicopter may produce a maximum sound level of 83 dBA at 500 feet (152 m) and 103 dBA at 50 feet (15 m). Helicopter use would cause high noise levels in some locations for short time periods during transmission line construction. Helicopters would only operate during daylight hours (generally 7:00 a.m. to 7:00 p.m.).

Impacts from Operations, Maintenance, and Emergency Repairs

The audible noise due to the corona effect of the overhead HVDC line would not exceed the EPA guidance level of Ldn of 55 dBA for outdoor areas beyond the transmission route and would not present a long-term impact (see **Section 4.1.7.2**).

Ongoing maintenance activities under the Project would include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. In addition, Northern Pass would conduct visual inspections via helicopter of the transmission lines periodically. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized. These operational noise sources would impact nearby outdoor recreational uses.

4.3.7.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the Central Section, 19 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Project operation, maintenance, and emergency repairs under Alternative 3 in the Central Section would also include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations. These operational noise sources could also cause adverse effects to nearby outdoor recreational uses.

Because the Project would be located underground, no long-term operational impacts would occur.

4.3.7.4 Alternative 4a

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 4a in the Central Section, the noise levels would be expected to be identical to those described for the Project under Alternative 3 in the Central Section (see **Section 4.3.7.3**). Under Alternative 4a in the Central Section, 3 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4a in the Central Section would be identical to those under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.5 Alternative 4b

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 4b in the Central Section, the noise levels would be expected to be identical to those discussed for the Project under Alternative 3 in the Central Section (see **Section 4.3.7.3**). However, the route under Alternative 4b in the Central Section would pass through more populated areas along roadway corridors than the route under Alternative 3. Under Alternative 4b in the Central Section, 79 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4b in the Central Section would be identical to those under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.6 Alternative 4c

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 4c in the Central Section, the noise levels would be expected to be identical to those discussed for the Project under Alternative 3 in the Central Section (see **Section 4.3.7.3**). However, the route for Alternative 4c would pass through more populated areas along roadway corridors than the route under Alternative 3. Under Alternative 4c in the Central Section, 1,036 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries, or schools within 50 feet (15 m) of the disturbance areas. Disturbance areas would be within 50 feet (15 m) of three daycare centers that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4c in the Central Section would be identical to those under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.7 Alternative 5a

Impacts from Construction

In the Central Section, Alternative 5a would include both overhead transmission lines and buried cables. The noise levels resulting from the construction of the overhead lines would be expected to be identical to those described under Alternative 2 in the Central Section (see **Section 4.3.7.2**). The noise levels resulting from burial of the cables under Alternative 5a in the Central Section would be expected to be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**). Under Alternative 5a in the Central Section, 23 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Central Section (see **Section 4.3.7.2**). Although the Project would follow a different alignment, the types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.8 Alternative 5b

Impacts from Construction

In the Central Section, Alternative 5b would include both overhead transmission lines and underground cables. The noise levels resulting from the construction of the overhead lines would be expected to be identical to those described for the Project under Alternative 2 (see **Section 4.3.7.2**). The noise levels resulting from burial of the cables under Alternative 5b in the Central Section would be expected to be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**). Under Alternative 5b in the Central Section, 39 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Central Section (see **Section 4.3.7.2**). Although the Project would follow a different alignment, the types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.9 Alternative 5c

Impacts from Construction

In the Central Section, Alternative 5c would include both overhead transmission lines and buried cables. The noise levels resulting from the construction of the overhead lines would be expected to be identical to those described for the Project under Alternative 2 (see **Section 4.3.7.2**). The noise levels resulting from burial of the cables under Alternative 5b in the Central Section would be expected to be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**). Under Alternative 5c in the Central Section, 401 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries, or schools within 50 feet (15 m) of the disturbance areas. Disturbance areas would be within 50 feet (15 m) of one daycare center that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Central Section (see **Section 4.3.7.2**). Although the Project would follow a different alignment, the types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.10 Alternative 6a

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 6a in the Central Section, the noise levels would be expected to be identical to those described for the Project under Alternative 3 in the Central Section (see **Section 4.3.7.3**). Under Alternative 6a in the Central Section, 32 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.11 Alternative 6b

Impacts from Construction

Because the cable would be constructed underground for its entire length under Alternative 6b in the Central Section, the noise levels would be expected to be identical to those described for the Project under Alternative 3 in the Central Section (see **Section 4.3.7.3**). For Alternative 6b in the Central Section, 108 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts from operations, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.7.12 Alternative 7 – Proposed Action

Impacts from Construction

In the Central Section, Alternative 7 would include both overhead transmission lines and buried cables. The noise levels resulting from the construction of the overhead lines would be expected to be identical to those described for the Project under Alternative 2 (see **Section 4.3.7.2**). The noise levels resulting from burial of the cables under Alternative 7 in the Central Section would be expected to be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

Under Alternative 7 in the Central Section, 657 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries, or schools within 50 feet (15 m) of the disturbance areas. Disturbance areas would be within 50 feet (15 m) of three daycare centers that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Central Section (see **Section 4.3.7.2**). Although the Project would follow a different alignment, the types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 3 (see **Section 4.3.7.3**).

4.3.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 4.1.8** for a discussion of general impacts common to all geographic sections. For more information about resource types and potential impacts, see **Section 3.3.8** and the **Cultural Resources Technical Report** (Sections 2.2 and 3.2).

Table 4-118 and **Table 4-119** summarize the number of archaeological resources (or sites) and archaeologically-sensitive areas within the direct APE (consisting of the entire width of the new transmission route and existing PSNH transmission route) that would be potentially affected by the Project in the Central Section. Archaeological resources may consist of pre-Contact Native American archaeological sites, post-Contact Euro-American archaeological sites, and/or multi-component archaeological sites that contain pre-Contact Native American and post-Contact Euro-American archaeological remains (see Section 2.1.1.1 of the **Cultural Resources Technical Report**). Archaeologically sensitive areas are those areas that have the potential to contain archaeological resources, although no archaeological resources have been previously identified or were observed within these areas. These areas may be sensitive for containing pre-Contact Native American archaeological resources, post-Contact Euro-American archaeological resources, and/or multi-component (pre-Contact Native American and post-Contact Euro-American) archaeological resources (see Section 2.1.1.2 of the **Cultural Resources Technical Report**). These archaeological resources (sites) and archaeologically sensitive areas could be physically impacted by the Project.

Table 4-120 summarizes the number of architectural resources (buildings, structures, or other built resources) within both the indirect APE and direct APE that would be potentially affected by the Project in the Northern Section. Architectural resources may consist of individual buildings, structures, or other built resources (for example, residences; farm complexes [residences, barns, and other outbuildings]; religious buildings [churches, meeting houses, and chapels]; cabins and cottages; civic buildings [libraries, post offices, town halls, etc.]; cemeteries; bridges; railroads; and trails) (see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources may also include historic districts, which are groups of buildings, structures, and other built resources that are related physically and/or thematically (also see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources within the indirect APE (1 mile [1.6 km] on each side of alternative centerlines) could be visually impacted by the Project, while architectural resources within the direct APE could be physically impacted by the Project.

Table 4-118. Number of Archaeological Resources Potentially Impacted in the Central Section during Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2	11	0	0	11
3	11	0	0	11
4a	1	0	0	1
4b	6	0	0	6
4c	11	0	0	11
5a	6	0	0	6
5b	14	0	0	14
5c	19	0	0	19
6a	2	0	0	2
6b	7	0	0	7
7 (Proposed Action)	5	0	0	5

Source: Claesson et al. 2014a, 2015b; Claesson and Peone 2016; Freedman et al. 2015
Note: Includes resources in the WMNF.

Table 4-119. Number of Archaeologically Sensitive Areas Potentially Impacted in the Central Section during Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	93	61 (25)
3	93	38 (15)
4a	11	Less than 1 (less than 0.4)
4b	53	4 (2)
4c	118	11 (4)
5a	72	47 (19)
5b	91	56 (23)
5c	112	51 (21)
6a	16	1 (0.4)
6b	59	4 (2)
7 (Proposed Action)	147	34 (14)

Source: Claesson et al. 2014a, 2015b; Claesson and Peone 2016; Freedman et al. 2015
Note: Includes resources in the WMNF.

Table 4-120. Number of Architectural Resources Potentially Impacted in the Central Section during Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)	--	--	--	--
2	78	11	7	71
3	80	12	7	73
4a	2	2	2	0
4b	31	25	3	28
4c	113	96	6	107
5a	82	34	7	75
5b	78	15	7	71
5c	84	30	7	77
6a	4	3	3	1
6b	32	27	2	30
7 (Proposed Action)	179	53	10	163

Source: Claesson et al. 2014b; Higgins et al. 2015, 2016b, 2016c, 2016e, 2016f
Note: Includes resources in the WMNF.

4.3.8.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.8.2 Alternative 2

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, approximately 545 acres (221 ha) of land in the Central Section would be disturbed. The majority of the construction disturbance area (approximately 419 acres [170 ha]) would be associated with the construction of the new overhead transmission line in existing PSNH transmission route, while the remainder of the construction disturbance area (approximately 125 acres [51 ha]) would be associated with access roads.

The archaeological investigation identified 11 archaeological sites within the direct APE for the Central Section under Alternative 2. Two of these sites are located within the construction disturbance area for the Central Section under Alternative 2. None of the 11 archaeological sites have been previously evaluated for NRHP eligibility (Claesson et al. 2014a, 2015b). Therefore, it is not known whether any are NRHP-eligible.

The archaeological investigation identified 93 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 2 (Claesson et al. 2014a, 2015b). All of these 93 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 2, covering an approximate total land area of 61 acres (25 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 78 architectural resources within the indirect APE of the Central Section under Alternative 2. Seven of these resources have been determined to be NRHP-eligible or have been listed in the NRHP (Claesson et al. 2014b; Higgins et al. 2016b, 2016c). The remaining 71 architectural resources have not yet been evaluated for NRHP eligibility or additional information is required in order to determine their NRHP eligibility (Claesson et al. 2014b).

The seven NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and construction pads, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Eleven of the 78 architectural resources are also located within the direct APE. These 11 architectural resources consist of two NRHP-eligible resources and nine resources for which NRHP-eligibility is unknown because they have not yet been evaluated for NRHP-eligibility.

Of the 11 architectural resources located within the direct APE, six are located within the construction disturbance area for the Central Section under Alternative 2—two NRHP-eligible resources (including the ANST) and four resources that have not yet been evaluated for NRHP-eligibility (Claesson et al. 2014b, Higgins et al. 2016b). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these resources if they cannot be avoided.

<u>**Impacts from Operations, Maintenance, and Emergency Repairs**</u>

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts to the 78 architectural resources located within the indirect or direct APE for the Central Section under Alternative 2. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.3 Alternative 3

<u>**Impacts from Construction**</u>

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, approximately 342 acres (138 ha) of land would be disturbed in the Central Section of the Project. All of the construction disturbance area would be associated with the installation of the underground HVDC transmission cable (316 acres [128 ha]), as well as access roads (26 acres [11 ha]).

The archaeological resources for the Central Section under Alternative 3 are identical to those under Alternative 2.

The archaeological investigation identified 93 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 2 (Claesson et al. 2014a, 2015b; Freedman et al. 2015). All of these 93 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 2, covering an approximate total land area of 38 acres (15 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 80 architectural resources within the indirect APE of the Central Section under Alternative 3. Seven of these resources are previously identified architectural resources that were listed, or determined eligible for listing, in the NRHP. The remaining 73 architectural resources have not yet been evaluated for NRHP eligibility or additional information is required in order to determine their NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015).

The seven NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and construction pads, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Twelve of the 80 architectural resources are also located within the direct APE. Of the 12 architectural resources located within the direct APE, six are located within the construction disturbance area for the Central Section under Alternative 3—three NRHP-eligible resources (including the ANST) and three architectural resources that have not yet been evaluated for NRHP-eligibility (Claesson et al. 2014b, Higgins et al. 2015). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, operation of the Project would be expected to have no impacts on the 11 archaeological resources or archaeologically sensitive areas, including those that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts to the 80 architectural resources located within the indirect or direct APE for the Central Section under Alternative 3. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.4 Alternative 4a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, approximately 78 acres (32 ha) of land in the Central Section would be disturbed. The construction disturbance area would be associated with the installation of the underground transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified one archaeological site within the direct APE for the Central Section under Alternative 4a. This archaeological site has not been previously evaluated for NRHP eligibility, nor is it located within the construction disturbance area for the Central Section under Alternative 4a (Freedman et al. 2015). Therefore, it is not known whether it is NRHP-eligible.

The archaeological investigation identified 11 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 4a (Freedman et al. 2015). Three of these 11 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 4a, covering an approximate total land area of less than 1 acre (0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified two architectural resources within the indirect APE of the Central Section under Alternative 4a. One of these two resources is the NRHP-eligible ANST. Both of these resources are previously identified architectural resources that were previously evaluated for NRHP-eligibility and determined NRHP-eligible or are being treated as eligible for listing in the NRHP (Higgins et al. 2015).

Construction of Project components, including new access roads and construction pads, would result in changes to the settings of, or views to and from, these resources. Because the setting of the NRHP-eligible ANST in particular is a character-defining feature that contributes to its importance, construction of the Project would result in short-term, adverse visual impacts to the ANST.

Both of these architectural resources are also located within the direct APE and the construction disturbance area for the Central Section under Alternative 4a.

Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the two architectural resources located within the indirect and direct APE for the Central Section under Alternative 4a. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.5 Alternative 4b

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4b, approximately 91 acres (37 ha) of land would be disturbed in the Central Section of the Project. The construction disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified six archaeological sites within the direct APE for the Central Section under Alternative 4b. None of these six archaeological sites are located within the construction disturbance area for the Central Section under Alternative 4b. None of these six archaeological sites have been previously evaluated for NRHP eligibility (Freedman et al. 2015). Therefore, it is not known whether they are NRHP-eligible.

The archaeological investigation identified 53 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 4b (Freedman et al. 2015). Eighteen of these 53 archaeologically sensitive areas are also located within the construction disturbance area for the Central Section under Alternative 4b, covering an approximate total land area of 4 acres (2 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 31 architectural resources within the indirect APE of the Central Section under Alternative 4b. Three of these 31 resources have been previously evaluated for NRHP eligibility and are listed in the NRHP, were previously determined NRHP-eligible, or are being treated as eligible for listing in the NRHP (Higgins et al. 2015). Therefore, these three architectural resources are considered historic properties. The NRHP eligibility of the remaining 28 architectural resources is unknown because they have not yet been evaluated (Higgins et al. 2015).

The three NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Twenty-five of the 31 architectural resources are in the direct APE; two of the 25 are also located within the construction disturbance area for the Central Section under Alternative 4b, including the NRHP-eligible ANST. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these two resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4b, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the architectural resources located within the indirect and direct APE for the Central Section under Alternative 4b. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.6 Alternative 4c

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4c, approximately 87 acres (35 ha) of land would be disturbed in the Central Section of the Project. The construction disturbance area would be associated with the installation of the underground

HVDC transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified 11 archaeological sites within the direct APE for the Central Section under Alternative 4c. None of these 11 archaeological sites are located within the construction disturbance area for the Central Section under Alternative 4b. None of these 11 archaeological sites have been previously evaluated for NRHP eligibility (Freedman et al. 2015). Therefore, it is not known whether they are NRHP-eligible.

The archaeological investigation identified 118 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 4c (Freedman et al. 2015). Of these, 33 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 4c, covering an approximate total land area of 11 acres (4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 113 architectural resources within the indirect APE of the Central Section under Alternative 4c. Six of these 113 resources have been previously evaluated for NRHP eligibility and are considered historic properties. The NRHP eligibility of the remaining 107 architectural resources is unknown because they have not yet been evaluated (Higgins et al. 2015).

The six NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Three of the 96 architectural resources in the direct APE are also located within the construction disturbance area for the Central Section under Alternative 4c, including the NRHP-eligible ANST. Long-term construction impacts could occur to these resources, resulting from surface and subsurface ground disturbance.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4c, operation of the Central Section of the Project is expected to have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the two architectural resources located within the indirect and direct APE for the Central Section under Alternative 4c. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.7 Alternative 5a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5a, approximately 370 acres (150 ha) of land in the Central Section would be disturbed. Approximately 261 acres (106 ha) of disturbance would be associated with the construction of the new overhead HVDC transmission line in the existing PSNH transmission route. The remainder of the construction disturbance area (approximately 109 acres [44 ha]) would be associated with: the installation of the new underground transmission cable in existing roadway corridors (25 acres [10 ha]), which would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance; new or improved access roads (82 acres [33 ha]); and two new transition stations (approximately 1 acre [0.4 ha])

The archaeological investigation identified six archaeological sites within the direct APE for the Central Section under Alternative 5a. None of these six archaeological sites have been previously evaluated for NRHP eligibility (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Therefore, it is not known whether any are NRHP-eligible. Of these six archaeological sites, two are located within the construction disturbance area for the Central Section under Alternative 5a.

The archaeological investigation identified 72 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 5a. Of these 72 archaeologically sensitive areas, 70 are located within the disturbance area, covering an approximate total of 47 acres (19 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 82 architectural resources within the indirect APE for the Central Section under Alternative 5a. The Project would be visible from these resources, and setting appears to be a character-defining feature that would contribute to their importance. Seven of these resources were previously evaluated for NRHP eligibility and were listed, determined eligible for listing, or are being treated as eligible for listing in the NRHP (Claesson et al. 2014b, Higgins et al. 2015). The remaining 75 architectural resources have either not yet been evaluated for NRHP eligibility or require additional information in order to determine NRHP eligibility.

The eight NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and construction pads, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Thirty-four of the 82 architectural resources are also located within the direct APE for the Central Section under Alternative 5a, including the NRHP-eligible ANST (Claesson et al. 2014b, Higgins et al. 2015). Three architectural resources are located within the disturbance area for the Central Section under Alternative 5a, consisting of two NRHP-eligible resources and one resource for which NRHP-eligibility is unknown. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts on the resources if it cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5a, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 82 architectural resources located within the indirect or direct APE for the Central Section under Alternative 5a. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.8 Alternative 5b

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5b, approximately 477 acres (193 ha) of land in the Central Section would be disturbed. The majority of the construction disturbance area (approximately 355 acres [144 ha]) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route. The remainder of the construction disturbance area (approximately 123 acres [50 ha]) would be associated with: the installation of the new underground HVDC transmission cable in existing roadway corridors (approximately 13 acres [5 ha]), which would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance; new or improved access roads (approximately 108 acres [44 ha]); and two new transition stations (approximately 1 acre [0.4 ha]).

The archaeological investigation identified 14 archaeological sites within the direct APE for the Central Section under Alternative 5b. None of these 14 archaeological sites have been previously evaluated for NRHP eligibility. Therefore, it is not known whether any are NRHP-eligible (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Of these 14 archaeological sites, two are located within the construction disturbance area for the Central Section under Alternative 5b.

The archaeological investigation identified 91 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 5b (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Of these 91 archaeologically sensitive areas, 90 are located within the construction disturbance area for the Central Section under Alternative 5b, covering an approximate total land area of 56 acres (23 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 78 architectural resources within the indirect APE for the Central Section under Alternative 5b. Seven of these resources are previously identified architectural resources that were previously evaluated for NRHP eligibility and were listed, or determined eligible for listing, in the NRHP. Therefore, these seven previously identified NRHP-listed or -eligible architectural resources are considered historic properties. The remaining 71 architectural resources have either not yet been evaluated for NRHP eligibility or require additional information in order to determine eligibility (Claesson et al. 2014b, Higgins et al. 2015).

The seven NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Fifteen of the 78 architectural resources are also located within the direct APE for the Central Section under Alternative 5b, including the NRHP-eligible ANST. These 15 architectural resources consist of three resources have previously been determined to be NRHP-eligible, and 12 resources for which NRHP eligibility is unknown because they have not yet been evaluated (Claesson et al. 2014b, Higgins et al. 2015).

Of the 15 architectural resources located within the direct APE, six are located within the construction disturbance area for the Central Section under Alternative 5b, consisting of two NRHP-eligible resources (including the ANST) and four resources for which NRHP-eligibility is unknown. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts on these resources if it cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5b, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 78 architectural resources located within the indirect or direct APE for the Central Section under Alternative 5b. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.9 Alternative 5c

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5c, approximately 381 acres (154 ha) of land would be disturbed in the Central Section of the Project. The majority of the construction disturbance area (approximately 270 acres [109 ha]) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route. The remainder of the construction disturbance area (approximately 112 acres [45 ha]) would be associated with: the installation of the new underground HVDC transmission cable in existing roadway corridors (approximately 26 acres [11 ha]), which would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance; new or improved access roads (approximately 85 acres [34 ha]); and two new transition stations (approximately 1 acre [0.4 ha]).

The archaeological investigation identified 19 archaeological sites within the direct APE for the Central Section under Alternative 5c. None of these 19 archaeological sites have been previously evaluated for NRHP eligibility (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Therefore, it is not known whether any are NRHP-eligible. Of these 19 archaeological sites, two are located within the construction disturbance area for the Central Section under Alternative 5c.

The archaeological investigation identified 112 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 5c (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Of these 112 archaeologically sensitive areas, 85 are located within the construction disturbance area for the Central Section under Alternative 5c, covering an approximate total land area of 51 acres (21 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.2**).

Architectural Resources

The assessment of architectural resources identified 84 architectural resources within the indirect APE for the Central Section under Alternative 5c. Seven of these resources were previously evaluated for NRHP eligibility and were listed, determined eligible for listing, or are being treated as eligible for listing in the NRHP. The remaining 77 architectural resources have either not yet been evaluated for NRHP eligibility or require additional information in order to determine NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015).

The seven NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Thirty of the 84 architectural resources are also located within the direct APE for the Central Section under Alternative 5b. Of these 30 architectural resources are located within the direct APE, three are located within the construction disturbance area for the Central Section under Alternative 5c, including the NRHP-eligible ANST. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these two resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5c, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 84 architectural resources located within the indirect or direct APE for the Central Section under Alternative 5c. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.10 Alternative 6a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6a, approximately 75 acres (30 ha) of land in the Central Section would be disturbed. The construction disturbance area would be associated with the installation of the underground HVDC transmission cable within existing roadway, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified two archaeological sites within the direct APE for the Central Section under Alternative 6a. These archaeological sites have not been previously evaluated for NRHP eligibility. Therefore, it is not known whether they are NRHP-eligible (Freedman et al. 2015). These sites are not located within the construction disturbance area for the Central Section under Alternative 4a.

The archaeological investigation identified 16 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 6a (Freedman et al. 2015). Seven of these 16 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 6a, covering an approximate total land area of less than 1 acre (0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the indirect APE of the Central Section under Alternative 6a. Three architectural resources have been previously determined NRHP-eligible and are considered historic properties. The NRHP eligibility of the other architectural resource is unknown because it has not yet been evaluated (Higgins et al. 2015).

The three NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Three of the architectural resources are also located within the direct APE for the Central Section under Alternative 6a, and two NRHP-eligible resources (including the ANST) are located within the disturbance area (Higgins et al. 2015). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these resources if it cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6a, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the architectural resources located within the indirect or direct APE for the Central Section under Alternative 6a. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.11 Alternative 6b

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6b, approximately 88 acres (36 ha) of land in the Central Section would be disturbed. The construction disturbance area would be associated with the installation of the underground HVDC transmission cable within existing roadway, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified seven archaeological sites within the direct APE for the Central Section under Alternative 6b. None of these seven archaeological sites have been previously evaluated for NRHP eligibility (Freedman et al. 2015). Therefore, it is not known whether they are NRHP-eligible. None of these seven archaeological sites are located within the construction disturbance area for the Central Section under Alternative 6b.

The archaeological investigation identified 59 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 6b (Freedman et al. 2015). Twenty-two of these 59 archaeologically sensitive areas are located within the construction disturbance area for the Central Section under Alternative 6b, covering an approximate total land area of 4 acres (2 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 32 architectural resources within the study area for the indirect APE of the Central Section under Alternative 6b. Three of these 32 resources have been previously evaluated for NRHP eligibility. Two of these resources were previously determined NRHP-eligible or are being treated as NRHP-eligible (Higgins et al. 2015). Therefore, these NRHP-listed or -eligible architectural resources are considered historic properties. The NRHP eligibility of the remaining 30 architectural resources is unknown because they have not yet been evaluated (Higgins et al. 2015).

Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Twenty-seven of the 32 architectural resources are located in the direct APE. Two of these 27 resources are also located within the construction disturbance area for the Central Section under Alternative 6b, including the NRHP-eligible ANST. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts on these two resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6b, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the architectural resources located within the indirect or direct APE for the Central Section under Alternative 6b. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.8.12 Alternative 7 – Proposed Action

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 7, approximately 201 acres (81 ha) of land would be disturbed in the Central Section of the Project. The majority of the construction disturbance area (approximately 105 acres [42 ha]) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route. The remainder of the construction disturbance area (approximately 96 acres [39 ha]) would be associated with: the installation of the new underground HVDC transmission cable in existing roadway corridors (56 acres [23 ha]), which would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance; new or improved access roads (38 acres [15 ha]), and two new transition stations (2 acres [0.8 ha]).

The archaeological investigation identified five archaeological sites within the direct APE for the Central Section under Alternative 7. None of these five archaeological sites has been previously evaluated for NRHP eligibility (Claesson et al. 2014a, 2015b; Freedman et al. 2015; Claesson and Peone 2016). Therefore, it is not known whether any are NRHP-eligible. Of these five archaeological sites, two are also located within the construction disturbance area for the Central Section under Alternative 7.

The archaeological investigation identified 147 archaeologically sensitive areas within the direct APE for the Central Section under Alternative 7 (Claesson et al. 2014a, 2015b; Freedman et al. 2015; Claesson and Peone 2016). Of these 147 archaeologically sensitive areas, 63 are located within the construction disturbance area for the Central Section under Alternative 7, covering an approximate total land area of 34 acres (14 ha).

Archaeological resources and archaeologically sensitive areas within the direct APE could experience both short- and long-term construction impacts as a result of surface and subsurface ground disturbance (see **Section 4.1.8.2**).

Architectural Resources

The assessment of architectural resources identified 179 architectural resources within the indirect APE for the Central Section under Alternative 7. Sixteen of these resources were previously evaluated for NRHP eligibility and ten were listed, determined eligible for listing, or are being treated as eligible for listing in the NRHP. The remaining 163 architectural resources have either not yet been evaluated for NRHP eligibility or require additional information in order to determine NRHP eligibility (Claesson et al. 2014b; Higgins et al. 2015, 2016b, 2016c, 2016e, 2016f).

The ten NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and construction pads, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Fifty-three of the 179 architectural resources are also located within the direct APE for the Central Section under Alternative 7 (Claesson et al. 2014b; Higgins et al. 2015, 2016b, 2016c, 2016e, 2016f). Of these 53 architectural resources, seven are located within the construction disturbance area for the Central Section under Alternative 7, including the NRHP-eligible ANST. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts to these two resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 7, operation of the Central Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 179 architectural resources located within the indirect or direct APE for the Central Section under Alternative 7. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.3.9 ENVIRONMENTAL JUSTICE

Refer to **Section 4.1.9** for a discussion of general impacts common to all geographic sections.

4.3.9.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.9.2 Alternative 2

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 2 (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected population) in the Central Section. **Table 4-121** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Central Section. There is a lower percentage of minorities living among the potentially affected population as compared to the unaffected population, and that population has the same median household income as the unaffected population. The percentage of families living below the poverty level is lower among the potentially affected population than among the potential unaffected population. These data indicate that the potentially affected residents have similar demographic characteristics to other residents of New Hampshire.

Table 4-121. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 2

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	21,952	4%	$50,000 to $59,999	5%
Unaffected	127,660	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 2, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.3 Alternative 3

Impacts from Construction

Under Alternative 3, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Central Section (see **Section 4.3.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 3, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Central Section (see **Section 4.3.9.2**).

4.3.9.4 Alternative 4a

Impacts from Construction

Table 4-122 summarizes the demographic characteristics of potentially affected populations for Alternative 4a in the Central Section. There would be a lower percentage of low-income individuals and a lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same.

Table 4-122. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 4a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	30,247	4%	$50,000 to $59,999	4%
Unaffected	119,365	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations consist of lower percentages of minority and low-income populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.5 Alternative 4b

Impacts from Construction

Table 4-123 summarizes the demographic characteristics of potentially affected populations for Alternative 4b in the Central Section. There would be a lower percentage of low-income individuals and a lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same.

Table 4-123. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 4b

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	30,209	5%	$50,000 to $59,999	4%
Unaffected	119,403	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations consist of lower percentages of minority and low-income populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4b.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4b, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.6 Alternative 4c

Impacts from Construction

Table 4-124 summarizes the demographic characteristics of potentially affected populations for Alternative 4c in the Central Section. There would be a lower percentage of low-income individuals and a slightly lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same.

Table 4-124. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 4c

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	32,723	5%	$50,000 to $59,999	4%
Unaffected	116,889	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations consist of lower percentages of minority and low-income populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4c.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4c, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.7 Alternative 5a

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 2 exhibit similar characteristics to the remainder of the block groups in the Central Section. **Table 4-125** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Central Section. There would be a slightly lower percentage of low-income individuals and a lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to other residents in the Central Section.

Table 4-125. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 5a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	21,038	4%	$50,000 to $59,999	5%
Unaffected	128,574	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 5a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.8 Alternative 5b

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 2 exhibit similar characteristics to the remainder of the block groups in the Central Section. **Table 4-126** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Central Section. There would be a slightly lower percentage of low-income individuals and a slightly lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to other residents in the Central Section.

Table 4-126. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 5b

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	21,000	4%	\$50,000 to \$59,999	5%
Unaffected	128,612	7%	\$50,000 to \$59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 5b.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5b, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.9 Alternative 5c

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 5a exhibit similar characteristics to the remainder of the block groups in the Central Section. **Table 4-127** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Central Section. There would be a slightly lower percentage of low-income individuals and a slightly lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to other residents in the Central Section.

Table 4-127. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 5c

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	21,000	4%	\$50,000 to \$59,999	5%
Unaffected	128,612	7%	\$50,000 to \$59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 5c.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5c, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.10 Alternative 6a

Impacts from Construction

Table 4-128 summarizes the demographic characteristics of potentially affected populations for Alternative 6a in the Central Section. There would be a lower percentage of low-income individuals and a lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to unaffected residents in the Central Section.

Table 4-128. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 6a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	28,286	5%	\$50,000 to \$59,999	4%
Unaffected	121,326	7%	\$50,000 to \$59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations consist of lower percentages of minority and low-income populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 6a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.11 Alternative 6b

Impacts from Construction

Table 4-129 summarizes the demographic characteristics of potentially affected populations for Alternative 6b in the Central Section. There would be a lower percentage of low-income individuals and a lower percentage of minorities within the population of people potentially affected by the Project in the Central Section. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to unaffected residents in the Central Section.

Table 4-129. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 6b

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	28,248	5%	$50,000 to $59,999	4%
Unaffected	121,364	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations consist of lower percentages of minority and low-income populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 6b.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6b, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.9.12 Alternative 7 – Proposed Action

Impacts from Construction

Table 4-130 summarizes the demographic characteristics of potentially affected populations for Alternative 7 in the Central Section. There would be a slightly lower percentage of low-income individuals (based on percent living below poverty level) and a slightly lower percentage of minorities within the population of people potentially affected by the Project in the Central Section as compared to low-income or minority communities within the unaffected population. The median household income of both groups is the same. These data indicate that the potentially affected residents have similar demographic characteristics to unaffected residents of New Hampshire.

Table 4-130. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Central Section – Alternative 7

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	27,902	6%	$50,000 to $59,999	5%
Unaffected	121,710	7%	$50,000 to $59,999	7%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from the unaffected populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 7.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 7, because the demographic characteristics of potentially affected populations are not greatly different from unaffected populations, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.3.10 AIR QUALITY

Refer to **Section 4.1.10** for a discussion of general impacts common to all geographic sections.

The Project within the Central Section would be located within Grafton and Belknap counties. Within the Central Section the study area includes a portion of the WMNF. This section is in attainment for all NAAQS; therefore, General Conformity does not apply. Project related construction would result in short-term impacts to air quality in the Central Section. On-going maintenance operating emissions would not result in measurable impacts to air quality. Construction and long-term maintenance emissions would be lower for the portions of the Project with underground cable compared to the aboveground lines because of the use different types of equipment, less equipment, and less overall vehicle activity. The Project would also result in a minimal loss of forested areas in this section and, therefore, some loss of carbon sequestration capacity. The reduction in forest carbon sink would have adverse, long-term, and regional impacts. This Project would not result in any major stationary sources; therefore, PSD requirements established by the Regional Haze Rule to protect Class I Wilderness areas do not apply.

4.3.10.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.10.2 Alternative 2

Impacts from Construction

Under Alternative 2 in the Central Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 65 miles (105 km). **Table 4-131** shows total emissions from the construction activities within the Central Section under Alternative 2. Construction emissions would be localized and short-term.

Table 4-131. Alternative 2 Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	94.81	8.17	56.09	1.65	180.24	31.89	24,455.43

Construction of the Project under Alternative 2 within the Central Section would require the removal of approximately 17 acres (7 ha) of deciduous forest, 16 acres (6.5 ha) of conifer forest, and 208 acres (84 ha) of mixed forest. The loss of sequestration capacity is estimated at 19,157 metric tons of carbon, which is the equivalent of 70,306 metric tons of CO_2. This would also result in the equivalent loss of 304 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction described under Alternative 2 in the Central Section (see **Section 4.3.10.2**). Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the Central Section, underground transmission cable would be located in the existing PSNH transmission route for about 65 miles (105 km). The transmission cable would be installed underground for the entire length of the Project. **Table 4-132** shows total emissions from the construction activities within the Central Section of the Project under Alternative 3. Construction emissions would be localized and short-term.

Table 4-132. Alternative 3 Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	42.19	4.41	38.37	0.09	113.17	16.08	8,515.08

Construction of the Project under Alternative 3 within the Central Section would require the removal of approximately 2 acres (0.8 ha) of deciduous forest, 2 acres (0.8 ha) of conifer forest, and 14 acres (6 ha) of mixed forest. The loss of sequestration capacity is estimated at 391 metric tons of carbon, which is the equivalent of 5,104 metric tons of CO_2. This also would result in the equivalent loss of 22 metric tons of CO_2 uptake per year—less than for Alternative 2 because of a narrower construction corridor for underground cable installation. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 3. Maintenance would also be more limited for the underground cable in Alternative 3 compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.4 Alternative 4a

Impacts from Construction

Under Alternative 4a in the Central Section, underground transmission cable would be located in an existing roadway corridor for approximately 64 miles (103 km). **Table 4-133** shows total emissions from the construction activities of the Project under Alternative 4a within the Central Section. Construction emissions would be localized and short-term.

Table 4-133. Alternative 4a Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	41.64	4.35	37.88	0.09	111.49	15.84	8,407.03

Construction of the Project under Alternative 4a within the Central Section would require the removal of less than an acre of conifer forest, and 1.4 acres (0.5 ha) of mixed forest. The loss of sequestration capacity is estimated at 139 metric tons of carbon, which is the equivalent of 512 metric tons of CO_2. This would also result in the equivalent loss of 2 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under this alternative. Maintenance would also be more limited for the underground cable in Alternative 4a compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.5 Alternative 4b

Impacts from Construction

Under Alternative 4b in the Central Section, the underground transmission cable would be located in an existing roadway corridor for approximately 79 miles (127 km). The transmission cable would be installed underground for the entire length of the Project in this section, along Routes 112 and 116 through the WMNF. **Table 4-134** shows total emissions from the construction activities within the Central Section under Alternative 4b. Construction emissions would be localized and short-term.

Table 4-134. Alternative 4b Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	47.99	5.03	43.62	0.10	130.84	18.60	9,653.83

Construction of the Project under Alternative 4b within the Central Section would require the removal of approximately 1 acre (0.4 ha) of conifer forest, and 3 acres (1.2 ha) of mixed forest. The loss of sequestration capacity is estimated at 330 metric tons of carbon, which is the equivalent of 1,210 metric tons of CO_2. This would also result in the equivalent loss of 5 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under this alternative. Maintenance requirements would also be more limited for the underground cable in Alternative 4b compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.6 Alternative 4c

Impacts from Construction

Under Alternative 4c in the Central Section, the underground transmission cable would be located in an existing roadway corridor for about 77 miles (124 km), along Routes 112 and 116 through the WMNF and along US Route 3 from North Woodstock to Ashland, NH. **Table 4-135** shows total emissions from the construction activities within the Central Section under Alternative 4c. Construction emissions would be localized and short-term.

Table 4-135. Alternative 4c Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	47.15	4.94	42.85	0.10	128.26	18.24	10,742.25

Construction of the Project within the Central Section for Alternative 4c would require the removal of less than an acre of deciduous forest, 1 acre (0.4 ha) of conifer forest, and 3 acres (1.2 ha) of mixed forest. The loss of sequestration capacity is estimated at 314 metric tons of carbon, which is the equivalent of 1,153 metric tons of CO_2. This would result in the equivalent loss of 5 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the underground transmission cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 4c. Maintenance would also be more limited for the underground cable in Alternative 4b compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.7 Alternative 5a

Impacts from Construction

Under Alternative 5a in the Central Section, the Project would be similar to Alternative 2, except that underground cable would run for 20 miles (32 km) in an existing road corridor along I-93 through Franconia Notch. The Project would be constructed as an aboveground transmission line in the existing PSNH transmission route for 43 miles (69 km) of the total 63 miles (101 km). **Table 4-136** shows total emissions from the construction activities within the Central Section under Alternative 5a. Construction emissions would be localized and short-term.

Table 4-136. Alternative 5a Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	91.33	8.23	61.95	1.25	184.87	30.60	22,419.28

Construction of the Project under Alternative 5a within the Central Section would require the removal of approximately 10 acres (4 ha) of deciduous forest, 15 acres (6 ha) of conifer forest, and 119 acres (48 ha) of mixed forest. The loss of sequestration capacity is estimated at 11,487 metric tons of carbon, which is the equivalent of 42,158 metric tons of CO_2. This would also result in the equivalent loss of 182 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 5a. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.8 Alternative 5b

Impacts from Construction

Under Alternative 5b in the Central Section, the Project would be similar to Alternative 2, except that underground cable would run for 13 miles (21 km) on existing road corridor along Routes 112 and 116 through the WMNF. The Project would be constructed as an aboveground transmission line in the existing PSNH transmission route for 56 miles (90 km) of the total 69 miles (111 km). **Table 4-137** shows total emissions from the construction activities within the Central Section under Alternative 5b. Construction emissions would be localized and short-term.

Table 4-137. Alternative 5b Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	103.90	9.25	68.46	1.52	205.25	34.62	25,813.88

Construction of the Project under Alternative 5b within the Central Section would require the removal of approximately 16 acres (6.5 ha) of deciduous forest, 11 acres (4.5 ha) of conifer forest, and 184 acres (74 ha) of mixed forest. The loss of sequestration capacity is estimated at 16,766 metric tons of carbon, which is the equivalent of 61,533 metric tons of CO_2. This would also result in the equivalent loss of 264 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 5b. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.9 Alternative 5c

Impacts from Construction

Under Alternative 5c in the Central Section, the Project would be similar to Alternative 2, except that underground cable would run for 25 miles (40 km) on existing road corridor along NH Routes 18, 112, and 116 through the towns of Sugar Hill, Franconia, Easton, NH, and the WMNF. Of the total 69 miles (111 km) of the Project located in the Central Section under Alternative 5c, approximately 44 miles (71 km) would be aboveground transmission line located in the existing PSNH transmission route. **Table 4-138** shows total emissions from the construction activities within the Central Section under Alternative 5c. Construction emissions would be localized and short-term.

Table 4-138. Alternative 5c Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	94.65	8.56	64.57	1.27	193.58	31.93	23,140.76

Construction of the Project under Alternative 5c within the Central Section would require the removal of approximately 16 acres (6.5 ha) of deciduous forest, 11 acres (4.5 ha) of conifer forest, and 126 acres (51 ha) of mixed forest. The loss of sequestration capacity is estimated at 12,097 metric tons of carbon, which is the equivalent of 44,396 metric tons of CO_2. This would also result in the equivalent loss of 191 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 5c. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.10 Alternative 6a

Impacts from Construction

Under Alternative 6a in the Central Section, the underground transmission cable would be located in an existing roadway corridor for about 61 miles (98 km). The Project would be similar to Alternative 4a, but would take a slightly different path near the Belknap/Merrimack county border, following NH Route 127 into Merrimack County. **Table 4-139** shows total emissions from the construction activities within the Central Section under Alternative 6a. Construction emissions would be localized and short-term.

Table 4-139. Alternative 6a Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	40.37	4.21	36.73	0.09	107.62	15.29	8,157.67

Construction of the Project under Alternative 6a within the Central Section would require the removal of less than an acre of conifer forest, and 1.4 acres (0.6 ha) of mixed forest. The loss of sequestration capacity is estimated at 140 metric tons of carbon, which is the equivalent of 512 metric tons of CO_2. This would also result in the equivalent loss of 2 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 6a. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.11 Alternative 6b

Impacts from Construction

Under Alternative 6b in the Central Section, the underground transmission cable would be located in an existing roadway corridor for about 76 miles (122 km). The transmission cable would be installed underground for the entire length of the Project in this section, along Routes 112 and 116 through the WMNF as in Alternative 4b, but would take a slightly different path near the Belknap/Merrimack county border, following NH Route 127 into Merrimack County. **Table 4-140** shows total emissions from the construction activities within the Central Section under Alternative 6b. Construction emissions would be localized and short-term.

Table 4-140. Alternative 6b Construction Emissions in the Central Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Central Section	46.72	4.89	42.47	0.10	126.97	18.05	9,404.47

Construction of the Project under Alternative 6b within the Central Section would require the removal of 0 acres (0 ha) of deciduous forest, less than an acre of conifer forest, and 3 acres (1.2 ha) of mixed forest. The loss of sequestration capacity is estimated at 330 metric tons of carbon, which is the equivalent of 1,211 metric tons of CO_2. This would result in the equivalent loss of 5 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 6b. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.3.10.12 Alternative 7 – Proposed Action

Impacts from Construction

Under Alternative 7 in the Central Section, the installation of the transmission line would occur in an existing transmission line corridor for approximately 18 miles. Removal or replacement of the existing transmission lines would be necessary to provide adequate clearance for the new transmission line on some segments of the existing transmission line corridor. In addition, the route would include a total of approximately 52 miles of underground construction, primarily along state roads between Bethlehem and Bridgewater, NH. There would be two converter stations in the Central Section under this alternative. Two concrete batch plants would be needed to support the construction. **Table 4-141** shows total emissions from the construction activities within the Central Section under Alternative 7.

Table 4-141. Alternative 7 Construction Emissions in the Central Section

Action	Emissions (tons)						GHG Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Construction in the Central Section	62.66	6.07	49.47	0.51	146.37	22.49	14,054.07

Key:
CO = carbon monoxide
CO_2 = carbon dioxide
GHG = greenhouse gas
NO_X = nitrogen oxides
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
SO_2 = sulfur dioxide
VOC = volatile organic compound

Construction of the Project under Alternative 7 within the Central Section would require the removal of approximately 11 acres (4.5 ha) of deciduous forest, 6 acres (2.4 ha) of conifer forest, and 35 acres (14 ha) of mixed forest. The loss of carbon sequestration capacity is estimated at 4,057 metric tons, which is the equivalent of 14,889 metric tons of CO_2. This would result in the equivalent loss of 67 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Central Section under Alternative 7. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10.**

4.3.11 WILDLIFE

Refer to **Section 4.1.11** for a discussion of general impacts common to all geographic sections.

The Project has the potential to impact wildlife resources. **Table 4-65** and **Table 4-66** in **Section 4.1.11** present a summary of Project-wide effects to federally- and state-listed species and the determination for federally-listed species. Because the nature of impacts to federally- and state-listed species is similar to that for non-listed species, all impacts are discussed in the General Wildlife discussion.

4.3.11.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.11.2 Alternative 2

Impacts from Construction

Aquatic Species

Impacts to aquatic species could result from injury or mortality to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. With implementation of the APMs listed in **Appendix H**, such as the implementation of a SWPPP, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction, impacts to aquatic species as a whole would be minimized.

Terrestrial Species

Impacts to terrestrial species could result from the same general effects as for aquatic species: direct mortality or injury to individuals, sensory disturbance, and increased depredation. During construction, any mobile terrestrial wildlife (e.g., white-tailed deer, birds) would be expected to flush or flee the area, prior to construction equipment physically clearing vegetation. Impacts would be short-term (wildlife would return to the Project corridor following construction, particularly as vegetation returns) and localized to regional (depending upon the extent of active construction activities). The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase causing increased mortalities and/or injuries.

Alternative 2 would result in the disturbance of approximately 545 acres (221 ha) of wildlife habitat in the Central Section. The majority of this habitat disturbance (241 acres [98 ha]) would occur to forestlands. Of these impacts to forestlands, approximately 151 acres (61 ha) would result from tree clearing for widening of the existing PSNH transmission route. Based on a review of the NHWAP Habitat data, approximately 1.176 million acres (475,910 ha) of forestlands are located within Belknap and Grafton counties.

Because the Project under Alternative 2 in the Central Section would be predominately located within the existing PSNH transmission route, tree clearing would generally be limited to the widening of the existing PSNH transmission route. Thus, no loss of interior forest habitats would occur, although the removal of trees along the edge of the existing PSNH transmission route could have an effect on interior forests located adjacent to the transmission route.

Forest clearing associated with construction in the Central Section would be limited to the edges of the existing PSNH transmission route. Canada lynx are mobile species with large home ranges and any lynx utilizing the Project corridor within the Central Section would be adapted to foraging or denning in the vicinity of the existing PSNH transmission route. The main food source for the lynx (i.e., snowshoe hare) may benefit from the thinning or removal of forested habitat. Studies have shown that snowshoe hares can benefit from clear-cutting or thinning practices as these actions encourage understory growth (Fuller and Harrison 2013). However, increased forest habitat fragmentation from construction could introduce additional competition by other predators of snowshoe hare, such as bobcat or coyote (Buskirk et al. 1999). As the Project under Alternative 2 in the Central Section would be located within an existing PSNH transmission route, any lynx present are expected to readily adapt to utilizing edge habitat. Adverse impacts would be limited to the short-term loss of suitable foraging habitats based on the narrow extent of disturbance.

Bat species may also be impacted by fragmentation and removal of forest and woodland habitats. Bat species such as the Indiana bat typically roost near forest edges or openings. Fragmentation of forest or woodland habitats may decrease connectivity between bat roosting areas and foraging areas. Project-specific surveys identified possible Indiana bats at multiple survey sites within Grafton County, although, no historical records regarding the Indiana bat exist for Grafton or Belknap counties, and the state of New Hampshire does not consider this species to occur within the state (NHFG 2015). In addition, eastern small-footed and northern long-eared bats may be impacted by fragmentation and removal of forest and woodland habitats through effects on foraging habitats. For northern long-eared bats, roosting habitat would also be impacted; the eastern small-footed bat does not roost in trees, so no affects to roosting habitats would be expected. Summer roosts located near the study area could be separated from foraging habitat, resulting in a decrease of connectivity between forest/woodland habitats and foraging areas. Potential impacts on summer roosting habitat are expected to be long-term. However, more than 1.1 million acres (445,344 ha) of forestland in Grafton and Belknap counties, NH, would remain undisturbed during construction would continue to provide suitable habitat. The removal of approximately 241 acres [98 ha]) of forestland would represent less than 0.1 percent of the overall forestland habitats available to wildlife within the counties. Included in **Appendix H** are APMs specific to bat species, and would require that tree removal occurs during bat hibernation periods. Implementation of this APM would avoid impacts to bat species.

Regarding other mammal species, construction activities in the Central Section would remove potentially suitable habitat for forest-dwelling species, such as the American marten, primarily the forestlands at the edge of the existing PSNH transmission route. The effect of forest fragmentation and human disturbance on American martens is poorly studied, but some literature shows that American marten populations decline when forested habitat is removed, although American martens have been observed crossing open areas of various sizes (Buskirk and Ruggiero 1994). As mentioned previously, clearing 151 acres (61 ha) of forested habitats along the edge of the existing PSNH transmission route would result in the removal of potentially suitable habitat for the American marten.

A total of 87 state-listed and four federally-listed threatened or endangered species have the potential to occur in the Central Section (two of the federally-listed species are also listed as threatened or endangered by NHFG). The federally-listed species potentially present in the study area in the Central Section include:

dwarf wedgemussel (endangered), Canada lynx (threatened), Indiana bat (endangered), and northern long-eared bat (threatened). One federally-listed species, the Indiana bat, was identified as potentially occurring in the Central Section during Project-specific field surveys. Twelve state-listed species were detected during Project-specific field surveys: the black-billed cuckoo, Canada warbler, chimney swift, Eastern towhee, field sparrow, northern goshawk, olive-sided flycatcher, prairie warbler, purple finch, ruffed grouse, scarlet tanager, and veery. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed wildlife populations.

Habitat Connectivity

Habitat fragmentation impacts to state- and federally-listed species would vary based on the habitat requirements of the listed species. Because the Project under Alternative 2 in the Central Section would be predominately located within the existing PSNH transmission route, tree clearing would generally be limited to the widening of the existing PSNH transmission route.

The Project under Alternative 2 would be located within an existing PSNH transmission route and no additional new habitat barriers would be created.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repair activities would be similar to those discussed for construction, except that these impacts would occur for shorter periods of time throughout the duration of the Project. There could be short-term, adverse effects resulting from direct mortality or injury to individuals (including collision and electrocution of birds), sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. For impacts to threatened and endangered wildlife species see **Section 4.3.11**.

The impacts of habitat loss, type conversion, and fragmentation described for construction would persist in the long term. Habitat loss and/or modification of existing habitats in the study area during the operation of the Project would also have adverse impacts. The majority of the disturbance would result from the widening of the existing PSNH transmission route. Additional habitat loss during operation is associated with new tower placement and removed towers.

Habitat loss and/or modification of existing habitats in the study area during the operation of the Project would also have adverse impacts. The majority of the disturbance would result from the expansion of the existing PSNH transmission route; these areas would be revegetated and would persist as maintained transmission route habitat throughout the operation of the Project.

4.3.11.3 Alternative 3

Impacts from Construction

Aquatic Species

Construction-related impacts to aquatic wildlife associated with habitat loss/modification would be similar to those discussed in Alternative 2, although at a reduced scale, based on the smaller disturbance area for Alternative 3, as a narrower construction corridor would be utilized. However, impacts to waterbody crossings would be greater for disturbances for underground transmission cable installation involving excavation of banks and channels for cable installation. Impacts would include disturbance in the trench area and suspension of sediments, resulting in short-term, adverse impacts at the specific waterbody crossings.

Terrestrial Species

Under Alternative 3, approximately 342 acres (138 ha) of wildlife habitat would be impacted by the Project. Of this total, 237 acres (96 ha) would be associated with the construction pad in the existing PSNH transmission route, while 79 acres (32 ha) would be associated with the trench area, and 26 acres (11 ha) associated with access roads. No interior forest would be impacted nor would any new habitat fragmentation be developed as a result of Alternative 3.

This habitat loss during construction would displace the majority of wildlife species within the transmission route. However, the extent of this displacement would be limited as the construction corridor would be relatively narrow (approximately 40 feet [12 m] wide), when compared to the adjoining forestlands (less than 0.1 percent removal of forestlands in Grafton and Belknap counties, NH). As clearing and grading activities would be confined to the transmission route and other work areas, suitable habitat for many wildlife species would remain undisturbed in habitats adjacent to the transmission route for the duration of construction.

Habitat Connectivity

In the Central Section, the Project under Alternative 3 would be located within an existing PSNH transmission route and would require minimal widening of the existing PSNH transmission route. Therefore, no additional habitat fragmentation or new habitat edges would be created. Impacts would be similar to Alternative 2 in the Central Section except that there would be no aboveground Project components.

Impacts from Operations, Maintenance, and Emergency Repairs

Potential impacts related to operation and maintenance equipment, vehicles, and personnel would generally be similar to those occurring during the construction phase of the Project, except that these impacts would occur for shorter periods of time throughout the duration of the Project. Other, long-term impacts resulting from the Project would generally be similar to those discussed for Alternative 2 (see **Section 4.3.11.2**), although the cable would be buried, eliminating the operational effects related to an overhead transmission line.

Impacts due to habitat fragmentation would be similar to those discussed for Alternative 2, except that there would be no aboveground Project components.

4.3.11.4 Alternative 4a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.3.11.3**); however, Alternative 4a would located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

As Alternative 4a would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Under Alternative 4a, approximately 78 acres (32 ha) of wildlife habitat would be impacted by the Project. Impacts would occur to approximately 56 acres (23 ha) of mowed ROW, 19 acres (8 ha) of developed lands, and 2 acres (0.8 ha) of forested habitats. The remaining 1 acre (0.8 ha) of impacts would occur in other habitat types.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 4a would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**), although adverse impacts would be reduced, as this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

4.3.11.5 Alternative 4b

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.3.11.3**); however, Alternative 4b would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

As Alternative 4b would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Under Alternative 4b, approximately 91 acres (37 ha) of wildlife habitat would be impacted by the Project, entirely from the installation of the underground line. The majority of impacts would occur to approximately 51 acres (21 ha) of mowed ROW, 34 acres (14 ha) of developed lands, and 4 acres (2 ha) of forested habitats. The remaining 1 acre (0.8 ha) of impacts would occur in other habitat types.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both would be buried in roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both would be buried in roadway corridors.

4.3.11.6 Alternative 4c

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.3.11.3**); however, Alternative 4c would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

As Alternative 4c would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Under Alternative 4c, up to 87 acres (35 ha) of wildlife habitat would be impacted by the Project, entirely from the installation of the underground cable. The majority of impacts would occur to approximately 55 acres (22 ha) of developed lands, 27 acres (11 ha) of mowed ROW and 4 acres (2 ha) of forested habitats. The remaining 1 acre (0.8 ha) of impacts would occur in other habitat types.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both would be buried in roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both would be buried in roadway corridors.

4.3.11.7 Alternative 5a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be identical to those discussed under Alternative 2 (see **Section 4.3.11.2**) for aboveground portions and similar to those discussed for Alternative 3 (see **Section 4.3.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines. However, Alternative 5a would be located along existing roadways which would limit its impact to aquatic species.

Terrestrial Species

In the Central Section, Alternative 5a would include overhead transmission line, underground cable, and aboveground transition stations. For the overhead portion, approximately 345 acres (140 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 144 acres (58 ha) of forestlands. Approximately 90 acres (36 ha) of the impacts to forestlands would result from tree clearing for widening of the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would continue to persist during operation of the Project.

For the underground portion, approximately 25 acres (10 ha) of wildlife habitat would be impacted by the Project. Impacts would occur to approximately 20 acres (8 ha) of mowed ROW, 3 acres (1 ha) of developed lands, and 0.6 acre (0.2 ha) of forested habitats. The remaining 1 acre (0.8 ha) of impacts would occur in other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5a would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.11.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.3.11.4**).

4.3.11.8 Alternative 5b

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be identical to those discussed under Alternative 2 (see **Section 4.3.11.2**) for aboveground portions, and similar to those discussed under Alternative 3 (see **Section 4.3.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines. However, Alternative 5b would be located along existing roadways which would limit its impact to aquatic species.

Terrestrial Species

In the Central Section, Alternative 5b would include overhead transmission line, underground cable, and aboveground transition stations. For the overhead portion, approximately 464 acres (188 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 209 acres (85 ha) of forestlands. Approximately 128 acres (52 ha) of the impacts to forestlands would result from tree clearing for widening of the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would continue to persist during operation of the Project.

For the underground portion, up to 13 acres (5 ha) of wildlife habitats would be impacted by the Project. Impacts would occur to approximately 8 acres (3 ha) of developed lands, 3 acres (1 ha) of mowed ROW and 2 acres (0.8 ha) of forested habitats. The remaining 0.2 acre (0.08 ha) of impacts would occur in other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5b would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.11.2**), and effects for underground portions would be identical to those described for Alternative 4b (see **Section 4.3.11.5**).

4.3.11.9 Alternative 5c

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.3.11.2**) for aboveground portions, and similar to those discussed under Alternative 4c (see **Section 4.3.11.9**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines. However, Alternative 5c would be located along existing roadways which would limit its impact to aquatic species.

Terrestrial Species

In the Central Section, Alternative 5c would include overhead transmission line, underground cable, and aboveground transition stations. For the overhead portion, approximately 356 acres (144 ha) of wildlife habitats would be impacted by the Project. Of this, impacts would occur to approximately 149 acres (60 ha) of forestlands. Approximately 92 acres (37 ha) of the impacts to forestlands would result from tree clearing for widening of the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would persist during operation of the Project.

For the underground portion, approximately 26 acres (11 ha) of wildlife habitats would be impacted by the Project Impacts would occur to approximately 16 acres (6 ha) of developed lands, 7 acres (3 ha) of mowed ROW, and 3 acres (1 ha) of forested habitats. The remaining 0.5 acre (0.2 ha) of impacts would occur in other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5c would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.11.2**), and effects for underground portions would be identical to those described for Alternative 4c (see **Section 4.3.11.6**).

4.3.11.10 Alternative 6a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.3.11.3**); however, Alternative 6a would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

As Alternative 6a would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Under Alternative 6a, approximately 75 acres (30 ha) of wildlife habitats would be impacted by the Project The majority of impacts would occur to approximately 53 acres (21 ha) of mowed ROW, 19 acres (8 ha) of developed lands, and 2 acres (0.8 ha) of forested habitat. The remaining 1 acre (0.4 ha) of impacts would occur in other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both alternatives would be buried in roadway corridors in the Central Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both alternatives would be buried in roadway corridors in the Central Section.

4.3.11.11 Alternative 6b

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.3.11.3**); however, Alternative 6b would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

As Alternative 6b would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.3.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Under Alternative 6b, approximately 88 acres (36 ha) of wildlife habitats would be impacted by the Project. The majority of impacts would occur to approximately 48 acres (19 ha) of mowed ROW, 34 acres (14 ha) of developed lands, and 4 acres (2 ha) or forested habitat. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both alternatives would be buried in roadway corridors in the Central Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.3.11.4**) because, despite following different alignments, both alternatives would be buried in roadway corridors in the Central Section.

4.3.11.12 Alternative 7 – Proposed Action

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.3.11.2**) for aboveground portions, and similar to those discussed under Alternative 3 (see **Section 4.3.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines. However, the majority of Alternative 7 would be located along existing roadways, within the Central Section, which would limit its impact to aquatic species.

Terrestrial Species

In the Central Section, Alternative 7 would include overhead transmission line, underground cable, and aboveground transition stations. For the overhead portion, approximately 145 acres (59 ha) of wildlife habitats would be impacted by the Project. Of this, impacts would occur to approximately 47 acres (19 ha) of forestlands. Approximately 31 acres (13 ha) of the impacts to forestlands would result from tree clearing for widening of the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would persist during operation of the Project.

For the underground portion, approximately 56 acres (11 ha) of wildlife habitats would be impacted by the Project. Impacts would occur to approximately 43 acres (6 ha) of developed lands, 9 acres (4 ha) of mowed ROW, and 4 acres (2 ha) of forested habitats. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 7 would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 7, operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.3.11.2**), and effects for underground portions would be identical to those described for Alternative 4c (see **Section 4.3.11.6**).

4.3.12 VEGETATION

Refer to **Section 4.1.12** for a discussion of general impacts common to all geographic sections.

4.3.12.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.12.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 534 acres (216 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 241 acres (98 ha) of forested habitats. Of the 241 acres (98 ha) of impacts to forests, 151 acres (61 ha) of impacts would result from tree clearing for widening the existing PSNH transmission route.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 2 would be associated with the installation of HVDC towers and would affect 0.8 acre (0.3 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of these facilities.

The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Central Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. No other federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions. Refer to **Section 4.1.12.2** for impacts on operation, maintenance and emergency repairs.

4.3.12.3 Alternative 3

Impacts from Construction

Under Alternative 3, approximately 332 acres (134 ha) of vegetated habitats would be impacted by the Project. Approximately 231 acres (93 ha) of disturbance would be associated with construction pads in the existing PSNH transmission route, 77 acres (31 ha) would be associated with cable burial, and 25 acres (10 ha) would be associated with access roads. Of the 231 acres (93 ha) of disturbance due to construction pads, impacts would occur to approximately 75 acres (30 ha) of mowed ROW, 94 acres (38 ha) of scrub-shrub habitats, and 33 acres (13 ha) of wetland habitats; the remaining impacts would occur to other habitat types (see **Section 4.1.12.1**). Of the 77 acres (31 ha) of disturbance associated with cable burial, impacts would occur to approximately 26 acres (11 ha) of mowed ROW and 32 acres (13 ha) of scrub-shrub communities; the remaining impacts would occur to other habitat types.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Central Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. No other federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 3, long-term impacts would result from the control of tree growth over the underground cable and periodic mowing of the corridor.

4.3.12.4 Alternative 4a

Impacts from Construction

Under Alternative 4a, approximately 59 acres (24 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 56 acres (23 ha) of mowed ROW and 2 acres (0.8 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4a the Project would be located underground in roadway corridors, and no additional long-term impacts would result from operation (see **Section 4.1.12.2**).

4.3.12.5 Alternative 4b

Impacts from Construction

Under Alternative 4b, approximately 57 acres (23 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 51 acres (21 ha) of mowed ROW and 4 acres (2 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4b, the Project would be located underground in roadway corridors, and no additional long-term impacts would result from operation (see **Section 4.1.12.2**).

4.3.12.6 Alternative 4c

Impacts from Construction

Under Alternative 4c, approximately 32 acres (13 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 27 acres (11 ha) of mowed ROW and 4 acres (2 ha) of forested habitats; the remaining impacts would occur to other habitat types.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4c, the Project would be located underground in roadway corridors, and no additional long-term impacts would result from operation (see **Section 4.1.12.2**).

4.3.12.7 Alternative 5a

Impacts from Construction

In the Central Section, Alternative 5a would include both overhead and underground portions. For the overhead portion, approximately 335 acres (136 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 144 acres (58 ha) of forested habitats. Of this, 144 acres (58 ha) of impacts to forests, approximately 90 acres (36 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route.

For the underground portion, approximately 22 acres (9 ha) of vegetated habitats would be impacted by the Project depending. Impacts would occur to approximately 20 acres (8 ha) of mowed ROW and 0.6 acre (0.2 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would persist during operation of the Project.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 5a would be associated with the installation of HVDC towers and transition stations for the underground portion and would be approximately 2 acres (0.8 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of these facilities.

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5a, long-term impacts would result from the control of tree growth over the underground cable and periodic mowing of the corridor (see **Section 4.1.12.2**).

4.3.12.8 Alternative 5b

Impacts from Construction

In the Central Section, Alternative 5b would include both overhead and underground portions. For the overhead portion, approximately 453 acres (183 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 209 acres (85 ha) of forested habitats. Of the 209 acres (85 ha) of impacts to forests, approximately 128 acres (52 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route.

For the underground portion, approximately 5 acres (2 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of mowed ROW and 2 acres (0.8 ha) of forested habitats. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 5b would be associated with the installation of HVDC towers and transition stations for the underground portion and would be approximately 2 acres (0.8 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of these facilities.

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.3.12.9 Alternative 5c

Impacts from Construction

In the Central Section, Alternative 5c would include both overhead and underground portions. For the overhead portion, approximately 345 acres (140 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 149 acres (60 ha) of forested habitats. Of the 149 acres (60 ha) of impacts to forests, approximately 92 acres (37 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route.

For the underground portion, approximately 10 acres (4 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 7 acres (3 ha) of mowed ROW and 3 acres (1 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 5c would be associated with the installation of HVDC towers and transition stations for the underground portion and would be approximately 2 acres (0.8 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of these facilities.

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.3.12.10 Alternative 6a

Impacts from Construction

Under Alternative 6a, approximately 56 acres (23 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 53 acres (21 ha) of mowed ROW and 2 acres (0.8 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6a, the Project would be located underground in roadway corridors, and no additional long-term impacts would result from operation (see **Section 4.1.12.2**).

4.3.12.11 Alternative 6b

Impacts from Construction

Under Alternative 6b, approximately 54 acres (22 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 48 acres (19 ha) of mowed ROW, and 4 acres (2 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6b, the Project would be located underground in roadway corridors, and no additional long-term impacts would result from operation (see **Section 4.1.12.2**).

4.3.12.12 Alternative 7 – Proposed Action

Impacts from Construction

In the Central Section, Alternative 7 would include both overhead and underground portions. For the overhead portion, approximately 141 acres (57 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 47 acres (19 ha) of forested habitats. Of the 47 acres (19 ha) of impacts to forests, approximately 31 acres (13 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route.

For the underground portion, approximately 13 acres (5 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 9 acres (4 ha) of mowed ROW and 4 acres (2 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 7 would be associated with the installation of HVDC towers and transition stations for the underground portion and would be approximately 2 acres (0.8 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of these facilities.

No federally- or state-listed plant species were observed during Project-specific surveys in 2013 and 2014. However, the Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.3.13 WATER RESOURCES

Refer to **Section 4.1.13** for a discussion of general impacts common to all geographic sections. As discussed in **Section 4.1.13**, short-term and long-term impacts to water resources would result from construction of the Project. In general, construction activities including overstory vegetation removal and installation of aboveground and underground facilities would result in ground disturbance and associated impacts to water quality including erosion and sedimentation. With APMs listed in **Appendix H** such as developing an EPSC

Plan, short-term and long-term impacts would be avoided or minimized from construction, operation, maintenance, and emergency repairs.

Table 4-142 presents direct, temporary and secondary wetland impacts in the Central Section for all alternatives. Direct disturbance includes the permanent loss from placement of structures such as towers, substations, and converter and transitions stations within wetlands. Temporary disturbance includes alteration of wetlands such as cutting trees and use of swamp mats during construction. Secondary disturbance includes the permanent conversion of forested wetlands to either scrub-shrub or emergent wetland. Refer to the **Water Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for impact to wetland by type (e.g., PEM, PFO, and PSS).

Table 4-142. Wetlands Impacts within the Study Area of the Central Section

Alternatives	Direct Disturbance acres (ha)	Temporary Disturbance acres (ha)	Secondary Disturbance acres (ha)
1 (No Action)	0 (0)	0 (0)	0 (0)
2	<0.5 (<0.5)	50 (20)	3 (1)
3	<0.5 (<0.5)	46 (19)	1 (0.5)
4a	<0.5 (<0.5)	0.5 (<0.5)	0 (0)
4b	0 (0)	<0.5 (<0.5)	0 (0)
4c	0 (0)	<0.5 (<0.5)	0 (0)
5a	<0.5 (<0.5)	19 (8)	3 (1)
5b	<0.5 (<0.5)	35 (14)	3 (1)
5c	<0.5 (<0.5)	20 (8)	3 (1)
6a	<0.5 (<0.5)	<0.5 (<0.5)	0 (0)
6b	0 (0)	<0.5 (<0.5)	0 (0)
7 (Proposed Action)	<0.5 (<0.5)	8 (3)	2 (1)

4.3.13.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.13.2 Alternative 2

Impacts from Construction

Watersheds

Under Alternative 2, construction disturbance would impact multiple watersheds in the Central Section including 42 acres (17 ha) of the Salmon Hole Brook-Ammonoosuc River Watershed, 46 acres (19 ha) of the Harper Brook-Pemigewasset River Watershed, and 51 acres of the Clay Brook-Pemigewasset River Watershed.

Surface Water

Under Alternative 2, approximately 4 miles (6 km) of waterbodies would be crossed by the Project. Less than 0.5 mile (0.8 km) of these waterbodies are considered impaired per the state 303(d) list. With the application of APMs identified in **Appendix H**, Alternative 2 would not further impair this waterbody.

In addition, removal of 1 acre (0.6 ha) of various forest types, including conifer, deciduous and mixed hard/softwood forests, within 100 feet (30 m) of a stream would result in secondary impacts to surface waters.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 2, approximately 130 acres (53 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources because of minimal ground disturbance and blasting needed for overhead transmission lines; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 2 in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 703 acres (285 ha) of disturbance would occur in SWPAs under Alternative 2 in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 87 acres (35 ha) of disturbance would occur in WHPAs as a result of clearing and construction activities.

Floodplains

Under Alternative 2, approximately 489 acres (198 ha) of disturbance would occur in FEMA Flood Zones: 9 acres (4 ha) of Zone A; 4 acres (2 ha) of Zone AE; 436 acres (176 ha) of Zone X; and 40 acres (16 ha) of undesignated area.[93] With the implementation of APMs (see **Appendix H**), any adverse impact is expected to be short term and localized. The only construction with permanent footprints of note would be the transmission tower foundations.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers. Temporary, short-term impacts would affect approximately 50 acres (20 ha) of wetlands (see **Table 4-142**). Of the 50 acres (20 ha) of temporary impacts, approximately 32 acres (13 ha) would be to PEM wetlands and 18 acres (7 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 3 acres (1 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

To minimize wetland impacts, Alternative 2 includes implementation of APMs listed in **Appendix H** for containment of trench material and minimizing sedimentation to the adjacent portions of a wetland, and APMs for restoring wetland contours and hydrology following transmission cable installation.

Vernal Pools

Under Alternative 2, five vernal pools would be impacted. Less than 0.5 acre (<0.5 ha) of direct impacts to vernal pools would be expected. Most impacts would be associated with expansion of the existing PSNH transmission route. Since Alternative 2 proposes overhead transmission line construction, impacts may be avoided by relocating towers to avoid vernal pools. Secondary impacts to vernal pools would also occur where less than 0.5 acre (<0.5 ha) of upland forest is removed within 100 feet (30 m) of a vernal pool.

[93] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

With implementation of APMs listed in **Appendix H** impacts to vernal pools would be minimized. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.3.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts from operations, maintenance and emergency repairs would be similar to short-term construction activities but would occur for shorter durations over the life of the Project.

Long-term impacts are anticipated on water resources from the operation of the Project under Alternative 2 in the Central Section. New or relocated towers could be located in floodplains or disturb wetland areas or other surface drainage features. The towers are not anticipated to have a long-term impact on flood zones as their footprint is relatively small in comparison to the local flood zone and any displacement of water during a flood event is expected to be minimal.

4.3.13.3 Alternative 3

Impacts from Construction

Watersheds

Under Alternative 3, construction disturbance would impact multiple watersheds in the Central Section including 33 acres (13 ha) of the Clay Brook-Pemigewasset River Watershed and 31 acres (13 ha) of the Ham Branch Watershed, which are the watersheds with the two largest disturbance areas in the Central Section under Alternative 3.

Surface Water

Under Alternative 3, approximately 2 miles (3 km) of waterbodies would be crossed by the Project; less than 0.5 mile (0.8 km) are impaired waterbodies on the CWA 303(d) list. With the application of APMs identified in **Appendix H**, Alternative 3 would not further impair this waterbody.

In addition, removal of 0.5 acre (<0.5 ha) of various forest types, including conifer, deciduous and mixed hard/softwood forests, within 100 feet (30 m) of a stream would result in secondary impacts to surface waters.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 3 approximately 87 acres (35 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. Potential impacts to groundwater would include blasting and/or inadvertent chemical releases through groundwater being more susceptible to infiltration by on-site materials from spills or leaks. Installation and long-term use of the transmission lines would not be expected to have a detrimental effect on groundwater resources.

Water Supply

Under Alternative 3 in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 455 acres (184 ha) of disturbance would occur in SWPAs under Alternative 3 in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 53 acres (21 ha) of disturbance would occur in WHPAs as a result of cable burial activities.

Floodplains

Alternative 3 would disturb approximately 299 acres (121 ha) of FEMA Flood Zones: 6 acres (2 ha) of Zone A; 4 acres (2 ha) of Zone AE; 266 acres (108 ha) of Zone X; and 22 acres (9 ha) of undesignated areas.[94] These impacts are expected to be short term and localized.

Wetlands

Approximately less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the Central Section under Alternative 3. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 46 acres (19 ha) of wetlands (see **Section 4.1.13.1**). Of the 46 acres (19 ha) of temporary impacts, approximately 29 acres (12 ha) would be to PEM wetlands and 17 acres (7 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 1 acre (0.5 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

Under Alternative 3, three vernal pools would be impacted. Less than 0.5 acre (<0.5 ha) of direct impacts to vernal pools would be expected. Most impacts would be associated with vegetation removal in the existing PSNH transmission route. Vernal pools are considered a valued resource. The impact would be expected to be short term. Secondary impacts to vernal pools would also occur where less than 0.5 acre (<0.5 ha) of PFO wetlands and less than 0.5 acre (<0.5 ha) of upland forest would be removed within 100 feet (30 m) of a vernal pool.

With implementation of APMs listed in **Appendix H** for restoring contours and hydrology, impacts to vernal pools would minimized. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.3.11.3**).

Impacts from Operations, Maintenance, and Emergency Repairs

The entirety of Alternative 3 would be underground; long-term impacts on water resources are not anticipated from the burial of the cables. Maintenance grading and drainage control would present potential impacts associated with erosion, runoff, flooding potential, and sedimentation from vehicle use.

4.3.13.4 Alternative 4a

Impacts from Construction

Watersheds

Under Alternative 4a, construction disturbance would impact multiple watersheds including 12 acres (5 ha) of the headwaters of the Pemigewassett River Watershed and 9 acres (4 ha) of the Harper Brook-Pemigewassett River Watershed, which are the watersheds with the two largest total disturbance areas.

[94] The floodplain areas with no designation indicate areas that are in the panel area, but are not in the jurisdiction of that community; thus, flood hazard information is shown in that area.

Surface Water

Under Alternative 4a, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Central Section. Of the less than 0.5 mile (0.8 km) of waterbodies, less than 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 4a, approximately 40 acres (16 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4a in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 90 acres (36 ha) of disturbance would occur in SWPAs under Alternative 4a in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 12 acres (5 ha) of disturbance would occur in WHPAs as a result of cable burial activities under Alternative 4a in the Central Section.

Floodplains

Under Alternative 4a, approximately 57 acres (23 ha) of disturbance would occur in FEMA Flood Zones: 3 acres (1 ha) of Zone A; 0.7 acre (<0.5 ha) of Zone AE; 44 acres (18 ha) of Zone X; and 9 acres (4 ha) are not in a designated zone. This disturbance is not anticipated to create adverse impacts to floodplains.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct impacts from installation of structures under Alternative 4a. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 0.5 acre (<0.5 ha) of wetlands (see **Section 4.1.13.1**). Of the approximate 0.5 acre (<0.5 ha) of temporary impacts, all would be to PEM wetlands. No secondary impacts would occur to approximately PFO wetlands within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

No vernal pools were identified in the Alternative 4a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4a would be similar to those described for the Project under Alternative 3 in the Central Section (see **Section 4.3.13.3**), as the Project would be underground for both alternatives. However, impacts under Alternative 4a would occur along roadway corridors which would allow for easier access and fewer impacts to water resources.

4.3.13.5 Alternative 4b

Impacts from Construction

Watersheds

Under Alternative 4b, construction disturbance would impact multiple watersheds including 9 acres (4 ha) of the Ham Branch Watershed and 9 acres (4 ha) of the Meadow Brook-Gale River Watershed, which are the watersheds with the two largest disturbance areas in the Central Section.

Surface Water

Under Alternative 4b, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Central Section. Of this amount, less than 0.1 mile (0.2 km) are impaired waterbodies on the 303(d) list. With the application of APMs identified in **Appendix H**, Alternative 4b would not further impair these waterbodies.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 4b, approximately 52 acres (21 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. Approximately less than 0.5 acre (<0.5 ha) of disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4b in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 122 acres (49 ha) of disturbance would occur in SWPAs under Alternative 4b in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 13 acres (5 ha) of disturbance would occur in WHPAs as a result of cable burial activities under Alternative 4b in the Central Section.

Floodplains

Under Alternative 4b in the Central Section, approximately 70 acres (28 ha) of disturbance would occur in FEMA Flood Zones: 4 acres (2 ha) of Zone A; 2 acres (1 ha) of Zone AE; and 64 acres (26 ha) of Zone X.

Wetlands

No wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the Central Section under Alternative 4b. Temporary, short-term impacts, primarily from transmission cable installation, would affect less than 0.5 acre (<0.5 ha) of wetlands (see **Section 4.1.13.1**). Of the less than 0.5 acre (<0.5 ha) of temporary impacts, almost all would be to PEM wetlands. No wetlands would experience secondary impacts.

Vernal Pools

No vernal pools were identified in the Alternative 4b Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a (see **Section 4.3.13.4**).

4.3.13.6 Alternative 4c

Impacts from Construction

Watersheds

Under Alternative 4c, construction disturbance would impact multiple watersheds including 9 acres (4 ha) of the Harper Brook-Pemigewasset River Watershed and 9 acres (4 ha) of the Ham Branch Watershed.

Surface Water

Under Alternative 4c, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Central Section. None of the waterbodies crossed are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 4c in the Central Section, approximately 55 acres (22 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. Approximately less than 0.5 acre (<0.5 ha) of disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4c in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 116 acres (47 ha) of disturbance would occur in SWPAs under Alternative 4c in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 10 acres (4 ha) of disturbance would occur in WHPAs as a result of burial activities under Alternative 4c in the Central Section.

Floodplains

Under Alternative 4c in the Central Section, approximately 66 acres (27 ha) of disturbance would occur in FEMA Flood Zones: 2 acres (1 ha) of Zone A; 3 acres (1 ha) of Zone AE; and 60 acres (24 ha) of Zone X.

Wetlands

No wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the Central Section under Alternative 4c. Temporary, short-term impacts, primarily from transmission cable installation, would affect less than 0.5 acre (<0.5 ha) of wetlands (see **Section 4.1.13.1**). Of the less than 0.5 acre (<0.5 ha) of temporary impacts, all would be to PEM wetlands. No wetlands would experience secondary impacts.

Vernal Pools

No vernal pools were identified in the Alternative 4c Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a (see **Section 4.3.13.4**).

4.3.13.7 Alternative 5a

Impacts from Construction

Watersheds

Under Alternative 5a, construction disturbance would impact multiple watersheds in the Central Section including 51 acres (21 ha) of the Clay Brook-Pemigewasset River Watershed, and 46 acres (19 ha) of the Harper Brook-Pemigewasset River Watershed, which are the watersheds with the two largest total disturbance areas in the Central Section.

Surface Water

Under Alternative 5a, disturbance areas would cross approximately 2 miles (3 km) of waterbodies in the Central Section. Of this amount, less than 0.5 mile (0.8 km) are listed as 303(d) impaired waterbodies.

In addition, removal of 1 acre (0.5 ha) of various forest types, including conifer, deciduous and mixed hard/softwood forests, within 100 feet (30 m) of a stream would result in secondary impacts to surface waters.

Groundwater

Under Alternative 5a in the Central Section, approximately 126 acres (51 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 5a in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 417 acres (169 ha) of disturbance would occur in SWPAs under Alternative 5a in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 90 acres (36 ha) of disturbance would occur in WHPAs as a result of cable burial activities under Alternative 5a in the Central Section.

Floodplains

Under Alternative 5a in the Central Section, approximately 314 acres (127 ha) of disturbance would occur in FEMA Flood Zones: 7 acres (3 ha) of Zone A; 2 acres (0.8 ha) of Zone AE; 296 acres (120 ha) of Zone X; and approximately 9 acres (4 ha) are not in a designated zone. These impacts are expected to be short term and localized.

Wetlands

Approximately less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers and transition stations. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 19 acres (8 ha) of wetlands (see **Section 4.1.13.1**). Of the 19 acres (8 ha) of temporary impacts, approximately 12 acres (5 ha) would be to PEM wetlands and 6 acres (0.8 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 3 acres (1 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

The direct impacts to three vernal pools from construction of Alternative 5a would be less than 0.5 acre (<0.5 ha). Secondary impacts to vernal pools would also occur where approximately less than 1 acre (<0.5 ha) of upland forest is removed within 100 feet (30 m) of a vernal pool.

With implementation of APMs listed in **Appendix H** for restoring contours and hydrology, impacts to vernal pools would be minimized. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.3.11.7**).

Impacts from Operations, Maintenance, and Emergency Repairs

Since the transmission lines/cable would be installed both overhead in the existing PSNH transmission route and underground along roadway corridors, impacts from operations, maintenance, and emergency repairs under Alternative 5a would be similar to Alternative 2 for overhead portions (see **Section 4.3.13.2**) and Alternative 4a for underground portions (see **Section 4.3.13.4**).

4.3.13.8 Alternative 5b

Impacts from Construction

Watersheds

Under Alternative 5b, construction disturbance would impact multiple watersheds in the Central Section including 51 acres (21 ha) of the Clay Brook-Pemigewasset River Watershed, 46 acres (19 ha) of the Harper Brook-Pemigewasset River Watershed, and 42 acres (17 ha) of the Salmon Hole Harper Brook-Ammonoosuc River Watershed, which are the watersheds with the three largest total disturbance areas in the Central Section.

Surface Water

Under Alternative 5b, approximately 3 miles (5 km) of waterbodies would be crossed by the Project in the Central Section. Of this, 3 miles (5 km) of waterbodies crossed, less than 0.5 mile (0.8 km) are impaired waterbodies on the 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 5b in the Central Section, approximately 135 acres (55 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 5b in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 617 acres (250 ha) of disturbance would occur in SWPAs under Alternative 5b in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 87 acres of disturbance (35 ha) would occur in WHPAs as a result of clearing activities under Alternative 5b in the Central Section.

Floodplains

Under Alternative 5b in the Central Section, approximately 421 acres (170 ha) of disturbance would occur in FEMA Flood Zones: 9 acres (4 ha) of Zone A; 4 acres (2 ha) of Zone AE; and 408 acres (165 ha) of Zone X. These impacts are expected to be short term and localized.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers and transition stations. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 35 acres (14 ha) of wetlands (see **Section 4.1.13.1**). Of the 35 acres (14 ha) of temporary impacts, approximately 25 acres (10 ha) would be to PEM wetlands and 10 acres (4 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 3 acres (1 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

Alternative 5b would directly impact less than 0.5 acre (<0.5 ha) to five vernal pools in the Central Section. Impacts would be associated with widening of the existing corridor. Secondary impacts to vernal pools would also occur where less than 0.5 acre (<0.5 ha) of upland forest is removed within 100 feet (30 m) of a vernal pool.

With implementation of APMs listed in **Appendix H** for restoring contours and hydrology, impacts to vernal pools would be minimized. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.3.11.8**).

Impacts from Operations, Maintenance, and Emergency Repairs

Since the transmission lines/cable would be installed both overhead in the existing PSNH transmission route and underground along roadway corridors, impacts from operations, maintenance, and emergency repairs under Alternative 5a would be similar to Alternative 2 for overhead portions (see **Section 4.3.13.2**) and Alternative 4a for underground portions (see **Section 4.3.13.4**).

4.3.13.9 Alternative 5c

Impacts from Construction

Watersheds

Under Alternative 5c, construction disturbance would impact multiple watersheds in the Central Section including 51 acres (21 ha) of the Clay Brook-Pemigewasset River Watershed and 46 acres (19 ha) of the Harper Brook-Pemigewasset River Watershed, which are the watersheds with the two largest disturbance areas in the Central Section.

Surface Water

Under Alternative 5c, up to 2 miles (3 km) of waterbodies would be crossed by the Project in the Central Section. Of this distance, less than 0.5 mile (0.8 km) are impaired waterbodies on New Hampshire's 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 5c in the Central Section, approximately 138 acres (56 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. Approximately less than 0.5 acre (<0.5 ha) of disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 5c in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 441 acres (178 ha) of disturbance would occur in SWPAs under Alternative 5c in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 87 acres (35 ha) of disturbance would occur in WHPAs as a result of clearing activities under Alternative 5c in the Central Section.

Floodplains

Under Alternative 5c in the Central Section, approximately 325 acres (131 ha) of disturbance would occur in FEMA Flood Zones: 7 acres (3 ha) of Zone A; 6 acres (2 ha) of Zone AE; and 312 acres (126 ha) of Zone X. These impacts are expected to be short term and localized.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers and transition stations. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 20 acres (8 ha) of wetlands (see **Table 4-142**). Of the 20 acres (8 ha) of temporary impacts, approximately 12 acres (5 ha) would be to PEM wetlands and 7 acres (3 ha) would be to PSS wetlands. Secondary impacts would occur to approximately 3 acres (1 ha) of PFO wetland within 100 feet (30 m) of a stream where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

Alternative 5c would directly impact less than 0.5 acre (<0.5 ha) of four vernal pools. The loss of habitat associated with vernal pools would impact aquatic wildlife species that rely on this habitat type (see **Section 4.3.11.9**). Secondary impacts to vernal pools would also occur where approximately less than 0.5 acre (<0.5 ha) of upland forest is removed within 100 feet (30 m) of a vernal pool.

Impacts from Operations, Maintenance, and Emergency Repairs

Since the transmission lines/cable would be installed both overhead in the existing PSNH transmission route and underground along roadway corridors, impacts from operations, maintenance, and emergency repairs under Alternative 5a would be similar to Alternative 2 for overhead portions (see **Section 4.3.13.2**) and Alternative 4a for underground portions (see **Section 4.3.13.4**).

4.3.13.10 Alternative 6a

Impacts from Construction

Watersheds

Under Alternative 6a, construction disturbance would impact multiple watersheds including 12 acres (5 ha) of the headwaters of the Pemigewassett River Watershed and 9 acres (4 ha) of the Harper Brook-Pemigewassett River Watershed, which are the watersheds with the two largest disturbance areas.

Surface Water

Under Alternative 6a, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Central Section. Of this distance, less than 0.1 mile (0.2 km) are impaired waterbodies on New Hampshire's 303(d) list. With the application of APMs identified in **Appendix H**, Alternative 6a would not further impair these waterbodies.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 6a in the Central Section, approximately 335 acres (136 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 6a in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 87 acres (35 ha) of disturbance would occur in SWPAs under Alternative 6a in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 13 acres (5 ha) of disturbance would occur in WHPAs as a result of burial activities under Alternative 6a in the Central Section.

Floodplains

Under Alternative 6a in the Central Section, approximately 57 acres (23 ha) of disturbance would occur in FEMA Flood Zones: 3 acres (1 ha) of Zone A; less than 0.5 acre (<0.5 ha) of Zone AE; 44 acres (17 ha) of Zone X; and 9 acres (4 ha) of undesignated areas. These impacts are expected to be short term and localized.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts in the Central Section under Alternative 6a. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 0.5 acre (<0.5 ha) of wetlands (see **Table 4-142**). All of the temporary impacts would be to PEM wetlands. No secondary impacts would occur to PFO wetlands within 100 feet (30 m) of a stream.

Vernal Pools

No vernal pools were identified in the Alternative 6a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

The impacts on water resources from operation, maintenance, and emergency repairs of Alternative 6a in the Central Section would be similar to those of Alternative 4a (see **Section 4.3.13.4**), because they would follow nearly the same alignment.

4.3.13.11 Alternative 6b

Impacts from Construction

Watersheds

Under Alternative 6b, construction disturbance would impact multiple watersheds including 9 acres (4 ha) of the Ham Branch Watershed and 9 acres (4 ha) of the Harper Brook-Pemigewasset River Watershed, which are the watersheds with the two largest total disturbance areas in the Central Section.

Surface Water

Under Alternative 6b, less than 0.5 mile (0.8 km) of waterbodies would be crossed by the Project in the Central Section. Of this distance, less than 0.1 mile (0.2 km) are impaired waterbodies on New Hampshire's 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 6b in the Central Section, approximately 50 acres (20 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. Approximately less than 0.5 acre (<0.5 ha) of disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 6b in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 119 acres (48 ha) of disturbance would occur in SWPAs under Alternative 6b in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 14 acres (6 ha) of disturbance would occur in WHPAs as a result of burial activities under Alternative 6b in the Central Section.

Floodplains

Under Alternative 6b in the Central Section, approximately 70 acres (28 ha) of disturbance would occur in FEMA Flood Zones: 4 acres (2 ha) of Zone A; 2 acres (1 ha) of Zone AE; and 63 acres (25 ha) of Zone X. These impacts are expected to be short term and localized.

Wetlands

No wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the Central Section under Alternative 6b. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately less than 0.5 acre (<0.5 ha) of wetlands (see **Table 4-142**). All of the temporary impacts would be to PEM wetlands. No wetlands would experience secondary impacts.

Vernal Pools

No vernal pools were identified in the Alternative 6b Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

The impacts on water resources from operation, maintenance, and emergency repairs of Alternative 6b in the Central Section would be similar to those of Alternative 4b (see **Section 4.3.13.5**), because they would follow nearly the same alignment.

4.3.13.12 Alternative 7 – Proposed Action

Impacts from Construction

Watersheds

Under Alternative 7 in the Central Section, construction disturbance would impact multiple watersheds including 9 acres (4 ha) of the Ham Branch Watershed and 34 acres (14 ha) of the Harper Brook-Pemigewasset River Watershed, which are the watersheds with the two largest disturbance areas in the Central Section.

Surface Water

Under Alternative 7, up to 0.9 mile (1 km) of waterbodies would be crossed by the Project in the Central Section. Of this distance, less than 0.5 mile (0.8 km) are impaired waterbodies on New Hampshire's 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 7 in the Central Section, approximately 91 acres (37 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. Approximately less than 0.5 acre (<0.5 ha) of disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 7 in the Central Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 249 acres (101 ha) of disturbance would occur in SWPAs under Alternative 7 in the Central Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 13 acres (5 ha) of disturbance would occur in WHPAs as a result of clearing and cable burial activities under Alternative 7 in the Central Section.

Floodplains

Under Alternative 7 in the Central Section, approximately 145 acres (59 ha) of disturbance would occur in FEMA Flood Zones: 4 acres (2 ha) of Zone A; 4 acres (2 ha) of Zone AE; and 138 acres (56 ha) of Zone X. These impacts are expected to be short term and localized.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the Central Section under Alternative 7. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 8 acres (3 ha) of wetlands (see **Table 4-142**). Of the 8 acres (3 ha) of temporary impacts, approximately 6 acres (2 ha) would be PEM wetlands, and 2 acres (0.8 ha) would be PSS wetlands.

Secondary impacts would occur to approximately 2 acres (1 ha) of forested land, including upland forest and PFO wetlands, within 100 feet of a stream or vernal pool where there is a permanent conversion to PSS or PEM wetland as a result of forest canopy removal.

Vernal Pools

In the Central Section under Alternative 7, there are expected to be less than 0.5 acre of direct impacts to one vernal pool. Impacts would be associated with vegetation clearing. Secondary impacts to vernal pools would also occur where approximately less than 0.5 acre of upland forest is removed within 100 feet of a vernal pool.

Impacts from Operations, Maintenance, and Emergency Repairs

The impacts on water resources from operation, maintenance, and emergency repairs of Alternative 7 in the Central Section would be similar to those of Alternative 5c (see **Section 4.3.13.5**), because they would follow nearly the same alignment.

4.3.14 GEOLOGY AND SOILS

Refer to **Section 4.1.14** for a discussion of general impacts common to all geographic sections.

4.3.14.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.3.14.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 545 acres (221 ha) of surface soils would be impacted in the Central Section. Surficial geologic impacts for the construction of the overhead structures of the Project would be localized and short-term impacts primarily from erosion within the existing PSNH transmission route where the structures are placed or relocated. Construction and modifications of aboveground features and other disturbance areas such as the construction pads, access roads, and maintenance roads would be short-term impacts on surficial geology if the road is rehabilitated to its original use.

No earthquakes have been documented within the disturbance areas; however, three faults would be crossed in disturbance areas and are considered inactive by New Hampshire's state geologist. Approximately 160 acres (65 ha) of disturbance areas within the Central Section have a high landslide incidence (over 15 percent of the area could be susceptible to landsliding) in Grafton County; mitigation would be needed in these areas. All other areas of the Project in the Central Section (385 acres [156 ha]) under Alternative 2 are considered to have low susceptibility to landsliding.

Under Alternative 2, about 545 acres (221 ha) of land would be impacted in the Central Section. Approximately 2 acres (0.8 ha) of hydric soils, about 487 acres (197 ha) of partially hydric soils, 52 acres (21 ha) of not hydric soils, and about 4 acres (2 ha) of unknown soils would be affected by disturbance areas under Alternative 2 in the Central Section. Of the 545 acres (221 ha), approximately 12 acres (5 ha) of Prime Farmland, 16 acres (6 ha) of Farmland of Statewide Importance, and about 122 acres (49 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 2 in the Central Section.

Impacts on soil from the construction of the overhead structures of the Project are expected to be short-term impacts primarily from erosion and within the existing PSNH transmission route where the structures are placed or relocated, with the exception of the areas where Prime Farmland, Farmland of Statewide

Importance, and Farmland of Local Importance are impacted by the structures. These various types of farmland soils would be permanently converted and would lose the ability to serve their purpose so are considered adverse impacts. These would be long-term impacts, though, because of the small percentage they represent when compared to all designated farmland soil in the Central Section.

Long-term impacts are anticipated on geology and soils of the Project under Alternative 2. Installation of new towers would require support structures that may necessitate blasting depending on the depth of bedrock and the depth to which the structures' foundations are installed.

Expansion of the transmission route would require the removal of overhead vegetation and soil disturbance, which could expose soils to additional environmental considerations such as exposure to erosion from additional precipitation or wind. Though these impacts are likely to cause some soil erosion, impacts are expected to be localized and could be mitigated with the implementation of APMs (see **Appendix H**).

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts primarily resulting in erosion from maintenance and emergency repairs. These impacts would occur for a shorter duration than construction impacts, but would occur over the life of the Project. Long-term impacts are not anticipated, except for permeant access roads or structures are needed. Short-term or long-term impacts are not anticipated on geology and soils from the operation of the Project under Alternative 2.

4.3.14.3 Alternative 3

Impacts from Construction

Under Alternative 3, approximately 342 acres (138 ha) of surface soils would be in the disturbance areas in the Central Section. The main impact would result from construction pads, which account for 237 acres (96 ha) and could result in additional erosion. Underground cable installation would require more grading, trenching, and other excavation along with backfilling compared to aboveground installation resulting in more soil disturbance and exposure to erosion during construction (see **Section 4.1.14.1**).

No earthquakes have been documented within the disturbance areas; however, two faults would be crossed at two locations in disturbance areas and are considered inactive by New Hampshire's state geologist. Approximately 84 acres (34 ha) of disturbance areas within the Central Section have a high landslide incidence (over 15 percent of the area is susceptible to landsliding) in Grafton County. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed. All other areas of the Project in the Central Section (258 acres [104 ha]) under Alternative 3 are considered to have low susceptibility to landsliding.

Alternative 3 would result in the disturbance of about 342 acres (138 ha) of land in the Central Section. The main disturbance to soils would be caused by construction pads which account for 237 acres (96 ha) of the impact area; a short-term impact primarily from erosion. Of the 342 acres (138 ha), approximately 2 acres (0.8 ha) of hydric soils, 302 acres (122 ha) of partially hydric soils, 33 acres (13 ha) of not hydric, and 5 acres (2 ha) of unknown soils would be impacted under Alternative 3 in the Central Section. Approximately 9 acres (4 ha) of Prime Farmland, 10 acres (4 ha) of Farmland of Statewide Importance, and 84 acres (34 ha) of Farmland of Local Importance would be impacted under Alternative 3 in the Central Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Alternative 3 would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required, similar to short-term construction impacts but for a shorter duration; however, burial of the transmission cable traditionally limits the need for maintenance in general.

4.3.14.4 Alternative 4a

Impacts from Construction

Alternative 4a would result in approximately 78 acres (32 ha) of surface soils disturbance in the Central Section. Impacts would result from the burial of cable in existing roadway corridors.

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; however, one fault is crossed within the disturbance areas and is considered inactive by New Hampshire's state geologist. Approximately 29 acres (12 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through erosion and sediment control plans to stabilize disturbed slopes. All other areas of the Project in the Central Section for Alternative 4a (49 acres [20 ha]) have low landslide incidence.

Under Alternative 4a, approximately 0.4 acre (0.2 ha) of hydric soils, approximately 56 acres (23 ha) of partially hydric soils, about 20 acres (8 ha) of soil are not hydric, and about 1 acre (0.4 ha) of unknown soils would be affected by disturbance areas in the Central Section. Approximately 4 acres (2 ha) of Prime Farmland, 0.5 acre (0.2 ha) of Farmland of Statewide Importance, and 20 acres (8 ha) of Farmland of Local Importance would be impacted. About 41 acres (17 ha) of disturbance areas under Alternative 4a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Alternative 4a would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required, similar to short-term construction impacts, but for a shorter duration; however, burial of the transmission cable traditionally limits the need for maintenance in general.

4.3.14.5 Alternative 4b

Impacts from Construction

Under Alternative 4b, approximately 91 acres (37 ha) of surface soils would be impacted in the Central Section. The burial of cable along roadways would result in a short-term impact to soils primarily from erosion. Therefore, the majority of underground construction would be where previous disturbance to surficial geology and soils has occurred. Construction impacts on geology and soils from Alternative 4b in the Central Section would be similar to the impacts of Alternative 4a in the Central Section (see **Section 4.3.14.4**), but would occur along a different roadway corridor.

No earthquakes have been documented within the disturbance areas; however, three faults would be crossed within the disturbance areas. Approximately 28 acres (11 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed. All other areas of the Project in the Central Section for Alternative 4b (63 acres [26 ha]) have a low landslide incidence.

Under Alternative 4b, less than 1 acre (<0.4 ha) of hydric soils, 66 acres (27 ha) of partially hydric soils, approximately 24 acres (10 ha) of soils that are not hydric, and less than 1 acre (<0.4 ha) of unknown soils are affected by disturbance areas in the Central Section. Of the 91 acres (37 ha), approximately 6 acres (2 ha) of Prime Farmland, 2 acres (0.8 ha) of Farmland of Statewide Importance, and 26 acres (11 ha) of Farmland of Local Importance would be impacted by disturbance areas. About 40 acres (16 ha) of disturbance areas under Alternative 4b are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to Alternative 4a (see **Section 4.3.14.4**).

4.3.14.6 Alternative 4c

Impacts from Construction

Under Alternative 4c, approximately 87 acres (35 ha) of surface soils would be impacted in the Central Section. The burial of cable along roadways would result in a short-term impact to soils primarily from erosion. Construction impacts on geology and soils from Alternative 4c in the Central Section would be similar to the impacts of Alternative 4a in the Central Section (see **Section 4.3.14.4**), but would occur along a different roadway corridor.

No earthquakes have been documented within the disturbance areas; however, three faults that are crossed within the disturbance areas are considered inactive. Approximately 26 acres (11 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the Central Section for Alternative 4c (61 acres [25 ha]) have a low landslide incidence.

Under Alternative 4c, less than 1 acre (<0.4 ha) of hydric soils, approximately 60 acres (24 ha) of partially hydric soils, 26 acres (11 ha) of soils that are not hydric, and less than 1 acre (<0.4 ha) of unknown soils would be affected by disturbance areas in the Central Section. Of the 87 acres (35 ha), approximately 4 acres (2 ha) of Prime Farmland, 3 acres (1 ha) of Farmland of Statewide Importance, and 30 acres (12 ha) of Farmland of Local Importance would be impacted. About 44 acres (18 ha) of disturbance areas under Alternative 4c are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to Alternative 4a (see **Section 4.3.14.4**).

4.3.14.7 Alternative 5a

Impacts from Construction

Under Alternative 5a, about 370 acres (150 ha) of surface soils in the Central Section would be impacted mainly due to the construction of construction pads, access roads, and widening the existing transmission corridor. There would also be a short-term impact to soils primarily from erosion. Disturbance related to the construction of buried cable would impact approximately 25 acres (10 ha). The remaining disturbances (345 acres [140 ha]) would be caused by aboveground construction. Since the transmission line would be installed both overhead and underground, construction impacts related to geology and soils would be similar to Alternative 2 for overhead portions (see **Section 4.3.14.2**) and Alternative 4a for underground portions (see **Section 4.3.14.4**).

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes were identified within disturbance areas; however, one fault has been documented within the disturbance areas, and is considered to be inactive. Approximately 128 acres (52 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed to provide for slope stability. All other areas of the Project in the Central Section for Alternative 5a (241 acres [98 ha]) have a low landslide incidence.

Under Alternative 5a, about 370 acres (150 ha) of soil would be impacted in the Central Section. Approximately 0.6 acre (0.2 ha) of hydric soils, 320 acres (130 ha) of partially hydric soils, 44 acres (18 ha) of soils that are not hydric, and about 5 acres (2 ha) of unknown soils would be affected by disturbance areas under Alternative 5a in the Central Section. Of the 370 acres (150 ha), approximately 12 acres (5 ha) of Prime Farmland, 13 acres (5 ha) of Farmland of Statewide Importance, and 81 acres (33 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 5a in the Central Section. About 258 acres (104 ha) of disturbance areas under Alternative 5a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to Alternative 2 (see **Section 4.3.14.2**).

4.3.14.8 Alternative 5b

Impacts from Construction

Under Alternative 5b, around 477 acres (193 ha) of surface soils in the Central Section would be impacted, associated mainly with construction pads, as well as access roads, and widening of the existing transmission corridor. Disturbance related to the construction of buried cable would impact approximately 13 acres (5 ha). The remaining disturbance (464 acres [188 ha]) would be caused by aboveground construction. Since the transmission line would be installed both overhead and underground, construction impacts for geology and soils would be similar to Alternative 2 for overhead portions (see **Section 4.3.14.2**) and Alternative 4b for underground portions (see **Section 4.3.14.5**).

No earthquakes have been documented within the disturbance areas. Five faults would be crossed in six locations within the disturbance areas however these faults are thought to be inactive. Approximately 148 acres (60 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the Central Section for Alternative 5b (330 acres [134 ha]) have a low landslide incidence.

Under Alternative 5b, about 477 acres (193 ha) of soil would be impacted in the Central Section. Approximately 2 acres (0.8 ha) of hydric soils, 428 acres (173 ha) of partially hydric soils, 43 acres (17 ha) of soils that are not hydric, and about 4 acres (2 ha) of unknown soils would be affected by disturbance areas under Alternative 5b in the Central Section. Of the 477 acres (193 ha), approximately 13 acres (5 ha) of Prime Farmland, 15 acres (6 ha) of Farmland of Statewide Importance, and 120 acres (49 ha) of Farmland of Local Importance would be impacted by Alternative 5b in the Central Section. About 304 acres (123 ha) of disturbance areas under Alternative 5b are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to Alternative 2 (see **Section 4.3.14.2**).

4.3.14.9 Alternative 5c

Impacts from Construction

Under Alternative 5c, around 381 acres (154 ha) of surface soils in the Central Section would be impacted due primarily to construction pads as well as widening of the existing transmission corridor, and construction of access roads. Disturbance related to the construction of buried cable would impact approximately 26 acres (11 ha). The remaining disturbance (356 acres [144 ha]) would be caused by aboveground construction. In general, construction impacts would be identical to Alternative 2 for aboveground segments and identical to Alternative 4c for belowground segments in the Central Section (see **Sections 4.3.14.2** and **4.3.14.6**) because the transmission line would be installed both overhead and underground.

No earthquakes have been documented within the disturbance areas. Three faults would be crossed within the disturbance areas however these faults are thought to be inactive. Approximately 132 acres (53 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the Central Section for Alternative 5c (249 acres [109 ha]) have a low landslide incidence.

Under Alternative 5c, about 381 acres (154 ha) of soil would be impacted in the Central Section. Approximately 0.6 acre (0.2 ha) of hydric soils, 331 acres (134 ha) of partially hydric soils, 46 acres (19 ha) of soils that are not hydric, and about 4 acres (2 ha) of unknown soils would be affected by disturbance areas under Alternative 5c in the Central Section. Of the 381 acres (154 ha), approximately 14 acres (6 ha) of Prime Farmland, 13 acres (5 ha) of Farmland of Statewide Importance, and 88 acres (36 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 5c in the Central Section. About 256 acres (104 ha) of disturbance areas under Alternative 5c are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to Alternative 2 (see **Section 4.3.14.2**).

4.3.14.10 Alternative 6a

Impacts from Construction

Alternative 6a would result in approximately 75 acres (30 ha) of surface soils disturbance in the Central Section. Impacts would result from the burial of cable along the roadway corridors.

Granite and pelitic schist (metasedimentary) are the most common bedrock types where construction disturbance would occur. Where bedrock outcrops or is near the surface, blasting may be required for cable burial. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; however, one fault is crossed within the disturbance areas and is considered inactive. Approximately 29 acres (12 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through erosion and sediment control plans to stabilize disturbed slopes. All other areas of the Project in the Central Section for Alternative 6a (46 acres [19 ha]) have low landslide incidence.

Under Alternative 6a, approximately 75 acres (30 ha) of soil would be impacted in the Central Section. Approximately 0.4 acre (0.2 ha) of hydric soils, approximately 54 acres (22 ha) of partially hydric soils, about 20 acres (8 ha) of soil are not hydric, and about 1 acre (0.4 ha) of unknown soils would be affected by disturbance areas under Alternative 6a in the Central Section. Of the 75 acres (30 ha), approximately 4 acres (2 ha) of Prime Farmland, 2 acres (1 ha) of Farmland of Statewide Importance, and 19 acres (8 ha) of Farmland of Local Importance would be impacted under Alternative 6a in the Central Section. About 39 acres (16 ha) of disturbance areas under Alternative 6a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to Alternative 4a (see **Section 4.3.14.4**).

4.3.14.11 Alternative 6b

Impacts from Construction

Alternative 6b would result in approximately 88 acres (36 ha) of surface soils disturbance in the Central Section. Impacts would result from the burial of cable along the roadway corridors.

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; however, three faults would be crossed within the disturbance areas and are considered inactive. Approximately 28 acres (11 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through erosion and sediment control plans to stabilize disturbed slopes. All other areas of the Project in the Central Section for Alternative 6b (60 acres [24 ha]) have low landslide incidence.

Under Alternative 6b, approximately 88 acres (36 ha) of soil would be impacted in the Central Section. Approximately 0.2 acre (<0.1 ha) of hydric soils, approximately 64 acres (26 ha) of partially hydric soils, about 23 acres (9 ha) of soil are not hydric, and about 0.6 acre (0.2 ha) of unknown soils would be affected by disturbance areas under Alternative 6b in the Central Section. Of the 88 acres (36 ha), approximately 6 acres (2 ha) of Prime Farmland, 2 acres (0.8 ha) of Farmland of Statewide Importance, and 25 acres (10 ha) of Farmland of Local Importance would be impacted under Alternative 6b in the Central Section. About 37 acres (15 ha) of disturbance areas under Alternative 6b are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to Alternative 4a (see **Section 4.3.14.4**).

4.3.14.12 Alternative 7 – Proposed Action

Impacts from Construction

Under Alternative 7, approximately 201 acres (81 ha) of surface soils in the Central Section would be impacted due primarily to burial of the cable in the PSNH corridor and along roadways, as well as construction pads, and widening of the existing transmission corridor. Disturbance related to the construction of buried cable would impact approximately 56 acres (23 ha). The remaining disturbance (145 acres [59 ha]) would be caused by aboveground construction. In general, types of construction impacts would be identical to Alternative 2 for aboveground segments and identical to Alternative 3 for belowground segments in the Central Section (see **Sections 4.3.14.2** and **4.3.14.3**) because the transmission line would be installed both overhead and underground.

No earthquakes have been documented within the disturbance areas. Four faults would be crossed within the disturbance areas; however, these faults are thought to be inactive. Approximately 26 acres (11 ha) of disturbance areas within the Central Section have a high landslide incidence. In those areas where there is high landslide incidence, surficial geology impacts would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the Central Section for Alternative 7 (175 acres [71 ha]) have a low landslide incidence.

Under Alternative 7, approximately 201 acres (81 ha) of soil would be impacted in the Central Section. Approximately 0.7 acre (0.3 ha) of hydric soils, 161 acres (65 ha) of partially hydric soils, 36 acres (15 ha) of soils that are not hydric, and about 3 acres (1 ha) of unknown soils would be affected by disturbance areas under Alternative 7 in the Central Section. Of the 201 acres (81 ha), approximately 11 acres (4 ha) of Prime Farmland, 6 acres (2 ha) of Farmland of Statewide Importance, and 66 acres (27 ha) of Farmland of

Local Importance would be impacted by disturbance areas under Alternative 7 in the Central Section. About 111 acres (45 ha) of disturbance areas under Alternative 7 are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to Alternative 2 (see **Section 4.3.14.2**).

4.4 SOUTHERN SECTION

4.4.1 VISUAL RESOURCES

Refer to **Section 4.1.1** for a discussion of general impacts common to all geographic sections.

4.4.1.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.1.2 Alternative 2

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 2. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing, the new Franklin Converter Station, and the expanded Deerfield Substation and Scobie Pond Substation would result in long-term visual impacts. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 2 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.4.8.2** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 2 would be approximately 3.8 square miles (10 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 2 would be approximately 21 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 2 would result in an additional 2.9 square miles (7.6 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 2 would increase the average visual magnitude from 1.97 to 2.42, indicating an increase in the number of visible structures. The visual magnitude would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 2 would result in an additional 0.5 square mile (1.3 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 2 would increase the average scenic impact from 1.47 to 1.71, indicating an increased visibility at sensitive locations. The scenic impacts remain "Very Low to Low" for the existing condition. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-143 summarizes landscape assessment impacts in the Southern Section under Alternative 2.

Table 4-143. Landscape Assessment Impacts under Alternative 2 – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Land Area within Viewshed	17.7 square miles (46 km^2)	3.8 square miles (10 km^2)	21.54 square miles (56 km^2)
Average Visual Magnitude	1.97 (Very Low to Low)	0.45	2.42 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	0.3 square mile (0.8 km^2)	0.5 square mile (1.3 km^2)	0.8 square mile (2.1 km^2)
Average Scenic Impact	1.47 (Very Low to Low)	0.24	1.71 (Very Low to Low)
Aggregate Scenic Impact	26.08	10.68	36.76

Under Alternative 2 in the Southern Section, a new converter station would be installed in Franklin, NH, and the existing Deerfield Substation in Deerfield, NH and the existing Scobie Pond Substation in Londonderry, NH, would be expanded. At all three sites, visibility analysis indicates that the existing vegetation that would remain around the proposed sites would effectively screen 60-foot (18-m) tall structural elements from the surrounding area.

In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. The AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another).

Under Alternative 2, upgrades to the AC system after the Project interconnected with the grid at the Deerfield Substation could result in some limited visual impacts. No vegetation removal would be required and clearance requirements would be satisfied by selectively increasing the height of a relatively small number of existing structures. For the structures that require replacement, the height increases would typically be in the range of 5 to 10 feet. While the towers requiring modification have not been identified and specific changes in height are unknown, field review of the structures proposed for modification indicate that any modification to these structures would not result in material changes to the existing character of the transmission corridor. The additional height of 5 to 10 feet would not noticeably increase the visibility of the transmission structures within the area due to the presence of the existing structures and the modest increase in height. Reconductoring between the Scobie Pond Substation and the Lawrence Road Substation has been completed by PSNH independent of the Northern Pass Project, so no additional visual impact would be associated with these upgrades.

Roads-Based Analysis

Under Alternative 2, the Project's overhead structures would not cross any publicly-accessible roads that are not crossed by the existing PSNH transmission line (0 additional road crossings). The Project would be visible from approximately 8.6 miles (14 km) of roads in addition to the 38 miles (61 km) of roads with visibility of the existing PSNH transmission line.[95] Approximately 10 miles (16 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 9 miles (14 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 2 would increase the average visual magnitude for roads within the viewshed from 2.35 to 3.07, indicating an increase in the number of visible structures. The visual magnitude would be "Moderate to High," compared with the rating of "Low to Moderate" for the existing condition.

Included in the 8.6 miles (14 km) of increased visibility from roads within the viewshed would be 0.2 mile (0.3 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 1.2 hours per day from 3.8 hours per day to 5 hours per day.[96] These impacts would be to the state-designated Upper Lamprey River Scenic Byway (1.2 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-144 summarizes roads-based analysis impacts in the Southern Section under Alternative 2.

Table 4-144. Roads-Based Analysis Impacts under Alternative 2 – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Miles of Road within Viewshed	38 miles (61 km)	8.6 miles (14 km)	46.6 miles (75 km)
Average Visual Magnitude	2.35 (Low to Moderate)	0.72 (1.2 km)	3.07 (Moderate to High)
Miles of Designated Scenic Roads within Viewshed	0.5 mile (0.8 km)	0.2 mile (0.3 km)	0.7 mile (1.1 km)
Vehicle Exposure on Scenic Roads	3.8 hours per day	1.2 hours per day	5 hours per day

[95] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[96] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Viewpoint Assessment

A review of the KOPs in **Appendix E** for the Southern Section gives an indication of how some existing views would change with the construction of Alternative 2. These KOPs represent the range of viewpoint characteristics and range of long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP CO-1 (Viewpoint CO-1c in **Appendix E**) is on Loudon Road (NH Route 9) looking at a retail shopping center in Concord, NH. It shows an urban shopping center with two existing transmission lines passing along the far side of the parking lot and behind the buildings; the existing contrast-dominance rating is “Strong” (28). Under Alternative 2, the contrast-dominance rating would be “Severe” (36), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP CO-4 (Viewpoint CO-4c in **Appendix E**) is located at the NHFG boat access facility at Turtletown Pond, in Concord, NH. It shows a view across the water with the existing PSNH transmission line in the foreground, located in front to the forested shore; the existing contrast-dominance rating is “Moderate” (26). Alternative 2 would include the installation of monopole and H-frame structures at this location. Under Alternative 2, the contrast-dominance rating would be “Strong” (31), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP DE-1 (Viewpoint DE-1c in **Appendix E**) is of the existing PSNH transmission route as it crosses Nottingham Road in Deerfield, NH. It shows a winter view of the existing PSNH transmission route in open and flat terrain; the existing contrast-dominance rating is “Strong” (32). Under Alternative 2, the contrast-dominance rating would be “Severe” (42), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP DE-2 (Viewpoint DE-2c in **Appendix E**) is located on Church Street in the Deerfield Center Historic District, Deerfield, NH. The existing transmission lines are not visible from this viewpoint. The contrast-dominance rating under Alternative 2 would be “Moderate” (25), which indicates that the visual change would be clearly noticeable to a casual observer, and would likely be considered adverse.

4.4.1.3 Alternative 3

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 3. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 3; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in the existing PSNH transmission route. Vegetation management would increase the viewshed of the existing PSNH transmission line by approximately 0.05 square mile (0.13 km^2).

Under Alternative 3 in the Southern Section, a new converter station would be installed in Deerfield, NH (North Road Converter Station) and the existing Deerfield Substation in Deerfield, NH and the existing Scobie Pond Substation in Londonderry, NH, would be expanded. At all three sites, visibility analysis indicates that the existing vegetation that would remain around the proposed sites would effectively screen 60-foot (18-m) tall structural elements from the surrounding area.

In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. The AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another).

Under Alternative 3, upgrades to the AC system after the Project interconnected with the grid at the Deerfield Substation could result in some limited visual impacts. Upgrades to two 345 kV circuits between the Deerfield and Scobie Pond substations would require limited structural modifications or replacements. The two circuits, Circuit 391 and Circuit 373, would share an existing corridor between these two substations, and both circuits would utilize wooden H-frame structures through this area.

An estimated ten structures on these two circuits would need to be modified, and would require height increases between 4.5 and 9 feet. The existing structures are between 56 and 86 feet tall. Field review of the structures proposed for modification revealed that any modification to these structures would not result in material changes to the existing character of Circuits 391 or 373. The additional height of 4.5 feet (and one instance of 9 feet) would not noticeably increase visibility of transmission structures within the area due to the presence of the existing structures associated with both circuits and the modest increase in height.

The Project under Alternative 3 (specifically, the North Road Converter Station and Deerfield Substation) could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.4.8.3** for a discussion of impacts to historic resources within the study area.

Viewpoint Assessment

The following potential impacts would occur relative to the four KOPs in the Southern Section under Alternative 3.

- KOP CO-1 (Viewpoint CO-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP CO-4 (Viewpoint CO-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP DE-1 (Viewpoint DE-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP DE-2 (Viewpoint DE-2b in **Appendix E**) – There would be no visible change from the existing condition.

4.4.1.4 Alternative 4a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from Alternative 4a; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in existing roadway corridors.

Long-term impacts resulting from the construction of the North Road Converter Station, expansion of the existing Deerfield Substation, expansion of the existing Scobie Pond Substation, and upgrades to the existing AC system would be identical to those described above for Alternative 3 (see **Section 4.4.1.3**).

Viewpoint Assessment

The following potential impacts would occur relative to the four KOPs in the Southern Section under Alternative 4a.

- KOP CO-1 (Viewpoint CO-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP CO-4 (Viewpoint CO-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP DE-1 (Viewpoint DE-1b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP DE-2 (Viewpoint DE-2b in **Appendix E**) – There would be no visible change from the existing condition.

4.4.1.5 Alternative 4b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.4.1.4**).

4.4.1.6 Alternative 4c

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.4.1.4**).

4.4.1.7 Alternative 5a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 5a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.1.2**), with the exception of impacts from upgrades to the existing AC system which would be identical to Alternative 3 (see **Section 4.4.1.3**).

4.4.1.8 Alternative 5b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 5b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.1.2**).

4.4.1.9 Alternative 5c

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 5c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.1.2**), with the exception of impacts from upgrades to the existing AC system which would be identical to Alternative 3 (see **Section 4.4.1.3**).

4.4.1.10 Alternative 6a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 6a and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing, the new Franklin Converter Station, and expanded the Deerfield Substation and Scobie Pond Substation would result in long-term visual impacts. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 6a could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.4.8.10** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 6a would be approximately 3.3 square miles (8.5 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 6a would be approximately 18 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 6a would result in an additional 0.6 square mile (1.7 km^2) of the viewshed with a visual magnitude rating of "High or Very High." However, Alternative 6a would not increase the average visual magnitude from 1.97 ("Very Low to Low"). Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 6a would result in an additional 0.04 square mile (0.1 km^2) of the viewshed with a scenic impact rating of "High or Very High." However, Alternative 6a would decrease the average scenic impact from 1.47 to 1.46, indicating decreased visibility at sensitive locations. The scenic impact would remain at its current rating of "Very Low to Low." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-145 summarizes landscape assessment impacts in the Southern Section under Alternative 6a.

Table 4-145. Landscape Assessment Impacts under Alternative 6a – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 6a)
Land Area within Viewshed	17.7 square miles (45.8 km^2)	3.3 square miles (8.5 km^2)	21 square miles (54 km^2)
Average Visual Magnitude	1.97 (Very Low to Low)	--	1.97 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	0.3 square mile (0.8 km^2)	0.04 square mile (0.1 km^2)	4.04 square miles (10.5 km^2)
Average Scenic Impact	1.47 (Very Low to Low)	-0.01	1.46 (Very Low to Low)
Aggregate Scenic Impact	26.08	4.69	30.77

Under Alternative 6a in the Southern Section, a new converter station would be installed in Franklin, NH, and the existing Deerfield Substation in Deerfield, NH and the existing Scobie Pond Substation in Londonderry, NH, would be expanded. At all three sites, visibility analysis indicates that the existing vegetation that would remain around the proposed sites would effectively screen 60-foot (18-m) tall structural elements from the surrounding area. Impacts from upgrades to the existing AC system would be identical to Alternative 3 (see **Section 4.4.1.3**).

Roads-Based Analysis

Under Alternative 6a, the Project's overhead structures would cross 38 additional publicly-accessible roads that are not crossed by the existing PSNH transmission line (38 additional road crossings). The Project would be visible from approximately 5.4 miles (8.7 km) of roads in addition to the 38 miles (61 km) of roads with visibility of the existing PSNH transmission line.[97] Approximately 3.2 miles (5.1 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 9 miles (14 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 6a would increase the average visual magnitude for roads within the viewshed from 2.35 to 2.55, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current value of "Low to Moderate."

Included in the 5.4 miles (8.7 km) of increased visibility from roads within the viewshed would be 0.6 mile (1 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure

[97] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

would increase by approximately 1.8 hours per day from 3.8 hours per day to 5.6 hours per day.[98] These impacts would be to the state-designated Upper Lamprey River Scenic Byway. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-146 summarizes roads-based analysis impacts in the Southern Section under Alternative 6a.

Table 4-146. Roads-Based Analysis Impacts under Alternative 6a – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 6a)
Miles of Road within Viewshed	38 miles (61 km)	5.4 miles (8.7 km)	43.4 miles (70 km)
Visual Magnitude	2.35 (Low to Moderate)	0.2	2.55 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	0.5 mile (0.8 km)	0.6 mile (1.0 km)	0.9 mile (1.4 km)
Vehicle Exposure on Scenic Roads	3.8 hours per day	1.8	5.6 hours per day

Viewpoint Assessment

A review of the KOPs in **Appendix E** for the Southern Section gives an indication of how some existing views would change with the construction of Alternative 6a. These KOPs represent the range of viewpoint characteristics and range of impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP CO-1 is on Loudon Road (NH Route 9) looking at a retail shopping center in Concord, NH. It shows an urban shopping center with two existing transmission lines passing along the far side of the parking lot and behind the buildings; the existing contrast-dominance rating is “Strong” (28). There is currently insufficient engineering complete to realistically simulate this view under Alternative 6a.
- KOP CO-4 (Viewpoint CO-4d in **Appendix E**) is located at the NHFG boat access facility at Turtletown Pond, in Concord, NH. It shows a view across the water with the existing PSNH transmission line in the foreground, located in front to the forested shore; the existing contrast-dominance rating is “Moderate” (26). Under Alternative 6a, the contrast-dominance rating would be “Strong” (34), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP DE-1 (Viewpoint DE-1d in **Appendix E**) is of the existing PSNH transmission route as it crosses Nottingham Road in Deerfield, NH. It shows a winter view of the existing PSNH transmission route in open and flat terrain; the existing contrast-dominance rating is “Strong” (32). Under Alternative 6a, the contrast-dominance rating would be “Severe” (41), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP DE-2 (Viewpoint DE-2d in **Appendix E**) is located on Church Street in the Deerfield Center Historic District, Deerfield, NH. The existing transmission lines are not visible from this viewpoint. Alternative 6a was not rated at this KOP because the simulation was not available at the time of evaluation. However, due similarity in structure design, it is expected that there would be some adverse impact to visual and scenic quality at this location similar to Alternatives 2, 5a, 5b and 5c.

[98] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

4.4.1.11 Alternative 6b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 6a (see **Section 4.4.1.10**).

4.4.1.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 7. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing, the new Franklin Converter Station, and expanded the Deerfield Substation and Scobie Pond Substation would result in long-term visual impacts. These long-term impacts resulting from operation are discussed below.

The Project under Alternative 7 could be visible from properties listed on the NRHP. Visibility of the Project could impact the historical setting and character of these properties. Certain NRHP-listed properties are considered in this analysis where adequate data were available. See **Section 4.4.8.10** for a discussion of impacts to historic resources within the study area.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 7 would be approximately 4 square miles (10 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 7 would be approximately 23 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 7 would result in an additional 3 square miles (7.7 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 7 would increase the average visual magnitude from "Very Low to Low" (1.97) to "Low to Moderate" (2.50). Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 7 would result in an additional 0.5 square mile (1.3 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 7 would increase the average scenic impact from 1.47 to 1.76, indicating decreased visibility at sensitive locations. The scenic impact would remain at its current rating of "Very Low to Low." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-147 summarizes landscape assessment impacts in the Southern Section under Alternative 7.

Table 4-147. Landscape Assessment Impacts under Alternative 7 – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Land Area within Viewshed	17.7 square miles (45.8 km^2)	4 square miles (10 km^2)	21 square miles (54 km^2)
Average Visual Magnitude	1.97 (Very Low to Low)	0.54	2.5 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	0.3 square mile (0.8 km^2)	0.5 square mile (1.3 km^2)	0.8 square mile (1.3 km^2)
Average Scenic Impact	1.47 (Very Low to Low)	0.3	1.76 (Very Low to Low)
Aggregate Scenic Impact	26.08	12.22	38.3

Under Alternative 7 in the Southern Section, a new converter station would be installed in Franklin, NH, and the existing Deerfield Substation in Deerfield, NH and the existing Scobie Pond Substation in Londonderry, NH, would be expanded. At all three sites, visibility analysis indicates that the existing vegetation that would remain around the proposed sites would effectively screen 60-foot (18-m) tall structural elements from the surrounding area. Impacts from upgrades to the existing AC system would be identical to Alternative 3 (see **Section 4.4.1.3**).

Roads-Based Analysis

Under Alternative 7, the Project's overhead structures would cross one additional publicly-accessible road that is not crossed by the existing PSNH transmission line. The Project would be visible from approximately 9 miles (14 km) of roads in addition to the 38 miles (61 km) of roads with visibility of the existing PSNH transmission line.[99] Approximately 11 miles (18 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," in addition to the 9 miles (14 km) of roads with "High or Very High" visual magnitude associated with the existing PSNH transmission route. Alternative 7 would increase the average visual magnitude for roads within the viewshed from 2.35 to 3.07, indicating an increase in the number of visible structures. The visual magnitude would increase from its current value of "Low to Moderate" to "Moderate."

Included in the 9 miles (14 km) of increased visibility from roads within the viewshed would be 0.3 mile (0.5 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 3 hours per day from 3.8 hours per day to 6.8 hours per day.[100] These impacts would be to the state-designated Upper Lamprey River Scenic Byway. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-148 summarizes roads-based analysis impacts in the Southern Section under Alternative 7.

Table 4-148. Roads-Based Analysis Impacts under Alternative 7 – Southern Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Miles of Road within Viewshed	38 miles (61 km)	9 miles (14 km)	47 miles (75 km)
Visual Magnitude	2.35 (Low to Moderate)	0.72	3.07 (Moderate)
Miles of Designated Scenic Roads within Viewshed	0.5 mile (0.8 km)	0.3 mile (0.5 km)	0.8 mile (1.2 km)
Vehicle Exposure on Scenic Roads	3.8 hours per day	3 hours per day	6.8 hours per day

[99] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[100] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Viewpoint Assessment

A review of the KOPs in **Appendix E** for the Southern Section gives an indication of how some existing views would change with the construction of Alternative 7. These KOPs represent the range of viewpoint characteristics and range of impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP CO-1 (CO-1d in **Appendix E**) is on Loudon Road (NH Route 9) looking at a retail shopping center in Concord, NH. It shows an urban shopping center with two existing transmission lines passing along the far side of the parking lot and behind the buildings; the existing contrast-dominance rating is “Strong” (28). Under Alternative 7, the contrast-dominance rating would increase to “Severe” (38), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP CO-4 (Viewpoint CO-4d in **Appendix E**) is located at the NHFG boat access facility at Turtletown Pond, in Concord, NH. It shows a view across the water with the existing PSNH transmission line in the foreground, located in front to the forested shore; the existing contrast-dominance rating is “Moderate” (26). Under Alternative 7, the contrast-dominance rating would be “Strong” (30), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP DE-1 (Viewpoint DE-1d in **Appendix E**) is of the existing PSNH transmission route as it crosses Nottingham Road in Deerfield, NH. It shows a winter view of the existing PSNH transmission route in open and flat terrain; the existing contrast-dominance rating is “Strong” (32). Under Alternative 7, the contrast-dominance rating would be “Severe” (39), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP DE-2 (Viewpoint DE-2d in **Appendix E**) is located on Church Street in the Deerfield Center Historic District, Deerfield, NH. The existing transmission lines are not visible from this viewpoint. Under Alternative 7, the contrast-dominance rating would be “Moderate” (23), which indicates that the visual change would be clearly noticeable to a casual observer, and would likely be considered adverse.

4.4.2 SOCIOECONOMICS

Refer to **Section 4.1.2** for a discussion of general impacts common to all geographic sections.

4.4.2.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.2.2 Alternative 2

Property Taxes

Table 4-149 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 2 would be approximately $16.7 million.

Table 4-149. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 2

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,087	$16.7	$29.8

Economic Activity

Impacts to statewide economic activity under Alternative 2, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.2**.

Property Values

Alternative 2 could reduce taxable assessed residential property values by approximately $6.5 million in the Southern Section. This could reduce residential tax revenue payments by approximately $177,000 per year. These adverse impacts would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass.

These estimates likely overstate the adverse impacts for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Impacts to tourism under Alternative 2 are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 2 are discussed in **Section 4.1.2.2**.

4.4.2.3 Alternative 3

Property Taxes

Table 4-150 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 3 would be approximately $24.7 million.

Table 4-150. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 3

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$2,128	$24.7	$57.9

Economic Activity

Impacts to statewide economic activity under Alternative 3, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.3**.

Property Values

Because the Project would be buried under Alternative 3, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 3 because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 3 are discussed in **Section 4.1.2.3**.

4.4.2.4 Alternative 4a

Property Taxes

Table 4-151 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 4a would be approximately $23.2 million.

Table 4-151. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 4a

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$2,034	$23.2	$56.5

Economic Activity

Impacts to statewide economic activity under Alternative 4a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.4**.

Property Values

Because the Project would be buried under Alternative 4a, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4a because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4a are discussed in **Section 4.1.2.4**.

4.4.2.5 Alternative 4b

Property Taxes

Table 4-152 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 4b would be approximately $23.2 million.

Table 4-152. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 4b

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$2,163	$23.2	$59.1

Economic Activity

Impacts to statewide economic activity under Alternative 4b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.5**.

Property Values

Because the Project would be buried under Alternative 4b, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4b because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4b are discussed in **Section 4.1.2.5**.

4.4.2.6 Alternative 4c

Property Taxes

Table 4-153 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 4c would be approximately $23.2 million.

Table 4-153. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 4c

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$2,094	$23.2	$58.0

Economic Activity

Impacts to statewide economic activity under Alternative 4c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.6**.

Property Values

Because the Project would be buried under Alternative 4c, no impacts to property values would be expected.

Tourism

No long-term impacts to tourism are anticipated under Alternative 4c because the transmission cable would be buried, thus minimizing visual effects. See **Section 4.1.1.2** for a discussion of visual impacts.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 4c are discussed in **Section 4.1.2.6**.

4.4.2.7 Alternative 5a

Property Taxes

Table 4-154 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 5a would be approximately $17.1 million.

Table 4-154. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 5a

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,180	$17.1	$31.3

Economic Activity

Impacts to statewide economic activity under Alternative 5a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.7**.

Property Values

It is estimated that implementation of Alternative 5a, could result in a reduction in taxable assessed residential property values of approximately $6.5 million across the Southern Section. This could result in a reduction of residential tax revenue payments of approximately $177,000 per year. The adverse impacts would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5a are discussed in **Section 4.1.2.7**.

4.4.2.8 Alternative 5b

Property Taxes

Table 4-155 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 5b would be approximately $16.6 million.

Table 4-155. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 5b

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,252	$16.6	$32.9

Economic Activity

Impacts to statewide economic activity under Alternative 5b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.8**.

Property Values

It is estimated that implementation of Alternative 5b, could result in a reduction in taxable assessed residential property values of approximately $6.5 million across the Southern Section. This could result in a reduction of residential tax revenue payments of approximately $177,000 per year. The adverse impacts would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5b are discussed in **Section 4.1.2.8**.

4.4.2.9 Alternative 5c

Property Taxes

Table 4-156 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 5c would be approximately $17.1 million.

Table 4-156. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 5c

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,227	$17.1	$32.2

Economic Activity

Impacts to statewide economic activity under Alternative 5c, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.9**.

Property Values

It is estimated that implementation of Alternative 5c, could result in a reduction in taxable assessed residential property values of approximately $6.5 million across the Southern Section. This could result in a reduction of residential tax revenue payments of approximately $177,000 per year. The adverse impacts would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 5c are discussed in **Section 4.1.2.9**.

4.4.2.10 Alternative 6a

Property Taxes

Table 4-157 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 6a would be approximately $19.6 million.

Table 4-157. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 6a

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,876	$19.6	$52.5

Economic Activity

Impacts to statewide economic activity under Alternative 6a, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.10**.

Property Values

It is estimated that implementation of Alternative 6a, could result in a reduction in taxable assessed residential property values of approximately $5.1 million across the Southern Section. This could result in a reduction of residential tax revenue payments of approximately $139,000 per year. The adverse impacts would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass.

These estimates likely overstate the adverse impact for segments of the Project that would parallel existing transmission lines since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6a are discussed in **Section 4.1.2.10**.

4.4.2.11 Alternative 6b

Property Taxes

Table 4-158 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections within the Southern Section under Alternative 6b would be approximately $19.6 million.

Table 4-158. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 6b

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$2,002	$19.6	$55.0

Economic Activity

Impacts to statewide economic activity under Alternative 6b, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.11**.

Property Values

Impacts to property values in the Southern Section under Alternative 6b would be identical to those under Alternative 6a.

Tourism

Potential impacts to tourism resulting from overhead portions of the Project are discussed under Alternative 2 (see **Section 4.1.2.2**), and impacts on tourism resulting from underground portions of the Project are discussed under Alternative 3 (see **Section 4.1.2.3**).

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 6b are discussed in **Section 4.1.2.11**.

4.4.2.12 Alternative 7 – Proposed Action

Property Taxes

Table 4-159 summarizes the anticipated property tax impacts in the Southern Section. Increases in annual property tax collections in the Southern Section under Alternative 7 would be approximately $17.1 million.

Table 4-159. Annual Property Tax Impact ($ million) in the Southern Section – Alternative 7

Total Construction Cost	Annual Property Tax Revenue	
	Southern	State
$1,410	$17.1	$37.0

Economic Activity

Impacts to statewide economic activity under Alternative 7, including employment, economic output, electricity costs, and wholesale electricity prices, are discussed in **Section 4.1.2.2**.

Property Values

Alternative 7 could reduce taxable assessed residential property values by approximately $6.6 million in the Southern Section, and thereby could reduce residential tax revenue payments by approximately $177,000 per year. Adverse impacts to property values would be greater in the Southern Section because property values tend to be higher in that portion of the state and a smaller portion of the land near the Project is owned or controlled by Northern Pass. These estimates likely overstate the adverse impacts for segments of the Project that would parallel existing transmission line since property values adjacent to those segments may have already been affected by the existing line.

Tourism

Impacts to tourism under Alternative 7 are discussed under **Section 4.1.2.2**.

Electricity System Infrastructure

Impacts to the diversity of energy sources in the ISO-NE region under Alternative 7 are discussed in **Section 4.1.2.2**.

4.4.3 RECREATION

Refer to **Section 4.1.3** for a discussion of general impacts common to all geographic sections.

In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to recreation would be very similar. Upgrades and reconductoring associated with the corridor between Deerfield and the Scobie Pond Substation would result in short-term construction impacts to approximately 3 acres (1 ha) within recreation sites that have a spatial area and 0.2 mile (0.3 km) of trails.

4.4.3.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.3.2 Alternative 2

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 2 in the Southern Section. Short-term, localized impacts due to construction activity would occur to approximately 84 acres (34 ha) within recreational sites that have a spatial area, and approximately 0.2 mile (0.3 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 2: Bear Brook State Park and Franklin Falls Reservoir. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 2 would cross three eligible federal Wild and Scenic Rivers (the Merrimack River, the Soucook River, and the Suncook River) as an overhead transmission line in the Southern Section. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.4.1.2**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 299 additional acres (121 ha) within recreational sites that have a spatial area, and 0.7 mile (1 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 2: Bear Brook State Park and Franklin Falls Reservoir.

The recreation experience under Alternative 2 would be affected by the construction of the Project because it would result in a modification to the natural environment. Even though the Southern Section is generally characterized by higher levels of development compared to other sections, it is assumed that most users still expect a scenic landscape when recreating. The implementation of the Project would alter the natural appearance of the landscape, thus impacting the recreation experience.

4.4.3.3 Alternative 3

Impacts from Construction

Short-term impacts to recreation during the construction of Alternative 3 in the Southern Section would be similar to those discussed above for Alternative 2 (see **Section 4.4.3.2**). Impacts would occur to the same locations. However, as discussed in **Section 4.1.3.1**, the construction of underground transmission cable could require a longer period of construction and more intense disturbance, resulting in additional disturbance to the recreation experience.

Alternative 3 would cross three eligible federal Wild and Scenic Rivers (the Merrimack River, the Soucook River, and the Suncook River) as an underground transmission cable in the Southern Section. Impacts to recreation would be relatively minor and incremental as there is already an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.4.1.3**, Alternative 3 would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures. Approximately 0.2 additional acre (0.1 ha) of recreational sites would be visually impacted by the Project.

4.4.3.4 Alternative 4a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4a in the Southern Section. Short-term, localized impacts due to construction activity would occur to approximately 9 acres (3.6 ha) within recreational sites that have a spatial area, and less than 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route.

Alternative 4a would cross three eligible federal Wild and Scenic Rivers (the Merrimack River, the Soucook River, and the Suncook River) as an underground transmission cable in the Southern Section. These crossings are not expected to impact recreation, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.4.1.4**, Alternative 4a would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.4.3.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.4.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.4.3.4**).

4.4.3.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.4.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.4.3.4**).

4.4.3.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

4.4.3.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

4.4.3.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

4.4.3.10 Alternative 6a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 6a in the Southern Section. Short-term, localized impacts due to construction activity would occur to approximately 24 acres (10 ha) within recreational sites that have a spatial area and approximately 0.1 mile (0.1 km) of trails. No impacts would occur to recreation point sites. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 6a: Bear Brook State Park and Franklin Falls Reservoir. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 6a would cross the Merrimack River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Southern Section where there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 6a would cross two eligible federal Wild and Scenic Rivers (the Soucook River and the Suncook River) as an overhead transmission line in the Southern Section. Impacts to recreation would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 6a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.4.1.10**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 214 additional acres (86 ha) within recreational sites that have a spatial area, three point sites, and 0.6 mile (1 km) of trails. The following examples of notable recreational resources are among those that would experience long-term visual impacts under Alternative 6a: Bear Brook State Park and Franklin Falls Reservoir.

The recreation experience under Alternative 6a would be affected by the construction of the Project because it would result in a modification to the natural environment. Even though the Southern Section is generally characterized by higher levels of development compared to other sections, it is assumed that most users still expect a scenic landscape when recreating. The implementation of the Project would alter the natural appearance of the landscape, thus impacting the recreation experience.

4.4.3.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 6a (see **Section 4.4.3.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 6a (see **Section 4.4.3.10**).

4.4.3.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.3.2**).

4.4.4 HEALTH AND SAFETY

Refer to **Section 4.1.4** for a discussion of general impacts common to all geographic sections. In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to recreation would be very similar and of the same nature as those described in **Section 4.1.4**.

4.4.4.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.4.2 Alternative 2

Impacts from Construction

Under Alternative 2, there could be an increased chance of encountering contaminated soils and groundwater. There are eight known sites with potential contamination within 250 feet (76 m) of disturbance areas. Further investigation may be required of these sites to determine their exact location and whether there could be subsurface contamination where excavation or construction would take place. No known pipelines would be crossed by Alternative 2 in the Southern Section and no transition or converter stations would be located on Alternative 2.

Impacts relating to hazardous materials and waste management are discussed in **Section 4.1.4.1**. The Southern Section has many fire departments to address fires that could occur during construction along the corridor or at substations. In addition, the communities along the Alternative 2 corridor are part of mutual aid associations that would assist any fire department in the area. Therefore, the impacts of a potential fire would be minimized.

No portion of this alternative would be constructed in roadway corridors; therefore, there would be no impact to the public associated with burial of the cable within roadway corridors. However, 77 roadways would have to be crossed by the overhead line, resulting in potential lane closures during stringing. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

With regards to hazardous materials and waste under Alternative 2, the Franklin Converter Station and Deerfield and Scobie Pond Substations would house transformers and other equipment requiring oils and hazardous materials. SPCC plans would have to be developed. With implementation of SPCC plans for these facilities, the potential for spills and any impacts associated with spills of oils would be decreased, would likely be short-term and localized.

There would be a risk associated with exposing contaminated soils or groundwater during operation, maintenance, and emergency repairs. The likelihood of encountering unknown contamination would be low because all work would be conducted in maintained corridors, which would have been investigated during initial construction.

No provisions would be needed for underground pipelines because there are no known pipeline crossings along Alternative 2 and there would be no transition stations in the Southern Section.

The Southern Section is more densely populated and has many fire departments to address fires that occur along the corridor or at the substations. In addition, the communities along Alternative 2 are part of mutual aid associations that would assist any fire department in the area. Therefore, impacts associated with fire would be minimized.

4.4.4.3 Alternative 3

Impacts from Construction

Construction impacts of Alternative 3 with respect to potential spills and fire would be similar to Alternative 3 in the Northern and Central Sections because in each area the transmission line would be installed underground for a total distance of approximately 46 miles (74 km). Impacts relating to hazardous materials and waste management are discussed in **Section 4.1.4.1**.

Under Alternative 3, there could be an increased chance of encountering contaminated soils and groundwater because a converter station would be constructed on North Road in Deerfield, NH. There would be ten known sites with potential contamination within 250 feet (76 m) of disturbance areas and five within 30 feet (9 m) of disturbance areas. Three of these are located near the proposed North Road Converter Station. In the Southern Section, Alternative 3 would cross no known pipelines; therefore, no provisions need to be made.

If a fire were to occur during construction in the Southern Section, any local fire department would be supported by its mutual aid association to decrease the potential of fire spreading and resulting in a regional impact. NESC codes would be implemented to reduce the risks, and the available fire support services.

No portion of this alternative would be constructed in a roadway; therefore, there would be no impact to public associated with burial of the cable within roadways.

Impacts from Operations, Maintenance, and Emergency Repairs

With regards to hazardous materials under Alternative 3, the North Road Converter Station and Deerfield and Scobie Pond Substations would house transformers and other equipment requiring oils and hazardous materials. SPCC plans would have to be developed and implemented for these facilities, reducing the potential of a spill.

Many public safety hazards associated with accident conditions of overhead transmission lines would be reduced by burying the transmission cable. Since the transmission cable would be buried, the potential for breakage and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or electrical shock. Lightning strikes would not affect operation under Alternative 3. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

4.4.4.4 Alternative 4a

Impacts from Construction

Despite following a different alignment, construction impacts from Alternative 4a would be similar to the impacts of Alternative 3 in the Southern Section with respect to hazardous materials/waste management, potential spills, and fires because these impacts do not differ greatly between locations.

Under Alternative 4a, there could be an increased chance of encountering contaminated soils and groundwater. Disturbance areas associated with this alternative would be in close proximity to many potentially contaminated sites in Chichester, Deerfield, and Epsom, NH.

Under Alternative 4a, the Project would result in the potential for accidents on roadways. This alternative would be constructed in roadway corridors in the Southern Section for approximately 41 miles (66 km). The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

With regards to hazardous materials under Alternative 4a, the North Road Converter Station and Deerfield Substation would house transformers and other equipment requiring oils and hazardous materials. SPCC plans would have to be developed and implemented for these facilities, decreasing the potential of a spill.

Under Alternative 4a, there could be an increased chance of encountering contaminated soils and groundwater due to the multiple sites with potential contamination are in close proximity of the corridor. No known underground utilities or pipelines would be crossed by Alternative 4a in the Southern Section.

Since the cable would be buried, the potential for public safety hazards such as lines breaking and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 4a. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

4.4.4.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those under Alternative 4a in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section.

4.4.4.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those under Alternative 4a in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section.

4.4.4.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those under Alternative 2 in the Southern Section. This alternative would have 77 overhead roadway crossings.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section.

4.4.4.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those under Alternative 2 in the Southern Section. This alternative would have 77 overhead roadway crossings.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section.

4.4.4.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those under Alternative 2 in the Southern Section. This alternative would have 77 overhead roadway crossings.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section.

4.4.4.10 Alternative 6a

Impacts from Construction

Construction impacts under Alternative 6a would be similar to Alternative 2 for overhead portions (8 miles [13 km]) and similar to Alternative 3 for underground portions (34 miles [55 km]).

In Franklin, NH, Alternative 6a would be located in areas where there have been multiple sites with leaking underground storage tanks as well as historic auto stations and dry cleaners. Since the cable would be installed underground to Franklin, NH, precautions would have to be taken to avoid any known contamination as well as to ensure that the proper procedures are in place in case contamination is unearthed. Suncook, NH had a historic gas station, with potential contamination less than 10 feet (3 m) Two sites with potential contamination on Lost River Road in Woodstock and North Woodstock, NH are co-located or immediately adjacent to areas that would be disturbed; therefore, there would be a potential for unearthing contamination; therefore, there would be a potential for unearthing contamination.

The Southern Section has many fire departments to address fires that occur during construction along the corridor or at substations. In addition, the communities along Alternative 6a are part of mutual aid associations that would assist any fire department in the area. Therefore, the impacts of a potential fire would be minimized.

Under Alternative 6a, the Project would result in the potential for accidents on roadways. Approximately 8 miles (13 km) of this alternative would be constructed in a roadway in the Southern Section. This alternative would have 54 overhead roadway crossings. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 2 in the Southern Section

4.4.4.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 6a in the Southern Section (see **Section 4.4.4.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.4.10**).

4.4.4.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those under Alternative 2 in the Southern Section. This alternative would have 77 overhead roadway crossings.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section.

4.4.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 4.1.5** for a discussion of general impacts common to all geographic sections.

All action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to traffic and transportation would be very similar. Because they all occur within existing infrastructure (corridors and substation locations) where construction equipment would be able to operate on existing PSNH roads and property, construction of these support projects would result in minimal impacts to surrounding traffic.

4.4.5.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.5.2 Alternative 2

Impacts from Construction

The Project under Alternative 2 would cross 2 interstate highways, 1 federal highway, 8 state roads, and 66 local roads in the Southern Section. These impacts would result from the stringing of overhead transmission lines across public roads. Construction of Project components that cross public roadways (i.e., overhead transmission lines) may require access to one or more roadway lanes to be temporarily restricted. The Project would result in the stringing of overhead transmission lines across public roads in 77 locations. As discussed in **Section 4.1.5.1**, partial or full roadway closures could reduce average speed and affect traffic patterns.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Southern Section ranges from 1 percent on I-93 (Northfield, NH) and I-393 (Concord, NH); to 72 percent on Cross Country Road in Pembroke, NH. The 72 percent increase in traffic volumes on Cross Country Road is an increase from an estimated 629 vehicles per day to 1,081 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. Short-term, localized transportation impacts would result from the Project during construction. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**. Impacts to traffic patterns due to potential roadway closures would result in short-term, localized inconvenience or delay and would not likely interrupt overall area traffic patterns and flow.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that five airfields are located within 20,000 feet (6,096 m) of the Project corridor in the Southern Section and that the Project is approximately 4,000 feet (1,219 m) from the Concord Airport runway. Northern Pass has consulted with the FAA on the eight proposed structures near the Concord Airport to ensure they would not exceed FAA obstruction standards. Northern Pass received a DNH from the FAA in December of 2010; therefore, no impacts on airports would be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Any adverse impact on public roadways that may occur during operation and maintenance would be short-term through the implementation of a transportation management plan (see **Appendix H**). See **Section 4.1.5.2** for a more detailed discussion.

4.4.5.3 Alternative 3

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.4.5.2**; however, fewer construction vehicles would be needed for burial of underground cable in the existing PSNH transmission route than would be needed for overhead transmission lines in the existing PSNH transmission route. The Project under Alternative 3 would cross 2 interstate highways, 1 federal highway, 8 state roads, and 66 local roads in the Southern Section.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Southern Section ranges from 1 percent on I-93 and I-393 to 59 percent on Cross Country Road in Pembroke, NH. The 59 percent increase in traffic volumes on Cross Country Road is an increase from an estimated 629 vehicles per day to 999 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would not require any tower structures; therefore, impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 3.

4.4.5.4 Alternative 4a

Impacts from Construction

The Project under Alternative 4a would be located with the I-93, I-393, US Route 4, US Route 202, NH Route 9, and NH Route 107 roadway corridors. The Project would cross 2 interstate highways, 2 federal highways, 6 state routes, and 129 local roads in the Southern Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission cable would be buried in a public road corridor. The Project under Alternative 4a would result in the disturbance of approximately 41 miles (66 km) of roadway corridors for burial of the transmission cable.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Southern Section ranges from 1 percent on I-93 and I -393 to 41 percent on NH Route 132. The 41 percent increase in traffic volumes on NH Route 132 is an increase from an estimated 900 vehicles per day to 1,270 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

The Project would not require any tower structures; therefore, impacts to airfields would not be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4a.

4.4.5.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.5.4**).

4.4.5.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.5.4**).

4.4.5.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

4.4.5.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

4.4.5.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

4.4.5.10 Alternative 6a

Impacts from Construction

The Project under Alternative 6a would cross 2 interstate highways, 1 federal highway, 6 state roads, and 99 local roads in the Southern Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the stringing of overhead transmission lines across public roads in 54 locations, and would result in the disturbance of approximately 8 miles (13 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the Southern Section ranges from 1 percent on I-93 and I-393 to 72 percent on Cross Country Road in Pembroke, NH. The 72 percent increase in traffic volumes on Cross Country Road is an increase from an estimated 629 vehicles per day to 1,081 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Table 3-3 and **Table 3-4** (in **Section 3.1.5**) show that three airfields are located within 20,000 feet (6,096 m) of the Project corridor within the Southern Section. The Project would be approximately 4,000 feet (1,219 m) from the Concord Airport runway. Northern Pass would need to consult with the FAA on the proposed structures near the Concord Airport to ensure they comply with FAA requirements.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 6a.

4.4.5.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 6a in the Southern Section (see **Section 4.4.5.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.5.10**).

4.4.5.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.5.2**).

4.4.6 LAND USE

Refer to **Section 4.1.6** for a discussion of general impacts common to all geographic sections.

In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to land use would be very similar. In terms of land use conversion, roughly 5 acres (2 ha) of undeveloped land would be impacted by the expansion of the existing Scobie Pond Substation. Of these 5 acres, roughly 3 acres (1 ha) are forested lands and 2 acres (1 ha) is shrubland with marginal amounts of wetlands and open water. These impacts would occur in an area contiguous with the existing substation.

4.4.6.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.6.2 Alternative 2

All impacts of Alternative 2 in the Southern Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 2 in the Southern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the Southern Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 2.

Approximately 11 percent (134 acres; 54 ha) of the Alternative 2 Project corridor is currently coded as a developed use. Approximately 85 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, with approximately 15 percent of the developed land in a Developed Residential, Commercial, and Industrial Use. Alternative 2 would pass through more intensive land use areas, such as population centers, village areas, and commercial centers. Construction of Alternative 2 would not be expected to result in a long-term impact to lands with a high development potential. Because less than 1 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 2, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 2 in the Southern Section would impact approximately 114 acres (46 ha) of federal, state, county, and private conservation land, and no NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

The Lamprey River, which is a designated Wild and Scenic River, lies within the Southern Section but is located over 7 miles (11 km) from Alternative 2. No designated Wild and Scenic Rivers would be impacted. Alternative 2 would cross the eligible federal Wild and Scenic Rivers the Merrimack River, the Soucook River and the Suncook River, as an overhead transmission line in the Southern Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

Alternative 2 would cross the Merrimack River and the Lamprey River (both State-protected rivers) as an overhead transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. The reach of the Lamprey River that would be crossed by Alternative 2 is designated as a State-protected river, but not a federally designated Wild and Scenic River. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.4.3.2**.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the Southern Section. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 2 within the existing corridor.

Road Crossings

Construction of Alternative 2 would require 77 aerial road crossings, and no underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur.

Refer to **Section 4.4.5.2** for a discussion of traffic and transportation impacts under Alternative 2.

Public Roadway Corridor Ownership Status

Alternative 2 would not be buried within any public roadway corridors in the Southern Section. Therefore, no impacts would be expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.4.6.3 Alternative 3

All impacts of Alternative 3 in the Southern Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 3 in the Southern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of Alternative 3 would be located within the existing PSNH transmission route in the Southern Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes. Although the new transmission line would be located underground, rather than overhead, the lands within the existing PSNH transmission route would continue to be subject to similar restrictions in use as they currently experience.

Approximately 11 percent (134 acres [55 ha]) of the Alternative 3 Project corridor is currently coded as a developed use. Approximately 85 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, with approximately 15 percent of the developed land in a Developed Residential, Commercial, and Industrial Use. Alternative 3 would pass through more intensive land use areas, such as population centers, village areas, and commercial centers. Construction of Alternative 3 would not be expected to result in long-term impacts to lands with a high development potential in the Southern Section. Because less than 1 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected (MRLC 2013).

Under Alternative 3, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 3 in the Southern Section would impact approximately 114 acres (46 ha) of federal, state, county, and private conservation land, and no NFS lands. These impacts would result from ground disturbance associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

The Lamprey River, which is a designated Wild and Scenic River, lies within the Southern Section but is located over 7 miles (11 km) from Alternative 3. No designated Wild and Scenic Rivers would be impacted. Alternative 3 would cross the eligible federal Wild and Scenic Rivers the Merrimack River, the Soucook River and the Suncook River, as an underground transmission cable in the Southern Section. These underground crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing overhead transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Southern Section Alternative 3 would cross the Merrimack River and the Lamprey River (both State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. The reach of the Lamprey River that would be crossed by Alternative 3 is designated as a State-protected river, but is not a federally designated Wild and Scenic River. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.4.3.3**.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route in the Southern Section. The portion of the Alternative 3 corridor which would be located within the existing PSNH transmission route is governed by more than 644 separate easements or other agreements. A review of a representative sampling these easements indicates the majority of the easements do not grant the Applicant the authority to install or operate underground transmission cables within the land governed by the easements. Therefore, in order for Alternative 3 to be implemented, the majority of these easements would need to be amended through agreement with each individual land owner. The analysis of Alternative 3, within this final EIS, ensures that the potential environmental impacts from any combination of above and below ground placement of the Project within the Proposed Action route is bounded by the analysis.

Road Crossings

Construction of Alternative 3 would require 77 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.4.5.3** for a discussion of traffic and transportation impacts under Alternative 3.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 3 would not be buried within any public roadway corridors in the Southern Section. Therefore, no impacts would be expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.4.6.4 Alternative 4a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4a in the Southern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4a would be constructed underground within the I-93, I-393/US Route 9/US Route 202, NH Route 107, and Nottingham Road corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Although the Alternative 4a Project corridor would pass through a number of population centers, developed lands, and lands with development potential while following roadway corridors, construction of this alternative would not be expected to result in a long-term impact to these areas as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Under Alternative 4a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the approximately 5 acres (2 ha) of state, county and private conservation lands in the Alternative 4a Southern Section Project corridor. Alternative 4a would intersect with each of these conservation lands in the alignment buried within roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

The Lamprey River, which is a designated Wild and Scenic River, lies within the Southern Section but is located over 7 miles (11 km) from Alternative 4a. No designated Wild and Scenic Rivers would be impacted. Alternative 4a would cross the eligible federal Wild and Scenic Rivers the Merrimack River, the Soucook River and the Suncook River, as an underground transmission cable in the Southern Section. These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Southern Section Alternative 4a would cross the Merrimack River and the Lamprey River (all State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. The reach of the Lamprey River that would be crossed by Alternative 4a is designated as a State-protected river, but is not a federally designated Wild and Scenic River.

Impacts to the recreational value of protected rivers are discussed in **Section 4.4.3.4**.

Rights-of-Way

New and Existing Transmission Routes

Over 99 percent of the Alternative 4a Project corridor would be located within a new transmission route in the Southern Section. While Alternative 4a would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors. I-93 and I-393/US Route 9/US Route 202 fall under the jurisdiction of the FHWA and NHDOT. NH Route 107 and Nottingham Road are state and local roads. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 4a would require 139 underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.4.5.4** for a discussion of traffic and transportation impacts under Alternative 4a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4a would be buried under 3 miles (5 km) of local roadway corridors, 7 miles (11 km) of state roadway corridors, and 36 miles (58 km) of US Highway and Interstate in the Southern Section. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.4.6.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.4.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.4.6.4**).

4.4.6.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.4.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.4.6.4**).

4.4.6.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

4.4.6.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

4.4.6.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

4.4.6.10 Alternative 6a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 6a in the Southern Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 6a would be constructed underground within the NH Route 127 and US Route 3 roadway corridors, and as co-located, overhead HVAC in the Alternative 2 alignment in the existing PSNH transmission route to the Deerfield Substation. Near the Concord Airport, height restrictions would require separate sets of shorter towers. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors. Lands within the existing PSNH transmission route are already subject to the same restrictions in use as they would be following the construction of Alternative 6a.

Approximately 16 percent of the Alternative 6a Project corridor is currently coded as a developed use. Approximately 86 percent of the developed land has a land cover category of Rural Residential and Recreation Uses, and about 14 percent of the developed land is in a Developed Residential, Commercial, and Industrial Use. Alternative 6a would pass through more intensive land use areas, such as population centers, village areas, and commercial centers. Construction of Alternative 6a would not be expected to result in a long-term impact to lands with a high development potential in the Southern Section. Because approximately 1.3 percent of the corridor experienced development activity between 2001 and 2011, a high level of future development is not expected.

Under Alternative 6a, the Project would result in impacts to the current or future use of existing private lands, as described in **Section 4.1.6.1**.

Conservation Lands

Construction of Alternative 6a in the Southern Section would impact approximately 29 acres (12 ha) of federal, state, county, and private conservation land, and no NFS lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 6a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

The Lamprey River, which is a designated Wild and Scenic River, lies within the Southern Section but is located over 7 miles (11 km) from Alternative 6a. No designated Wild and Scenic Rivers would be impacted. Alternative 6a would cross the Merrimack River (an eligible federal Wild and Scenic River) as an underground transmission cable in the Southern Section. This crossing is not expected to impact the potential future designation of this river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Alternative 6a would cross the eligible federal Wild and Scenic Rivers, the Soucook River and the Suncook River, as an overhead transmission line in the Southern Section. These crossings may impact the potential future designation of these eligible rivers; however, the impact would be relatively minor and incremental as there is already an existing transmission line crossing in these locations. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the Southern Section, Alternative 6a would cross the Pemigewasset River, the Merrimack River, and the Lamprey River (all State-protected rivers) as an underground transmission cable. The Applicant would be required to comply with the specific protection measures established by the New Hampshire Rivers Management and Protection Program. The reach of the Lamprey River that would be crossed by Alternative 6a is designated as a State-protected river, but is not a federally designated Wild and Scenic River. No other State-protected rivers would be impacted.

Impacts to the recreational value of protected rivers are discussed in **Section 4.4.3.10**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 34 miles (54 km) of the Project corridor of Alternative 6a would be located within the existing PSNH transmission route in the Southern Section. Approximately 8 miles (12 km) of the Project in the Southern Section would be located within a new transmission route within roadway corridors.

In order to accommodate the installation of the Project in the existing corridor, the actions described in **Section 4.1.6.1** would have to be taken. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 6a within the existing corridor. NH Route 127 falls under the jurisdiction of NHDOT. US Route 3 falls under the jurisdiction of the FHWA and NHDOT. The Project would require authorizations for this use (see **Section 4.1.6.1**).

Road Crossings

Construction of Alternative 6a would require 54 aerial road crossings, and 54 underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.4.5.10** for a discussion of traffic and transportation impacts under Alternative 6a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 6a would be buried under 4 miles (6 km) of state roadway corridors, 4 miles (6 km) of US Highway, and no local roadway corridors in the Southern Section. The Project would require an authorization for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

4.4.6.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 6a (see **Section 4.4.6.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 6a (see **Section 4.4.6.10**).

4.4.6.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those discussed above for Alternative 2 (see **Section 4.4.6.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those discussed above for Alternative 2(see **Section 4.4.6.2**).

4.4.7 NOISE

Refer to **Section 4.1.7** for a discussion of general impacts common to all geographic sections.

All action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), noise impacts would be very similar. Impacts from the HVAC line reconductoring would cause short-term, adverse noise impacts on sensitive noise receptors within 50 feet (15 m). Most of these impacts would occur during daylight hours (generally 7:00 a.m. to 7:00 p.m.) and would be short-term. Impacts at the Scobie Pond Substation would be similar to the expansion of the Deerfield Substation and would involve clearing and grading, excavation for foundations, and installation of major electrical equipment. Construction of the capacitor banks would cause short-term increases in ambient noise levels in the immediate vicinity of the construction site. Depending upon the distance involved, construction of the substation may result in localized, short-term annoyance at the nearest sensitive noise receptors to the station. In addition, implementation of APMs (see **Appendix H**) would further ensure that noise levels do not exceed projected levels during construction at converter station sites.

4.4.7.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.7.2 Alternative 2

Impacts from Construction

Under Alternative 2 in the Southern Section, 50 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Construction activities at the Franklin Converter Station would involve clearing and grading, excavation for foundations, building construction, and installation of major electrical equipment. The estimated composite construction noise level at 1,000 feet (305 m) from the approximate center of the converter station siting areas (adjusted for quantity of equipment and utilization factor) is 67 dBA for the station site preparation, 65 dBA for the foundation construction, and 69 dBA for the station construction. The composite noise levels at the nearest receptor (a residence 200 feet [61 m] from the site fence line) would be 81 dBA for the station site preparation, 79 dBA for the foundation construction, and 83 dBA for the station construction. These noise levels are below the USDOT noise guideline of 90 dBA for daytime (7:00 a.m. to 10:00 p.m.) construction noise in a residential land use area. Because of the distance involved, construction of the converter station would result in localized, short-term annoyance at the nearest sensitive noise receptors to the station. In addition, implementation of APMs (see **Appendix H**) would further ensure that noise levels do not exceed projected levels during construction at converter station sites.

In addition, the expansion of the Deerfield Substation would involve clearing and grading, excavation for foundations, and installation of major electrical equipment. Construction of the substation would cause short-term increases in ambient noise levels in the immediate vicinity of the construction site. Depending upon the distance involved, construction of the substation may result in localized, short-term annoyance at the nearest sensitive noise receptors to the station. In addition, implementation of APMs (see **Appendix H**) would further ensure that noise levels do not exceed projected levels during construction at converter station sites.

Impacts from Operations, Maintenance, and Emergency Repairs

The audible noise due to the corona effect of the overhead HVDC and HVAC lines would not exceed the EPA guidance level of Ldn of 55 dBA for outdoor areas beyond the transmission route and would not present a long-term impact (see **Section 4.1.7.2**).

Noise levels due to the operation of the Franklin Converter Station were estimated based on typical converter station equipment and a typical converter station layout. The estimated noise level at the nearest receptor to the Franklin Converter Station (a residence at approximately 200 feet [61 m]) could range from 45 to 58 dBA depending on station layout, equipment, and orientation. The audible noise requirements would be considered in the detailed design and the station would be designed to meet the requirements. Noise modeling should be conducted prior to construction and measurements should be taken after construction to verify the design.

Ongoing maintenance activities under the Project would include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. In addition, Northern Pass would conduct visual inspections via helicopter of the transmission lines periodically. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized. These operational noise sources could also cause short-term adverse effects to nearby outdoor recreational uses.

4.4.7.3 Alternative 3

Impacts from Construction

Construction of the Project under Alternative 3 in the Southern Section would result in noise due to vegetation removal, transmission cable burial, and construction of the North Road Converter Station. Under Alternative 3 in the Southern Section, 27 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Construction activities at the North Road Converter Station would involve clearing and grading, excavation for foundations, building construction, and installation of major electrical equipment. Construction noise levels at this converter station would be expected to be similar to those described for the Franklin Converter Station for Alternative 2 (see **Section 4.4.7.2**), but would impact different receptors.

Construction activities at the Deerfield Substation would involve clearing and grading, excavation for foundations, and installation of major electrical equipment. Construction of the substation would cause short-term increases in ambient noise levels in the immediate vicinity of the construction site. Depending upon the distance involved, construction of the substation may result in localized, short-term annoyance at the nearest sensitive noise receptors to the station. In addition, implementation of APMs (see **Appendix H**) would further ensure that noise levels do not exceed projected levels during construction at converter station sites. The composite noise levels at the nearest receptor (a residence 780 feet [238 m] from the site center) would be 69 dBA for the station site preparation, 67 dBA for the foundation construction, and 71 dBA for the station construction. These noise levels are below the USDOT noise guideline of 90 dBA for daytime (7:00 a.m. to 10:00 p.m.) construction noise in a residential land use area. Because of the distance involved, construction of the converter station would result in short-term noise impacts at the nearest sensitive noise receptors to the station. In addition, implementation of typical construction noise minimization measures would further ensure that noise levels do not exceed projected levels during construction at converter station sites.

Impacts from Operations, Maintenance, and Emergency Repairs

Noise levels due to the operation of the North Road Converter Station were estimated based on typical converter station equipment and a typical converter station layout. The estimated noise level at the nearest receptor to the North Road Converter Station (approximately 780 feet [238 m]) could range from 41 to 55 dBA depending on station layout, equipment, and orientation. The audible noise requirements would be considered in the detailed design and the station would be designed to meet the requirements. Noise modeling should be conducted prior to construction and measurements should be taken after construction to verify the design.

Project operation, maintenance, and emergency repairs under Alternative 3 in the Southern Section would also include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations. These operational noise sources would also impact nearby outdoor recreational uses.

4.4.7.4 Alternative 4a

Impacts from Construction

Because the cable would be constructed underground for its entire length, construction noise levels would be expected to be identical to those discussed for the Project under Alternative 3 in the Southern Section (see **Section 4.4.7.3**). However, because the Project would follow roadway corridors, more residences would be affected. Under Alternative 4a in the Southern Section, 325 residences would be located within 50 feet (15 m) of disturbance areas. These residences may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, schools, or daycare centers within 50 feet (15 m) of the disturbance areas. Disturbance areas would be within 50 feet (15 m) of one library that may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Noise resulting from the construction of the North Road Converter Station would be identical to that discussed under Alternative 3 (see **Section 4.4.7.3**).

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4a in the Southern Section would be identical to those under Alternative 3 (see **Section 4.4.7.3**).

4.4.7.5 Alternative 4b

Impacts from Construction

Construction-related noise impacts under Alternative 4b in the Southern Section would be identical to those under Alternative 4a (see **Section 4.4.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 4b in the Southern Section would be identical to those under Alternative 4a (see **Section 4.4.7.4**).

4.4.7.6 Alternative 4c

Impacts from Construction

Construction-related noise impacts under Alternative 4c in the Southern Section would be identical to those under Alternative 4a (see **Section 4.4.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 4c in the Southern Section would be identical to those under Alternative 4a (see **Section 4.4.7.4**).

4.4.7.7 Alternative 5a

Impacts from Construction

Construction-related noise impacts under Alternative 5a in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5a in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

4.4.7.8 Alternative 5b

Impacts from Construction

Construction-related noise impacts under Alternative 5b in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5b in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

4.4.7.9 Alternative 5c

Impacts from Construction

Construction-related noise impacts under Alternative 5c in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 5c in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

4.4.7.10 Alternative 6a

Impacts from Construction

In the Southern Section, Alternative 6a would include both overhead transmission lines and underground cables. The noise levels resulting from the construction of the overhead lines would be expected to be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.7.2**). The noise levels resulting from burial of the cables would be expected to be identical to those described for the Project under Alternative 3 in the Southern Section (see **Section 4.4.7.3**). Under Alternative 6a in the Southern Section, 335 residences would be located within 50 feet (15 m) of disturbance areas. Residences located at these distances may experience short-term noise levels in excess of the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. With the implementation of APMs (see **Appendix H**), such as utilizing construction equipment with proper mufflers and routing vehicles away from sensitive noise receptors, noise levels would be expected to fall below USDOT guidelines. There would be no hospitals, places of worship, libraries and schools, or daycare centers within 50 feet (15 m) of the disturbance areas. These construction noise sources could also cause short-term adverse effects to nearby outdoor recreational uses and conservation lands.

Noise resulting from the construction of the Franklin Converter Station would be identical to that discussed under Alternative 2 (**Section 4.4.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6a, aboveground portions of the Project would follow the same alignment as Alternative 2, and buried portions would follow the same alignment as Alternative 4a. Therefore, the type of impacts from operations, maintenance, and emergency repairs of the aboveground portions of the Project under Alternative 6a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.7.2).** The types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.7.4**). Operation of the Franklin Converter Station would result in identical noise impacts to those discussed for Alternative 2 (see **Section 4.4.7.2**).

4.4.7.11 Alternative 6b

Impacts from Construction

Construction-related noise impacts under Alternative 6b in the Southern Section would be identical to those under Alternative 6a (see **Section 4.4.7.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 6b in the Southern Section would be identical to those under Alternative 6a (see **Section 4.4.7.10**).

4.4.7.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction-related noise impacts under Alternative 7 in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 7 in the Southern Section would be identical to those under Alternative 2 (see **Section 4.4.7.2**).

4.4.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 4.1.8** for a discussion of general impacts common to all geographic sections. For more information about resource types and potential impacts, see **Section 3.4.8** and the **Cultural Resources Technical Report** (Sections 2.3 and 3.3).

Table 4-160 and **Table 4-161** summarize the number of archaeological resources (or sites) and archaeologically-sensitive areas within the direct APE (consisting of the entire width of the new transmission route and existing PSNH transmission route) that would be potentially affected by the Project in the Southern Section. Archaeological resources may consist of pre-Contact Native American archaeological sites, post-Contact Euro-American archaeological sites, and/or multi-component archaeological sites that contain pre-Contact Native American and post-Contact Euro-American archaeological remains (see Section 2.1.1.1 of the **Cultural Resources Technical Report**). Archaeologically sensitive areas are those areas that have the potential to contain archaeological resources, although no archaeological resources have been previously identified or were observed within these areas. These areas may be sensitive for containing pre-Contact Native American archaeological resources, post-Contact Euro-American archaeological resources, and/or multi-component (pre-Contact Native American and post-Contact Euro-American) archaeological resources (see Section 2.1.1.2 of the **Cultural Resources Technical Report**). These archaeological resources (sites) and archaeologically sensitive areas could be physically impacted by the Project.

Table 4-162 summarizes the number of architectural resources (buildings, structures, or other built resources) within both the indirect APE and direct APE that would be potentially affected by the Project in the Northern Section. Architectural resources may consist of individual buildings, structures, or other built resources (for example, residences; farm complexes [residences, barns, and other outbuildings]; religious buildings [churches, meeting houses, and chapels]; cabins and cottages; civic buildings [libraries, post offices, town halls, etc.]; cemeteries; bridges; railroads; and trails) (see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources may also include historic districts, which are groups of buildings, structures, and other built resources that are related physically and/or thematically (also see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources within the indirect APE (1 mile [1.6 km] on each side of alternative centerlines) could be visually impacted by the Project, while architectural resources within the direct APE could be physically impacted by the Project.

Table 4-160. Number of Archaeological Resources Potentially Impacted in the Southern Section during Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2	24	0	0	24
3	24	0	0	24
4a	12	0	0	12
4b	Identical to Alternative 4a			
4c	Identical to Alternative 4a			
5a	Identical to Alternative 2			
5b	Identical to Alternative 2			
5c	Identical to Alternative 2			
6a	17	0	0	17
6b	Identical to Alternative 6a			
7 (Proposed Action)	Identical to Alternative 2			
AC System Support Projects	6	--	--	6

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015

Table 4-161. Number of Archaeologically Sensitive Areas Potentially Impacted in the Southern Section during Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	98	60 (24)
3	98	46 (19)
4a	69	13 (5)
4b	Identical to Alternative 4a	
4c	Identical to Alternative 4a	
5a	Identical to Alternative 2	
5b	Identical to Alternative 2	
5c	Identical to Alternative 2	
6a	88	56 (23)
6b	Identical to Alternative 6a	
7 (Proposed Action)	Identical to Alternative 2	
AC System Support Projects	45	--

Source: Claesson et al. 2014a, 2015a, 2015b; Freedman et al. 2015

Table 4-162. Number of Architectural Resources Potentially Impacted in the Southern Section during Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible (within Indirect APE)	Not Yet Evaluated for NRHP Eligibility (within Indirect APE)
1 (No Action)				
2	40	11	6	34
3	37	9	5	32
4a	62	60	28[a]	27
4b	Identical to Alternative 4a			
4c	Identical to Alternative 4a			
5a	Identical to Alternative 2			
5b	Identical to Alternative 2			
5c	Identical to Alternative 2			
6a	48	22	5[b]	42
6b	Identical to Alternative 6a			
7 (Proposed Action)	Identical to Alternative 2			
AC System Support Projects	62	--	0[c]	49

Source: Claesson et al. 2014b, 2015a; Higgins et al. 2015, 2016c, 2016d
[a] Seven previously evaluated architectural resources were determined to be not NRHP-eligible.
[b] One previously evaluated architectural resources was determined to be not NRHP-eligible.
[c] Thirteen previously evaluated architectural resources were determined to be not NRHP-eligible.

All action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. These activities include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion of the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to historic and cultural resources would be very similar. Components of these upgrades that apply to cultural resources would be ground disturbance and grading activities for the expansion of the Scobie Pond Substation that could impact archeological resources through the associated ground disturbance. If the reconductoring of the existing transmission lines includes new towers that are different in size or character from the existing towers, they could have an impact on architectural resources. These resources are detailed below.

Under all alternatives, approximately 29 acres (12 ha) would be disturbed for the AC Support Systems Projects. The majority of the disturbance area would be associated with new or improved access roads (approximately 13 acres [5 ha]). The disturbance area (approximately 16 acres [6 ha]) would be associated with construction pads (6 acres [2 ha]), clearing within the existing PSNH ROW (6 acres [2 ha]), and modifications to the Scobie Pond Substation (3 acres [1 ha]).

Archeological Resources and Archaeologically Sensitive Areas

The archaeological investigation identified a total of six previously identified archaeological resources within the direct APE between the Deerfield and Scobie Pond Substation. None of the six archaeological sites in the direct APE for this section of the have been evaluated for NRHP eligibility (Claesson et al. 2015a).

DOE's desktop analysis identified a total of 45 archaeologically sensitive areas within the direct APE for the AC System Support Projects. Additionally, a Phase IA archaeological investigation of the direct APE for the AC System Support Projects is recommended to verify the sensitivity of these areas for containing archaeological resources (Claesson et al. 2015a).

Architectural Resources

The assessment of architectural resources identified a total of 62 previously identified architectural resources within the indirect APE for this portion of the Project. Of the 62 previously identified architectural resources, 13 have been previously evaluated for NRHP eligibility and determined not eligible. The NRHP eligibility status of the remaining 16 previously identified architectural resources is unknown because they have not yet been evaluated (Claesson et al. 2015a).

4.4.8.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.8.2 Alternative 2

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, approximately 358 acres (145 ha) of land in the Southern Section would be disturbed. The majority of the construction disturbance area (approximately 237 acres [96 ha]) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route, while the remainder of the construction disturbance area would be associated with the new Franklin Converter Station (approximately 16 acres [6 ha]) and modifications at the existing Deerfield Substation (approximately 9 acres [4 ha]), and new or improved access roads (96 acres [39 ha]).

The archaeological investigation identified 24 archaeological sites within the direct APE for the Southern Section under Alternative 2. None of these 24 archaeological sites have been previously evaluated for NRHP eligibility; therefore, it is not known whether any are NRHP-eligible (Claesson et al. 2014a, 2015b).[101] Of these 24 archaeological sites, four are located within the construction disturbance area for the Southern Section under Alternative 2.

The archaeological investigation identified 98 archaeologically sensitive areas within the direct APE for the Southern Section under Alternative 2 (Claesson et al. 2014a, 2015b). Of these 98 archaeologically sensitive areas, 95 are located within the construction disturbance area for the Southern Section under Alternative 2—94 within the existing PSNH transmission route and one at the location of the new Franklin Converter Station—covering an approximate total land area of 60 acres (24 ha). Approximately 50 of these acres (20 ha) are located within the existing PSNH transmission route and approximately 10 acres (4 ha) would be located at the new Franklin Converter Station.

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 40 architectural resources within the indirect APE of the Southern Section under Alternative 2. Six of these resources were previously evaluated for NRHP

[101] It should be noted that two archaeological sites were previously recommended as potentially NRHP-eligible and five were previously recommended as not NRHP-eligible. However, no formal evaluation/determination occurred, so NRHP eligibility is unknown.

eligibility and have been listed, or determined eligible for listing in the NRHP. The remaining 34 resources are previously and newly identified architectural resources that have not yet been evaluated for NRHP eligibility or require additional information in order to determine their eligibility (Claesson et al. 2014b; Higgins 2016c, 2016d).

The six NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Eleven of the 40 architectural resources are also located within the direct APE. These 11 architectural resources consist of three NRHP-eligible historic properties and eight resources for which NRHP eligibility is unknown because they have not yet been evaluated (Claesson et al. 2014b; Higgins 2016c, 2016d). Six of these 11 resources, consisting of three NRHP-eligible resources and three resources that have not yet been evaluated for NRHP-eligibility, are located within the construction disturbance area for the Southern Section under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, operation of the Southern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 40 architectural resources located within the indirect or direct APE for the Southern Section under Alternative 2. These impacts would result from ongoing overstory vegetation removal and installation of aboveground structures.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.4.8.3 Alternative 3

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, approximately 330 acres (134 ha) of land would be disturbed in the Southern Section of the Project. The majority of the construction disturbance area (220 acres [89 ha]) would be associated with the installation of the underground HVDC and HVAC transmission cables in the existing PSNH transmission route, while the remainder of the construction disturbance area (approximately 110 acres [45 ha]) would be associated with the new North Road Converter Station (approximately 33 acres [13 ha]), modifications at the existing Deerfield Substation (approximately 9 acres [4 ha]), and new or improved access roads (approximately 68 acres [28 ha]).

The archaeological investigation identified 24 archaeological sites within the direct APE for the WMNF Section under Alternative 3. None of these 24 archaeological sites have been previously evaluated for NRHP eligibility; therefore, it is not known whether any are NRHP-eligible (Claesson et al. 2014a, 2015b;

Freedman et al. 2015).[102] Of these 24 archaeological sites, four are also located within the construction disturbance area for the Southern Section under Alternative 3.

The archaeological investigation identified 98 archaeologically sensitive areas within the direct APE for the Southern Section under Alternative 3 (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Of these 98 archaeologically sensitive areas, 96 are located within the construction disturbance area for the Southern Section under Alternative 3—95 within the existing PSNH transmission route and one at the location of the new North Road Converter Station—covering an approximate total land area of 46 acres (19 ha). Approximately 44 acres (18 ha) are located within the existing PSNH transmission route and approximately 2 acres (1 ha) would be located at the new North Road Converter Station.

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 37 architectural resources within the indirect APE of the Southern Section under Alternative 3. Five of these resources have been listed, or determined eligible for listing in the NRHP. The remaining 32 resources are previously and newly identified architectural resources that have not yet been evaluated for NRHP eligibility or require additional information in order to determine their eligibility (Higgins et al. 2015).

The five NRHP-listed or -eligible resources are considered historic properties. Construction of Project components, including new access roads and laydown areas, would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Nine of the 37 architectural resources are also located within the direct APE. These nine architectural resources consist of three NRHP-eligible resources, and six resources for which NRHP eligibility is unknown because they have not yet been evaluated. Six of these nine architectural resources, consisting of three NRHP-eligible resources and three resources that have not yet been evaluated for NRHP-eligibility, are also located within the disturbance area for the Southern Section of Alternative 3 (Higgins et al. 2015).

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, operation of the Southern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 37 architectural resources located within the indirect or direct APE for the Southern Section under Alternative 3. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

[102] It should be noted that two archaeological sites were previously recommended as potentially NRHP-eligible and five were previously recommended as not NRHP-eligible. However, no formal evaluation occurred.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.4.8.4 Alternative 4a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, approximately 92 acres (41 ha) of land would be disturbed in the Southern Section of the Project. The majority of the construction disturbance area (approximately 50 acres [20 ha]) would be associated with the installation of the underground HVDC and HVAC transmission cables within existing roadway, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance. The remainder of the construction disturbance area (approximately 42 acres [17 ha]) would be associated with the new North Road Converter Station (approximately 33 acres [13 ha]) and modifications at the existing Deerfield Substation (approximately 9 acres [4 ha]).

The archaeological investigation identified 12 archaeological sites within the direct APE for the Southern Section under Alternative 4a. None of these 12 archaeological sites are located within the construction disturbance area for the Southern Section under Alternative 4a. None of these 12 archaeological sites have been previously evaluated for NRHP eligibility. Therefore, it is not known whether they are NRHP-eligible (Freedman et al. 2015).

The archaeological investigation identified 69 archaeologically sensitive areas within the direct APE for the Southern Section under Alternative 4a (Freedman et al. 2015). Fifty-nine of these areas are located within the construction disturbance area for the Southern Section under Alternative 4a—58 along roadways and one at the location of the new North Road Converter Station—covering an approximate total land area of 13 acres (5 ha). Approximately 11 acres (4 ha) are located along roadways and approximately 2 acres (1 ha) would be located at the new North Road Converter Station).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 62 architectural resources within the indirect APE of the Southern Section under Alternative 4a. Thirty-five of these resources were previously evaluated for NRHP eligibility—one was previously listed in the NRHP, 28 were previously determined NRHP-eligible either as individual resources or as contributing resources to historic districts, and seven were previously determined not NRHP-eligible. The remaining 27 resources are newly identified architectural resources that have not yet been evaluated for NRHP eligibility (Higgins et al. 2015).

The 28 NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

Sixty of the 62 architectural resources are also located within the direct APE. These 60 architectural resources consist of all of the 35 previously identified architectural resources, including all resources previously evaluated for NRHP eligibility and 25 of the 27 resources that have not yet been evaluated for NRHP eligibility. Five of these 62 resources have not yet been evaluated for NRHP-eligibility and are located within the construction disturbance area for the Southern Section under Alternative 4a (Higgins et al. 2015). Long-term construction impacts could occur to resources located in the disturbance area, resulting from surface and subsurface ground disturbance.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, operation of the Southern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 62 architectural resources located within the indirect or direct APE for the Southern Section under Alternative 4a. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.4.8.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those under Alternative 4a in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those under Alternative 4a in the Southern Section.

4.4.8.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those under Alternative 4a in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those under Alternative 4a in the Southern Section.

4.4.8.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those under Alternative 2 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those under Alternative 2 in the Southern Section.

4.4.8.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those under Alternative 2 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those under Alternative 2 in the Southern Section.

4.4.8.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those under Alternative 2 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those under Alternative 2 in the Southern Section.

4.4.8.10 Alternative 6a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6a, approximately 225 acres (91 ha) of land would be disturbed in the Southern Section of the Project. The majority of the disturbance area—approximately 127 acres (51 ha)—would be associated with the installation of the new overhead HVAC transmission line in existing PSNH transmission route. Approximately 9 acres (4 ha) of the construction disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance. The remainder of the construction disturbance area would be associated with the new Franklin Converter Station—approximately 16 acres (6 ha)—modifications at the existing Deerfield Substation—approximately 8 acres (3 ha)—and new or improved access roads—approximately 65 acres (26 ha).

The archaeological investigation identified 17 archaeological sites within the direct APE for the Southern Section under Alternative 6a. None of these 17 archaeological sites have been previously evaluated for NRHP eligibility; therefore, it is not known whether any are NRHP-eligible (Freedman et al. 2015).[103] Of these 17 archaeological sites, three are located within the construction disturbance area for the Southern Section under Alternative 6a.

The archaeological investigation identified 88 archaeologically sensitive areas within the direct APE for the Southern Section under Alternative 6a (Freedman et al. 2015). Of these 88 archaeologically sensitive areas, 83 are located within the construction disturbance area for the Southern Section under Alternative 6a—71 within the existing PSNH transmission route, 11 along state and federal roadways, and 1 at the location of the new Franklin Converter Station—covering an approximate total land area of 56 acres (23 ha). Approximately 33 acres (13 ha) are located within the existing PSNH transmission route, 13 acres (5

[103] It should be noted that one archaeological site was previously recommended as potentially NRHP-eligible and four were previously recommended as not NRHP-eligible. However, no formal evaluation occurred.

ha) along state and federal roadways, and approximately 10 acres (4 ha) would be at the new Franklin Converter Station.

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 48 architectural resources within the study area for the indirect APE of the Southern Section under Alternative 6a. Five of these resources were previously evaluated for NRHP eligibility and have been listed, or determined eligible for listing in the NRHP. The remaining 42 resources have not yet been evaluated for NRHP eligibility or require additional information in order to determine their NRHP eligibility.

The five NRHP-listed or -eligible resources are considered historic properties. Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these three resources, as well as any other architectural resources in the indirect APE.

Twenty-two of the 48 architectural resources are also located within the direct APE. These 22 architectural resources consist of four NRHP-eligible resources, one resource that was previously determined not NRHP-eligible, and 17 resources for which NRHP-eligibility is unknown because they have not yet been evaluated for NRHP-eligibility (Higgins et al. 2015). Seven of these architectural resources, consisting of four NRHP-eligible resources, one resource that was previously determined not NRHP-eligible, and two resources that have not yet been evaluated for NRHP-eligibility, are also within the disturbance area for the Southern Section of Alternative 6a. Long-term construction impacts could occur to resources located in the disturbance area, resulting from surface and subsurface ground disturbance.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 6a, operation of the Southern Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation activities would result in long-term visual impacts on the 48 architectural resources located within the indirect or direct APE for the Southern Section under Alternative 6a. These impacts would result from ongoing overstory vegetation management, which has the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.4.8.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 6a in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those under Alternative 6a in the Southern Section.

4.4.8.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those under Alternative 2 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those under Alternative 2 in the Southern Section.

4.4.9 ENVIRONMENTAL JUSTICE

Refer to **Section 4.1.9** for a discussion of general impacts common to all geographic sections. In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts would be very similar.

4.4.9.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.9.2 Alternative 2

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 2 (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected population) in the Southern Section. **Table 4-163** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Southern Section. There is a slightly higher percentage of minorities living among the potentially affected population compared to the unaffected population, and that population has a lower median household income. The percentage of families living below the poverty level is also slightly higher among the potentially affected population than among the unaffected population. Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in compliance with EO 12898, no disproportionately high and adverse human health or environmental effects to minority or low-income populations would be expected to occur under Alternative 2.

Table 4-163. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Southern Section – Alternative 2

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	28,892	7%	$60,000 to $74,999	5%
Unaffected	415,690	6%	$75,000 to $99,999	4%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 2, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.4.9.3 Alternative 3

Impacts from Construction

Under Alternative 3, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 3, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

4.4.9.4 Alternative 4a

Impacts from Construction

Table 4-164 summarizes the demographic characteristics of potentially affected populations for Alternative 4a in the Southern Section. Potentially affected groups exhibit a slightly higher percentage of minority populations, lower median income, and higher percentage of those living below the poverty level.

Table 4-164. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Southern Section – Alternative 4a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	34,652	7%	$60,000 to $74,999	6%
Unaffected	409,930	6%	$75,000 to $99,999	4%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 4a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.4.9.5 Alternative 4b

Impacts from Construction

Under Alternative 4b, construction impacts relating to environmental justice would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.9.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.9.4**).

4.4.9.6 Alternative 4c

Impacts from Construction

Under Alternative 4c, construction impacts relating to environmental justice would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.9.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 4c, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 4a in the Southern Section (see **Section 4.4.9.4**).

4.4.9.7 Alternative 5a

Impacts from Construction

Under Alternative 5a, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5a, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

4.4.9.8 Alternative 5b

Impacts from Construction

Under Alternative 5b, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

4.4.9.9 Alternative 5c

Impacts from Construction

Under Alternative 5c, construction impacts relating to environmental justice would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 5c, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 2 in the Southern Section (see **Section 4.4.9.2**).

4.4.9.10 Alternative 6a

Impacts from Construction

The Census block groups located within 1,000 feet (305 m) of Alternative 6a (identified as the potentially affected populations) exhibit similar characteristics to the remainder of the block groups (the unaffected population) in the Southern Section. **Table 4-165** summarizes the demographic characteristics of potentially affected populations for Alternative 2 in the Southern Section. Potentially affected groups exhibit a slightly higher percentage of minority populations, lower median income, and higher percentage of those living below the poverty level. Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in compliance with EO 12898, no disproportionately high and adverse human health or environmental effects to minority or low-income populations would be expected to occur under Alternative 6a.

Table 4-165. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Southern Section – Alternative 6a

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	31,481	7%	$60,000 to $74,999	7%
Unaffected	413,101	6%	$75,000 to $99,999	4%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 6a.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6a, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.4.9.11 Alternative 6b

Impacts from Construction

Under Alternative 6b, construction impacts relating to environmental justice would be identical to those under Alternative 6a in the Southern Section (see **Section 4.4.9.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 6b, impacts relating to environmental justice from operation, maintenance, and emergency repairs would be identical to those under Alternative 6a (see **Section 4.4.9.10**).

4.4.9.12 Alternative 7 – Proposed Action

Impacts from Construction

Table 4-166 summarizes the demographic characteristics of potentially affected populations for Alternative 7 in the Southern Section. Potentially affected groups exhibit a higher percentage of minority populations, lower median income, and higher percentage of those living below the poverty level.

Table 4-166. Demographic Characteristics of Potentially Affected Populations and Other NH Residents in the Southern Section – Alternative 7

Population Status	Total Population	% Minority	Median Household Income Range	% Families Living Below Poverty Level
Potentially Affected	28,892	7%	$60,000 to $74,999	5%
Unaffected	415,690	6%	$75,000 to $99,999	4%

Source: U.S. Census Bureau 2016a, 2016e

Because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations under Alternative 7.

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 7, because the demographic characteristics of potentially affected populations are not greatly different from those populations outside the affected area for environmental justice, in considering EO 12898, DOE has not identified the potential for disproportionately high and adverse impacts that would affect minority or low-income populations.

4.4.10 AIR QUALITY

Refer to **Section 4.1.10** for a discussion of general impacts common to all geographic sections.

The Southern Section of the Project would be located in Merrimack and Rockingham counties. The Franklin and North Road Converter Stations, and the Deerfield and Scobie Pond Substations would be located within the Southern Section. Project related construction would result in short-term impacts to air quality in the Southern Section. Long-term maintenance operating emissions would not result in measurable impacts to air quality. Construction and maintenance emissions would be lower for the portions of the Project with underground cable compared to the aboveground lines because of the use different types of equipment, less equipment, and less overall vehicle activity. The Project would also result in a minimal loss of forested areas in this section and, therefore, some loss of carbon sequestration capacity. The reduction in forest carbon sink would have adverse, long-term, and regional impacts.

In the Southern Section, all action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to air quality would be very similar. **Table 4-167** shows the total emissions from the construction activities associated with the 5 acres (2 ha) of construction at the Scobie Pond Substation; these impacts would be identical for all alternatives. Impacts from line upgrades and tower modification are expected to be minimal.

Table 4-167. Scobie Pond Substation Construction Emissions

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction at Scobie Pond	2.53	0.24	2.07	0.005	3.38	0.52	601.39

Since parts of the Southern Section are located within a nonattainment area, the Conformity Rule would apply to the Project in this section. The towns of Allenstown, Pembroke, and Concord, NH, in Merrimack County and the Deerfield, NH, in Rockingham County have been designated as the Central New Hampshire area, which is in nonattainment for the 2010 SO_2 NAAQS. Therefore, the SO_2 thresholds apply. Emissions from construction, operation, maintenance, and emergency repairs would not exceed General Conformity *de minimis* thresholds within the applicable counties.

4.4.10.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.10.2 Alternative 2

Impacts from Construction

Under Alternative 2 in the Southern Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 46 miles (74 km). The Franklin Converter Station would be constructed on 16 acres in Merrimack County, and the existing Deerfield Substation in Rockingham County would be expanded by approximately 9 acres (4 ha). Construction activities at the Scobie Pond 345kV Substation expansion in Londonderry, NH, would result in additional impacts and have also been evaluated. **Table 4-168** shows total emissions from the construction activities within the Southern Section under Alternative 2.

Table 4-168. Alternative 2 Construction Emissions in the Southern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Southern Section	88.72	7.73	56.49	1.42	164.62	28.55	24,833.77
General Conformity Thresholds	N/A	N/A	N/A	100	N/A	N/A	N/A

The SO_2 *de minimis* threshold is conservatively applied to construction of the Project within the entire Southern Section, although it is only applicable to the Project within the nonattainment area. The Scobie Pond Substation is not located within the "Central New Hampshire" SO_2 non-attainment area. When compared to the General Conformity Rule *de minimis* thresholds, the total annual emissions from construction within the Southern Section (and at Scobie Pond) would be below the thresholds for SO_2. Construction emissions would be localized and short-term.

The Project under Alternative 2 in the Southern Section would require the removal of approximately 2 acres (0.8 ha) of deciduous forest, 24 acres (10 ha) of conifer forest, and 83 acres (34 ha) of mixed forest. The loss of sequestration capacity is estimated at 8,570 metric tons of carbon, which is the equivalent of 31,453 metric tons of CO_2. This would also result in the equivalent loss of 132 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

The loss of 3 acres (1 ha) of mixed forest from the construction at the Scobie Pond Substation could result in the loss of sequestration capacity estimated at 235 metric tons of carbon, which is the equivalent of 861 metric tons of CO_2. This would also result in the equivalent loss of 4 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line would be a small fraction of the Project's short-term emissions from construction in the Southern Section under this alternative. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.4.10.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the Southern Section, the underground transmission cable would be located in the existing PSNH transmission route for approximately 46 miles (74 km). The North Road Converter Station would be constructed on approximately 33 acres (13 ha) in Rockingham County, and the existing Deerfield Substation in Rockingham County would be expanded by approximately 9 acres (4 ha). **Table 4-169** shows total emissions from the construction activities within the Southern Section of the Project under Alternative 3.

Table 4-169. Alternative 3 Construction Emissions in the Southern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Southern Section	47.90	4.88	45.55	0.11	106.04	15.39	10,146.67
General Conformity Thresholds	N/A	N/A	N/A	100	N/A	N/A	N/A

The SO_2 *de minimis* threshold is conservatively applied to the entire Southern Section, although it is only applicable to the Project within the nonattainment area. When compared to the General Conformity Rule *de minimis* thresholds, the total annual emissions from construction within the Southern Section under Alternative 3 are below the thresholds for SO_2. Construction emissions would be localized and short-term.

Construction of the Project within the Southern Section for Alternative 3 would require the removal of less than an acre of deciduous and conifer forest, and 51 acres (21 ha) of mixed forest. The loss of sequestration capacity is estimated at 4,094 metric tons of carbon, which is the equivalent of 15,024 metric tons of CO_2. This would result in the equivalent loss of 65 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line would be a small fraction of the Project's short-term emissions from construction in the Southern Section under this alternative. Maintenance requirements would also be more limited for the underground cable in Alternative 3 compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.4.10.4 Alternative 4a

Impacts from Construction

Under Alternative 4a in the Southern Section, the underground transmission cable would be located in an existing roadway corridor for approximately 41 miles (66 km). The North Road Converter Station would be constructed on approximately 33 acres (13 ha) in Rockingham County, and the existing Deerfield Substation in Rockingham County would be expanded by approximately 9 acres (4 ha). **Table 4-170** shows total emissions from the construction activities within the Southern Section of the Project under Alternative 4a.

Table 4-170. Alternative 4a Construction Emissions in the Southern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Southern Section	45.95	4.67	43.79	0.10	100.11	14.54	9,764.32
General Conformity Thresholds	N/A	N/A	N/A	100	N/A	N/A	N/A

The SO_2 *de minimis* threshold is conservatively applied to the entire Southern Section, although it is only applicable to the Project within the nonattainment area. When compared to the General Conformity Rule *de minimis* thresholds, the total annual emissions from construction within the Southern Section under Alternative 4a are below the thresholds for SO_2. Construction emissions would be localized and short-term.

Construction of the Project in the Southern Section for Alternative 4a would require the removal of less than an acre of deciduous and conifer forest, and 45 acres (18 ha) of mixed forest. The loss of sequestration capacity is estimated at 575 metric tons of carbon, which is the equivalent of 13,122 metric tons of CO_2. This would result in the equivalent loss of 57 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line would be a small fraction of the Project's short-term emissions from construction in the Southern Section under this alternative. Maintenance requirements would also be more limited for the underground cable in Alternative 4a compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.4.10.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.10.4**).

4.4.10.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.10.4**).

4.4.10.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

4.4.10.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

4.4.10.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

4.4.10.10 Alternative 6a

Impacts from Construction

Under Alternative 6a in the Southern Section, the underground transmission cable would be located in an existing roadway corridor for approximately 8 miles (13 km). At the Franklin Converter Station, the cable would transition to an overhead line. The overhead line would be installed within the existing PSNH transmission route for 34 miles (55 km). The Franklin Converter Station would be constructed on 42 acres (17 ha) in Merrimack County, and the existing Deerfield Substation in Rockingham County would be expanded by approximately 9 acres (4 ha). **Table 4-171** shows total emissions from the construction activities within the Southern Section of the Project under Alternative 6a.

Table 4-171. Alternative 6a Construction Emissions in the Southern Section

Action	Emissions (tons)						CO_2 Emissions (metric tons)
	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	
Construction in Southern Section	96.28	8.68	69.77	1.23	181.73	30.02	23,790.59
General Conformity Thresholds	N/A	N/A	N/A	100	N/A	N/A	N/A

The SO_2 *de minimis* threshold is conservatively applied to the entire Southern Section, although it is only applicable to the Project within the nonattainment area. When compared to the General Conformity Rule *de minimis* thresholds, the total annual emissions from construction within the Southern Section under Alternative 6a are below the thresholds for SO_2. Construction emissions would be localized and short-term.

Construction of the Project under Alternative 6a in the Southern Section would require the removal of approximately 20 acres (8 ha) of conifer forest, and 26 acres (11 ha) of mixed forest. The loss of sequestration capacity is estimated at 3,606 metric tons of carbon, which is the equivalent of 13,233 metric tons of CO_2. This would result in the equivalent loss of 53 metric tons of CO_2 uptake per year. This adverse impact would be long-term and regional.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance operations for the transmission line and underground cable would be a small fraction of the Project's short-term emissions from construction in the Southern Section under this alternative. Maintenance requirements would also be more limited for the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.4.10.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.10.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.10.10**).

4.4.10.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.10.2**).

4.4.11 WILDLIFE

Refer to **Section 4.1.11** for a discussion of general impacts common to all geographic sections.

The Project has the potential to impact wildlife resources. **Table 4-65** and **Table 4-66** in **Section 4.1.11** present a summary of Project-wide effects to federally- and state-listed species and the determination for federally-listed species. Because the nature of impacts to federally- and state-listed species is similar to that for non-listed species, all impacts are discussed in the General Wildlife discussion.

All alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to wildlife would be very similar. For vegetation loss, roughly 5 acres (2 ha) of vegetation would be impacted by the expansion of the existing Scobie Pond Substation. Of these 5 acres (2 ha), roughly 3 acres (1 ha) is forested habitat and 2 acres (1 ha) is scrub-shrub habitats with marginal amounts of wetlands and open water.

4.4.11.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.11.2 Alternative 2

Impacts from Construction

Aquatic Species

Impacts to aquatic species could result from direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. With the implementation of a SWPPP, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction (see **Appendix H**), impacts to aquatic species would be minimized.

Terrestrial Species

Impacts to terrestrial species could result from the same general effects as for aquatic species: direct mortality or injury to individuals, sensory disturbance, and increased depredation. During construction, any mobile terrestrial wildlife (e.g., white-tailed deer, birds) would be expected to flush or flee the area, prior to construction equipment physically clearing vegetation. Impacts would be short-term (wildlife would return to the Project corridor following construction, particularly as vegetation returns) and localized to regional (depending upon the extent of active construction activities). The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase causing increased mortalities and/or injuries.

Alternative 2 would result in the disturbance of approximately 387 acres (157 ha) of wildlife habitat in the Southern Section. Of this total, the primary disturbance would occur to scrub-shrub (161 acres [65 ha]), and forestlands (109 acres [44 ha]). The primary disturbance activities causing these impacts are the widening of the existing PSNH transmission route, and construction of the Deerfield Substation, Franklin Converter

Station, and proposed towers. Based on a review of the NHWAP Habitat data, approximately 774,000 acres (313,227 ha) of forestlands are located within Merrimack and Rockingham counties, NH. The removal of approximately 109 acres (44 ha) of forestland would represent less than 0.1 percent of the overall forestland habitats available to wildlife within the county.

In the Southern Section, nearly all construction activity would be located in the existing PSNH transmission route and would primarily involve widening the existing PSNH transmission route. Thus, no loss of interior forest habitats would occur, although the removal of trees along the edge of the existing PSNH transmission route could have an effect on interior forests located adjacent to the transmission route.

The federally endangered Karner blue butterfly and a number of state listed insect species (see **Table 3-14**) may be impacted by the clearing of vegetation in the transmission route. These species that use grassland and shrublands may benefit from the fragmentation and removal of forest and woodland habitats adjacent to the transmission route. Alternative 2 would cross known locations of wild lupine habitat and a conservation easement near the Concord Airport. Based on the NHB dataset, a total of three wild lupine habitat locations in Concord, NH are within or immediately adjacent to the existing PSNH transmission route, based on NHB records. A detailed discussion of potential impacts to Karner blue butterfly habitat is presented in the Final Biological Assessment for the Northern Pass Transmission Line Project Environmental Impact Statement (SE Group 2017). An estimated 20 square feet (2 m^2) of permanent loss of wild lupine patches and the temporary disturbance to 17,000 square feet (1,579 m^2) of wild lupine habitat, which support Karner blue butterfly populations. Based on this impact to habitat, the Applicant is offering compensatory mitigation in the form of the acquisition of a long-term conservation easement on a 6.9-acre (2.8-ha) parcel, in the vicinity of existing Karner blue butterfly habitat that would be impacted by the Project.

In addition to the Karner blue butterfly, a number of the state listed insect species, rely on the pine barrens habitat for portions of their life cycle. This species utilizes early successional pine trees for larval development and may benefit from construction-related disturbance that eliminate competition and encourage growth. Impacts to these habitats would be minimized with the application of APMs, including the creation of a long-term conservation easement in the pine barrens region (see **Appendix H**).

A total of 106 state-listed and four federally-listed threatened or endangered species have the potential to occur in the Southern Section (one of the federally-listed species are also listed as threatened or endangered by New Hampshire). Two of the federally-listed, the Indiana bat and the northern long-eared bat were potentially detected during Project-specific field surveys in the study area in the Southern Section. Twelve state-listed species were observed during Project-specific field surveys: the brook floater, wood turtle, brown thrasher, chimney swift, Eastern towhee, field sparrow, prairie warbler, purple finch, ruffed grouse, scarlet tanager, veery, and wood thrush. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed wildlife populations.

Habitat Connectivity

Habitat fragmentation impacts to listed species would vary based on the habitat requirements of the listed species. Because the Project under Alternative 2 in the Southern Section would be predominately located within the existing PSNH transmission route, tree clearing would generally be limited to the widening of the existing PSNH transmission route and no additional new habitat barriers would be created. As this section is located south of the WMNF and other similar forested land in the northern part of New Hampshire, no suitable habitat for listed forest-dwelling species such as the Canada lynx, American marten, and Bicknell's thrush is present. Thus, any short-term or long-term adverse effects related to the loss of interior forest habitats adjacent to the existing PSNH transmission route would be limited to non-listed species.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repair activities would be similar to those discussed for construction, except that these impacts be of shorter duration and would continue for the life of the Project. There could be short-term, adverse effects resulting from direct mortality or injury to individuals (including collision and electrocution of birds), sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation.

The impacts of habitat loss, type conversion, and fragmentation described for construction would persist in the long term. Habitat loss and/or modification of existing habitats in the study area during the operation of the Project would also have adverse impacts. The majority of the disturbance would result from the widening of the existing PSNH transmission route. In addition, the construction and operation of the Franklin Converter Station, Deerfield Substation, and Scobie Pond Substation would remove 28 acres (11 ha) of wildlife habitat in the long term. Additional habitat loss during operation is associated with new tower placement and removed towers.

4.4.11.3 Alternative 3

Impacts from Construction

Aquatic Species

Construction-related impacts to aquatic wildlife associated with habitat loss/modification would be similar to those discussed in Alternative 2, although at a reduced scale, based on the smaller disturbance area for Alternative 3, as a narrower construction corridor would be utilized. However, impacts to waterbody crossings would be greater for disturbances for underground transmission cable installation involving excavation of banks and channels for cable installation. Impacts would include disturbance in the trench area and suspension of sediments, resulting in short-term impacts at the specific waterbody crossings. See **Section 4.4.13.3** for impacts to water resources.

Terrestrial Species

Under Alternative 3, approximately 359 acres (106 ha) of wildlife habitat would be impacted by the Project.

The aboveground facilities (North Road Converter Station, Deerfield Substation and Scobie Pond Substation expansion) and transmission route widening would impact approximately 51 acres (18 ha) of wildlife habitat. Of this, impacts would occur to approximately 42 acres (17 ha) of forested habitats. Of the 42 acres (17 ha) of impacts to forests, approximately 5 acres (2 ha) of impacts would result from tree clearing for widening the existing PSNH transmission route, 7 acres (3 ha) from tree clearing for the Deerfield Substation, 28 acres (11 ha) from tree clearing for the North Road Converter Station, and 3 acres (1 ha) from tree clearing for the Scobie Pond Substation. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland communities would be converted, but scrub-shrub and herbaceous wetland communities would persist during operation of the Project.

For the underground cable installation, approximately 55 acres (89 ha) of wildlife habitat would be impacted by the Project. Of this, approximately 165 acres (67 ha) of impacts would result from general construction activity in the existing PSNH transmission route and 55 acres (22 ha) would result from the trench area. Of the 165 acres (67 ha) associated with construction activities the existing PSNH transmission route, impacts would occur primarily to approximately 102 acres (41 ha) of scrub-shrub habitats. Of the 55 acres (22 ha) associated with the trench area, impacts would primarily occur to 0.7 acre (0.3 ha) of forestlands, and 34 acres (14 ha) of scrub-shrub habitats; the remaining impacts would occur to other habitat types.

The removal of approximately 45 acres (18 ha) of forestland associated with Alternative 3 would represent an extremely small area, compared to the overall forestland within the Southern Section. Effects of forest fragmentation on terrestrial species would be similar to those discussed under Alternative 2 (see **Section 4.4.11.2**), although at a reduced scale, based on the smaller disturbance area for Alternative 3.

Habitat Connectivity

In the Southern Section, the Project under Alternative 3 would be located within an existing PSNH transmission route and would require minimal widening of the existing PSNH transmission route. Therefore, no additional habitat fragmentation or new habitat edges would be created, and impacts would be similar to Alternative 2 in the Southern Section except that there would be no aboveground Project components.

Impacts from Operations, Maintenance, and Emergency Repairs

Potential impacts related to operation and maintenance equipment, vehicles, and personnel would generally be similar to those occurring during the construction phase of the Project, though they would occur for shorter durations for the life of the Project. Other, long-term impacts resulting from the Project would generally be similar to those discussed for Alternative 2 (see **Section 4.4.11.2**), although the cable would be buried, eliminating the operational effects related to an overhead transmission line.

Impacts due to habitat fragmentation would be similar to those discussed for Alternative 2, except that there would be no aboveground Project components.

4.4.11.4 Alternative 4a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.4.11.3**); however, Alternative 4a would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead lines.

Terrestrial Species

In the Southern Section, the Project under Alternative 4a would include underground transmission cable and aboveground facilities.

For the aboveground facilities, approximately 45 acres (17 ha) of wildlife habitat would be impacted by the construction of the North Road Converter Station, Deerfield Substation, and Scobie Pond Substation expansion. Of this, impacts would occur to approximately 37 acres (14 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

For the underground portion, approximately 50 acres (20 ha) of wildlife habitat would be impacted by the Project. Impacts would occur to approximately 33 acres (14 ha) of developed lands, 14 acres (6 ha) of mowed ROW and less than 1 acre (<0.4 ha) of forested habitats; the remaining impacts would occur to other habitat types. The construction disturbance associated with Alternative 4a in the Southern Section would result in short-term localized adverse impacts to various wildlife species. The extent of this displacement would be limited as the construction corridor would be relatively narrow compared to the scale of adjoining forestlands.

Construction-related effects for the underground cable portion would be similar to those described for Alternative 3 (see **Section 4.4.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

Localized impacts during construction would likely cause a short-term decrease in species richness and/or abundance.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 4a would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance related effects would be similar to those described for Alternative 3 (see **Section 4.4.11.3**), although adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting new edge habitats.

The largest disturbance area would result from vegetation clearing in the transmission route and buried cable trench, followed by the North Road Converter Station and the Deerfield Substation. All of these locations would result in a long-term loss of wildlife habitat. Species richness and abundance are expected to return to levels prior to construction disturbance, during operation of the Project.

4.4.11.5 Alternative 4b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.4.11.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.4.11.4**).

4.4.11.6 Alternative 4c

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.4.11.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.4.11.4**).

4.4.11.7 Alternative 5a

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

4.4.11.8 Alternative 5b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

4.4.11.9 Alternative 5c

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

4.4.11.10 Alternative 6a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.4.11.2**) for aboveground portions, and Alternative 4a (see **Section 4.4.11.4**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects when compared with aboveground portions. See **Section 4.4.13.10** for impacts to water resources.

Terrestrial Species

In the Southern Section, Alternative 6a would include underground cable in roadway corridors, aboveground transmission line, and aboveground facilities (Franklin Converter Station, Deerfield Substation and Scobie Pond Substation expansion). For the overhead portion, approximately 245 acres (39 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 46 acres (23 ha) of forested habitats. Of the 46 acres (23 ha) of impacts to forests, approximately 11 acres (3 ha) of impacts would result from tree clearing for widening the existing PSNH transmission route, 7 acres (3 ha) from tree clearing for the Deerfield Substation, 16 acres (17 ha) from tree clearing for the Franklin Converter Station, and 3 acres (1 ha) from tree clearing for the Scobie Pond Substation. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project.

For the underground portion, approximately 9 acres (4 ha) of wildlife habitat would be impacted by the Project. Approximately all 9 acres (4 ha) of impacts would occur to developed lands.

The majority of the impacts would be forested and scrub-shrub habitats. These disturbance areas are immediately adjacent to the existing PSNH transmission route.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 6a would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.4.11.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.4.11.4**).

4.4.11.11 Alternative 6b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 6a (see **Section 4.4.11.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 6a (see **Section 4.4.11.10**).

4.4.11.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species under Alternative 7 would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Under Alternative 7, impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 2 (see **Section 4.4.11.2**).

4.4.12 VEGETATION

Refer to **Section 4.1.12** for a discussion of general impacts common to all geographic sections.

All alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to vegetation would be very similar. For vegetation loss, roughly 3 acres (1 ha) of vegetation would be impacted by the expansion of the existing Scobie Pond Substation. Of these 3 acres (1 ha), roughly 2 acres (1 ha) is forested habitat and 1 acre (0.4 ha) is scrub-shrub habitat.

4.4.12.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.12.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 373 acres (151 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 109 acres (44 ha) of forested habitats. Of the 109 acres (44 ha) of impacts to forests, 61 acres (25 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route.

Under Alternative 2, approximately 28 acres (11 ha) of vegetated habitats would be impacted by the installation of towers, and construction at the Deerfield Substation, Scobie Pond Substation, and Franklin Converter Station. Vegetation resources of any forestlands or wetlands would be permanently removed in the disturbance areas and footprints of the towers.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

Generally suitable habitat for all state-listed species was found by a predictive floristic model. The state-listed wild lupine was found in local surveys. The federally-listed small whorled pogonia was identified as potentially being present at several locations along the Project corridor of the Southern Section, based on a GIS model. However, no individuals were observed during the Project-specific surveys of 2013 and 2014. In addition, based on the NHB database, the short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities could impact listed species (wild lupine and small whorled pogonia) potentially present in the corridors (see **Section 4.1.12.2**).

4.4.12.3 Alternative 3

Impacts from Construction

In the Southern Section, Alternative 3 would be constructed as an underground transmission cable with aboveground facilities at the North Road Converter Station, Deerfield Substation, and Scobie Pond Substation. For the aboveground portion, approximately 293 acres (119 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 52 acres (21 ha) of forested habitats. Of the 52 acres (21 ha) of impacts to forests, 5 acres (2 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route, 7 acres (3 ha) would be from tree clearing for the Deerfield Substation, 3 acres (1 ha) would be from tree clearing for the Scobie Pond Substation, and 28 acres (11 ha) would be from tree clearing for the North Road Converter Station.

For the underground portion, approximately 53 acres (85 ha) of vegetated habitats would be impacted by the Project. Of this, approximately all impacts would be associated with the trench area. Of the 53 acres (21 ha) of impacts associated with the trench area, impacts would occur to 7 acres (3 ha) of mowed ROW, 0.2 acre (<0.1 ha) of forestlands, and 34 acres (14 ha) of scrub-shrub habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 3 would be associated with the operation of the Project through installation of substations and transition stations for the underground portion and would be approximately 45 acres (18 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in these areas.

Generally suitable habitat for all state-listed species was found by a predictive floristic model. The state-listed wild lupine was found in local surveys. The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Southern Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. Short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities could impact listed species (wild lupine and small whorled pogonia) potentially present in the Project corridors (see **Section 4.1.12.2**).

4.4.12.4 Alternative 4a

Impacts from Construction

In the Southern Section, Alternative 4a would be constructed as an underground transmission cable with aboveground facilities at the North Road Converter Station, Deerfield Substation and Scobie Substation. Impacts of the aboveground portions of Alternative 4a in the Southern Section would be identical to those discussed for Alternative 3 (see **Section 4.4.12.3**).

For the underground portion, up to 16 acres (6 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 14 acres (16 ha) of mowed ROW, and 0.8 acre (0.3 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

Generally suitable habitat for all state-listed species was found by a predictive floristic model. The state-listed wild lupine was found in local surveys. The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Southern Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. Short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.4.12.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.12.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.12.4**).

4.4.12.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.12.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.12.4**).

4.4.12.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

4.4.12.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

4.4.12.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

4.4.12.10 Alternative 6a

Impacts from Construction

In the Southern Section, Alternative 6a would be constructed as both an overhead transmission line and underground transmission cable, and would include aboveground facilities at the Franklin Converter Station, Deerfield Substation, and Scobie Pond Substation. For the overhead portion, approximately 235 acres (38 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 46 acres (23 ha) of forested habitats. Of the 46 acres (23 ha) of impacts to forests, 11 acres (3 ha) of impacts would result from tree clearing to widen the existing PSNH transmission route, 7 acres (3 ha) would be from tree clearing for the Deerfield Substation, 16 acres (6 ha) would be from tree clearing for the Franklin Converter Station.

For the underground portion, approximately 0.2 acre (<0.1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 0.1 acre (<0.1 ha) of forested habitats, and 0.1 acre (<0.1 ha) of open water.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 6a would be associated with the installation of towers and converter/substations for the underground portion and would be approximately 28 acres (11 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in these areas.

Generally suitable habitat for all state-listed species was found by a predictive floristic model. The state-listed wild lupine was found in local surveys. The federally-listed small whorled pogonia was included in a GIS model as existing in several locations along the Project corridor of the Southern Section; however, no individuals were observed during the Project-specific surveys of 2013 and 2014. Short-term effects could include the direct mortality or disturbance through mowing or grading activities. With the implementation of APMs (see **Appendix H**), no long-term impacts to federally- or state-listed species would be expected. The Applicant is currently consulting with USFWS, USFS, and NHFG regarding any potential disturbance to listed plant populations.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.4.12.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.12.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.12.10**).

4.4.12.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.12.2**).

4.4.13 WATER RESOURCES

Refer to **Section 4.1.13** for a discussion of general impacts common to all geographic sections. As discussed in **Section 4.1.13**, short-term and long-term impacts to water resources would result from construction of the Project, including impacts associated with AC system support projects south of the Deerfield Substation to the Scobie Pond Substation. In general, construction activities including overstory vegetation removal and installation of aboveground and underground facilities would result in ground disturbance and associated impacts to water quality including erosion and sedimentation. With APMs listed in **Appendix H** such as developing an EPSC Plan, short-term and long-term impacts would be avoided or minimized from construction, operation, maintenance, and emergency repairs.

Table 4-172 presents direct, temporary and secondary wetland impacts in the Southern Section for all alternatives. Direct disturbance includes the permanent loss from placement of structures such as towers, substations, and converter and transitions stations within wetlands. Temporary disturbance includes alteration of wetlands such as cutting trees and use of swamp mats during construction. Secondary disturbance includes the permanent conversion of forested wetlands to either scrub-shrub or emergent wetland. Refer to the **Water Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for impact to wetland by type (e.g., PEM, PFO, and PSS).

Table 4-172. Wetlands Impacts within the Study Area of the Southern Section

Alternatives	Direct Disturbance acres (ha)	Temporary Disturbance acres (ha)	Secondary Disturbance acres (ha)
1 (No Action)	0 (0)	0 (0)	0 (0)
2	0.6 (<0.5)	31 (13)	0 (0)
3	3 (1.0)	40 (16)	0 (0)
4a	2 (1.0)	0.9 (<0.5)	0 (0)
4b	2 (1.0)	0.9 (<0.5)	0 (0)
4c	2 (1.0)	0.9 (<0.5)	0 (0)
5a	0.6 (<0.5)	31 (13)	0 (0)
5b	0.6 (<0.5)	31 (13)	0 (0)
5c	0.6 (<0.5)	31 (13)	0 (0)
6a	0.6 (<0.5)	21 (8)	0 (0)
6b	0.6 (<0.5)	21 (8)	0 (0)
7 (Proposed Action)	0.6 (<0.5)	31 (13)	0 (0)

All alternatives would include indirect impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to water resources would be very similar. The only upgrade with potential impacts to water resources would be the expansion of the existing Scobie Pond Substation, which would impact roughly 5 acres (2 ha) of primarily upland vegetation. Of these 5 acres (2 ha), roughly 3 acres (1 ha) is forested habitat and 2 acres (1 ha) is scrub-shrub habitats with marginal amounts of wetlands and open water.

Watersheds

The Scobie Pond Substation would affect one watershed; 38 acres (15 ha) of the Headwater of the Beaver Brook Watershed.

Surface Water

The Scobie Pond Substation expansion would not cross any waterbodies.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Approximately 3 acres (1 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

No disturbance would occur to PWS wells, SWPAs, or WHPAs within the Scobie Pond substation expansion areas.

Floodplains

Approximately 38 acres (2 ha) of disturbance would occur in FEMA Flood Zone X. These impacts are expected to be short term and localized.[104]

Wetlands

Scobie Pond Substation expansion would result in less than 0.5 acre (<0.5 ha) of disturbance to wetland communities. With implementation of APMs in **Appendix H**, most adverse impacts to wetlands would be indirect, short-term, and localized.

Vernal Pools

No vernal pools were identified in the Scobie Pond Substation expansion area. Alternative 1 – No Action

4.4.13.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

[104] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

4.4.13.2 Alternative 2

Impacts from Construction

Watersheds

Under Alternative 2, construction disturbance in the Southern Section would affect multiple watersheds including 64 acres (26 ha) of the Punch Brook-Merrimack River Watershed, which is the watershed with the largest total disturbance area in the Southern Section.

Surface Water

Under Alternative 2, approximately 1 mile (2 km) of waterbodies would be crossed by the Project in the Southern Section. Of the 1 mile (2 km) of waterbodies disturbed, less than 0.5 mile (0.8 km) are impaired waterbodies on the 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 2 in the Southern Section, approximately 130 acres (53 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 2 in the Southern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 387 acres (157 ha) of disturbance would occur in SWPAs under Alternative 2 in the Southern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and excavation activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 66 acres (27 ha) of disturbance would occur in WHPAs as a result of clearing and construction activities.

Floodplains

Under Alternative 2 in the Southern Section, approximately 387 acres (157 ha) of disturbance would occur in FEMA Flood Zones: 11 acres (4 ha) of Zone A; 1 acre (<0.5 ha) of Zone AE; and 376 acres (152 ha) of Zone X. These impacts are expected to be short term and localized.[105]

Wetlands

Approximately 0.6 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers, the Franklin Converter Station, and the Deerfield Substation. Temporary, short-term impacts would affect approximately 31 acres (13 ha) of wetlands (see **Table 4-172**). Of the 31 acres (13 ha) of temporary impacts, approximately 8 acres (3 ha) would be to PEM wetlands and 23 acres (9 ha) would be to PSS wetlands. No wetlands would experience secondary impacts.

[105] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

To minimize wetland impacts, Alternative 2 includes implementation of APMs listed in **Appendix H** for containment of trench material and minimizing sedimentation to the adjacent portions of a wetland, and APMs for restoring wetland contours and hydrology following transmission cable installation.

Vernal Pools

No vernal pools would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts from operations, maintenance and emergency repairs would be similar to short-term construction activities but would occur for shorter durations over the life of the Project. Long-term impacts are anticipated as a result of the Franklin Converter Station and Deerfield Substation. Operation of these features requires the conversion of vegetated areas to impervious areas which could increase stormwater runoff and erode surrounding soils. Impacts are expected to be localized and could be mitigated with appropriate APMs (see **Appendix H**).

4.4.13.3 Alternative 3

Impacts from Construction

Watersheds

Under Alternative 3, construction disturbance in the Southern Section would impact multiple watersheds including 43 acres (17 ha) of the Suncook River Watershed and 61 acres (25 ha) of the headwaters of the Lamprey River Watershed, which are the watersheds with the two largest total disturbance areas in the Southern Section.

Surface Water

Under Alternative 3, approximately 2 miles (3 km) of waterbodies would be crossed by the Project in the Southern Section. Of the 2 miles (3 km) of waterbodies that occur, less than 0.5 mile (0.8 km) are impaired waterbodies on the 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term and localized.

Groundwater

Under Alternative 3 in the Southern Section, approximately 94 acres (38 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. Potential impacts to groundwater would include blasting and/or inadvertent chemical releases. Installation and long-term use of the transmission lines would not be expected to have a detrimental effect on groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 3 in the Southern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 358 acres (145 ha) of disturbance would occur in SWPAs under Alternative 3 in the Southern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 55 acres (22 ha) of disturbance would occur in WHPAs as a result of burial activities.

Floodplains

Under Alternative 3 in the Southern Section, approximately 358 acres (145 ha) of disturbance would occur in FEMA Flood Zones: 14 acres (6 ha) of Zone A; 2 acres (1 ha) of Zone AE; and 343 acres (139 ha) of Zone X.

Construction activity may impact 8 acres (3 ha) of Zone X designation for the Deerfield substation, and 31 acres (13 ha) of Zone X designation and 2 acres (0.8 ha) of Zone A designation for the North Road Converter Station. However, there would be no stations or site developments within floodplains.

Wetlands

Approximately 3 acres (1 ha) of wetlands would experience direct, long-term impacts from installation of structures including the North Road Converter Station and Deerfield Substation. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 40 acres (16 ha) of wetlands (see **Table 4-172**). Of the 40 acres (16 ha) of temporary impacts, approximately 11 acres (4 ha) would be to PEM wetlands and 29 acres (12 ha) would be to PSS wetlands. No wetlands would experience secondary impacts.

Vernal Pools

No vernal pools would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

The entirety of Alternative 3 would be underground; long-term impacts on water resources are not anticipated from the burial of the transmission cable. Long-term impacts are anticipated as a result of aboveground structures, such as the North Road Converter Station and Deerfield Substation. Operation of these features requires the conversion of vegetated areas to impervious areas which could increase stormwater runoff and erode surrounding soils. Impacts are expected to be localized and could be mitigated with appropriate APMs (see **Appendix H**).

4.4.13.4 Alternative 4a

Impacts from Construction

Watersheds

Under Alternative 4a, construction disturbance in the Southern Section would impact multiple watersheds including 42 acres (17 ha) of the headwaters of the Lamprey River Watershed and 27 acres (11 ha) of the Pawtuckway Pond Watershed, which are the watersheds with the two largest total disturbance areas in the Southern Section under Alternative 4a.

Surface Water

Under Alternative 4a, disturbance areas include 0.5 mile (0.8 km) of waterbodies within the Southern Section based on Project features. Of the 0.5 mile (0.8 km) of waterbodies crossed, approximately 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Overall, with implementation of APMs in **Appendix H** for stream buffers, adverse impacts to surface waters would be short-term, and localized.

Groundwater

Under Alternative 4a in the Southern Section, approximately 22 acres (9 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. This disturbance is not anticipated to create adverse impacts to groundwater resources; however, blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 4a in the Southern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 120 acres (49 ha) of disturbance would occur in SWPAs under Alternative 4a in the Southern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 5 acres (2 ha) of disturbance would occur in WHPAs as a result of burial activities under Alternative 4a in the Southern Section.

Floodplains

Under Alternative 4a in the Southern Section, approximately 121 acres (49 ha) of disturbance would occur in FEMA Flood Zones: 6 acres (2 ha) of Zone A; 1 acre (<0.5 ha) of Zone AE; and 114 acres (46 ha) of Zone X.

Construction activity may impact 8 acres (3 ha) of Zone X designation for the Deerfield Substation, and 31 acres (13 ha) of Zone X designation and 2 acres (0.8 ha) of Zone A designation for the North Road Converter Station. However, there would be no stations or site developments within floodplains.

Wetlands

Approximately 2 acres (0.9 ha) of wetlands would experience direct, long-term impacts from installation of structures including the North Road Converter Station and Deerfield Substation. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 0.9 acre (<0.5 ha) of wetlands (see **Table 4-172**). Of the 0.9 acre (<0.5 ha) of temporary impacts, almost all would be to PEM wetlands. There would be no secondary impacts on wetlands.

Vernal Pools

No vernal pools were identified in the Alternative 4a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operations, maintenance, and emergency repairs under Alternative 4a would be identical to those described for Alternative 3 (see **Section 4.4.13.3**).

4.4.13.5 Alternative 4b

Impacts from Construction

Impacts from construction under Alternative 4b would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.13.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operations, maintenance, and emergency repairs under Alternative 4b would be identical to those described for Alternative 3 (see **Section 4.4.13.3**).

4.4.13.6 Alternative 4c

Impacts from Construction

Impacts from construction under Alternative 4c would be identical to those described for the Project under Alternative 4a in the Southern Section (see **Section 4.4.13.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operations, maintenance, and emergency repairs under Alternative 4c would be identical to those described for Alternative 3 (see **Section 4.4.13.3**).

4.4.13.7 Alternative 5a

Impacts from Construction

Impacts from construction under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

4.4.13.8 Alternative 5b

Impacts from Construction

Impacts from construction under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

4.4.13.9 Alternative 5c

Impacts from Construction

Impacts from construction under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

4.4.13.10 Alternative 6a

Impacts from Construction

Under Alternative 6a, approximately 255 acres (103 ha) would be disturbed in the Southern Section due to the burial of the transmission cable along the corridor or roadway corridors and due to the construction of the Deerfield Substation and Franklin Converter Station. Generally, construction impacts on water resources for aboveground portions of Alternative 6a in the Southern Section would be identical to those described for Alternative 2 (see **Section 4.4.13.2**), while impacts from underground portions would be identical to those under Alternative 4a (see **Section 4.4.13.4**).

Watersheds

Under Alternative 6a, construction disturbance in the Southern Section would impact multiple watersheds including 35 acres (14 ha) of the Soucook River, the watershed with the largest total disturbance areas in the Southern Section.

Surface Water

Under Alternative 6a, disturbance areas would include approximately 0.7 mile (1 km) of waterbodies in the Southern Section due to Project features. Less than 0.5 mile (0.8 km) of the 0.7 mile (1. km) of waterbodies crossed are listed as 303(d) impaired waterbodies.

Groundwater

Under Alternative 6a, approximately 101 acres (41 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers. Blasting could result in groundwater being more susceptible to infiltration by on-site materials from spills or leaks.

Water Supply

Under Alternative 6a in the Southern Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 254 acres (103 ha) of disturbance would occur in SWPAs under Alternative 6a in the Southern Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. In addition, approximately 52 acres (21 ha) of disturbance would occur in WHPAs as a result of clearing and burial activities under Alternative 6a in the Southern Section.

Floodplains

Under Alternative 6a in the Southern Section, approximately 254 acres (103 ha) of disturbance would occur in FEMA Flood Zone: 7 acres (3 ha) of Zone A; 1 acre (<0.5 ha) of Zone AE; and 246 acres (100 ha) of Zone X.

Construction activity may impact 8 acres (3 ha) of Zone X designation for the Deerfield Substation and 16 acres (6 ha) of Zone X designation for Franklin Converter Station. However, there would be no stations or site developments within floodplains.

Wetlands

Approximately 0.6 acre (<0.5 ha) of wetlands would experience direct, long-term impacts from installation of structures such as towers, the Franklin Converter Station, and the Deerfield Substation. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 21 acres (8 ha) of wetlands (see **Table 4-172**). Of the 21 acres (8 ha) of temporary impacts, approximately 5 acres (2 ha) would be to PEM wetlands and 16 acres (6 ha) would be to PSS wetlands. No secondary impacts would occur.

Vernal Pools

No vernal pools would be impacted.

Impacts from Operations, Maintenance, and Emergency Repairs

No long-term impacts on water resources would be anticipated to result from the underground portions of Alternative 6a in the Southern Section. The impacts from operations, maintenance, and emergency repairs of overhead portions of Alternative 6a in the Southern Section, as well as the Franklin Converter Station and Deerfield Substation, would be similar to those of Alternative 2 (see **Section 4.4.13.2**).

4.4.13.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those described for the Project under Alternative 6a in the Southern Section (see **Section 4.4.13.10**)

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 6b in the Southern Section would be identical to Alternative 6a (see **Section 4.4.13.10**).

4.4.13.12 Alternative 7 – Proposed Action

Impacts from Construction

Impacts from construction under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 2 in the Southern Section (see **Section 4.4.13.2**).

4.4.14 GEOLOGY AND SOILS

Refer to **Section 4.1.14** for a discussion of general impacts common to all geographic sections. All action alternatives would include impacts associated with AC system support projects south of the Deerfield Substation. This activity would include system upgrades, reconductoring of existing 345 kV lines in the existing PSNH transmission route, and an expansion to the existing Scobie Pond Substation. Although the AC system support projects vary slightly between alternatives (Alternatives 2 and 5b include one set of upgrades and Alternatives 3, 4a, 4b, 4c, 5a, 5c, 6a, 6b, and 7 include another), impacts to geology and soils would be very similar.

4.4.14.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.4.14.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 387 acres (157 ha) of surface soils would be impacted in the Southern Section. Long-term impacts on soils are anticipated as a result of aboveground structures, such as the converter station. Operation of these features requires the conversion of vegetated areas to impervious areas which could increase stormwater runoff and erode surrounding soils; however, impacts are expected to be localized and could be mitigated with the implementation of APMs (see **Appendix H**).

Expansion of the transmission route would require the removal of overhead vegetation and soil disturbance, which could expose soils to additional environmental considerations such as exposure to erosion from additional precipitation or wind. Though these impacts are likely to cause some soil erosion, impacts are expected to be localized and could be mitigated with the implementation of APMs (see **Appendix H**).

No earthquakes have been documented within the disturbance areas. Five faults would be crossed in fourteen locations within the disturbance areas; however, they are thought to be inactive by New Hampshire's state geologist. Approximately 119 acres (48 ha) of disturbance areas within the Southern

Section have a moderate susceptibility to landsliding and low landslide incidence in Merrimack County. All other areas of the Project in the Southern Section under Alternative 2 (268 acres [108 ha]) are considered to have low susceptibility to landsliding.

The Southern Section is located within 2 miles (3 km) of one crushed stone and one dimension granite deposit. The crushed stone deposit is located approximately 4 miles (6 km) northwest of MP 160 under Alternative 2. No short-term impacts are anticipated on these mineral resources as a result of the construction of the Project since they are not within the disturbance area.

Under Alternative 2, about 387 acres (157 ha) of soil would be impacted in the Southern Section. Approximately 17 acres (7 ha) of hydric soils, 274 acres (111 ha) of partially hydric soils, 92 acres (37 ha) of not hydric soils, and 3 acres (1 ha) of unknown soil would be impacted by disturbance areas under Alternative 2 in the Southern Section. Approximately 8 acres (3 ha) of Prime Farmland with an additional acre (0.4 ha) if the farmland is protected from frequent flooding, about 22 acres (9 ha) of Farmland of Statewide Importance, and 178 acres (72 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 2 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts primarily resulting in erosion from maintenance and emergency repairs. These impacts would occur for a shorter duration than construction impacts, but would occur over the life of the Project. Long-term impacts are not anticipated, except for permeant access roads or structures are needed. Short-term or long-term impacts are not anticipated on geology and soils from the operation of the Project under Alternative 2.

4.4.14.3 Alternative 3

Impacts from Construction

Alternative 3 would result in the surface soils disturbance of approximately 359 acres (145 ha) in the Southern Section. The main impact would result from the creation of construction pads which accounts for 171 acres (69 ha). Additional disturbances would result from construction of access roads (81 acres [33 ha]), and the underground line trenched (54 acres [22 ha]). Underground cable installation would require more grading, trenching, and other excavation along with backfilling compared to aboveground installation resulting in more soil disturbance and exposure to erosion during construction (see **Section 4.1.14**). Granite, meta-argillite, and pelitic schist (metasedimentary) are the most common bedrock types where construction disturbance would occur.

No earthquakes have been documented within the disturbance areas. Six faults are crossed at eleven locations within the disturbance areas; however, they are thought to be inactive by New Hampshire's state geologist. Approximately 102 acres (41 ha) of disturbance areas within the Southern Section have a moderate susceptibility to landsliding and low landslide incidence in Merrimack County. All other areas of the Project in the Southern Section under Alternative 3 (257 acres [104 ha]) are considered to have low susceptibility to landsliding; therefore, landslides are not anticipated to be an issue for the Project in this area.

The Southern Section is located within 2 miles (3 km) of one crushed stone and one dimension granite deposit. The crushed stone deposit is located approximately 4 miles (6 km) northwest of MP 160 under Alternative 3. No short-term impacts are anticipated on these mineral resources as a result of the construction of the Project since they are not within the disturbance area.

Under Alternative 3, about 359 acres (145 ha) would be in the total disturbance area in the Southern Section. The main impact to soils would be the creation of construction pads which accounts for 171 acres (69 ha) of the disturbance area. Approximately 18 acres (7 ha) of hydric soils, 259 acres (105 ha) of partially hydric soils, 78 acres (32 ha) of not hydric soils, and 4 acres (2 ha) of unknown soils would be impacted by disturbance areas under Alternative 3 in the Southern Section. Approximately 7 acres (3 ha) of Prime Farmland, with an additional 0.7 acre (0.3 ha) if the farmland is protected from frequent flooding, 13 acres (5 ha) of Farmland of Statewide Importance, and 196 acres (79 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 3 in the Southern Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Alternative 3 would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required; however, burial of the transmission cable traditionally limits the need for maintenance in general.

4.4.14.4 Alternative 4a

Impacts from Construction

Under Alternative 4a, approximately 121 acres (49 ha) of surface soils would be impacted in the Southern Section due to the burial of cable along the transmission route or roadways and due to the construction of the Deerfield Substation, Scobie Pond Substation, and North Road Converter Station. The Deerfield Substation, Scobie Pond Substation, and North Road Converter Station would be long-term impacts to soils. Disturbance related to the construction of buried cable would impact approximately 50 acres (20 ha). The remaining disturbances (71 acres [29 ha]) would be caused by aboveground construction.

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas. Five faults would be crossed in five locations within the disturbance areas; however, all are thought to be inactive by New Hampshire's state geologist. Approximately 20 acres (8 ha) of disturbance areas within the Southern Section have a moderate susceptibility to landsliding and a low incidence. All other areas of the Project in the Southern Section for Alternative 4a (101 acres [41 ha]) are considered to have low incidence of landslides; therefore, landslides are not anticipated to be an issue along this portion of the Project.

The Southern Section is located within 2 miles (3 km) of one crushed stone and one dimension granite deposit. The crushed stone deposit is located approximately 2 miles (3 km) south of MP 140 under Alternative 4a. No short-term impacts are anticipated on these mineral resources as a result of the construction of the Project since they are not within the disturbance area.

Under Alternative 4a, about 121 acres (49 ha) of soil would be in the total disturbance area in the Southern Section. Approximately 5 acres (2 ha) of hydric soils, 89 acres (36 ha) of partially hydric soils, about 25 acres (10 ha) of soil are not hydric, and about 2 acres (0.8 ha) of unknown soils would be affected by disturbance areas under Alternative 4a in the Southern Section. Approximately 0.7 acre (0.3 ha) of Prime Farmland with an additional 0.7 acre (0.3 ha) if these areas are protected from flooding, 5 acres (2 ha) of Farmland of Statewide Importance, and 20 acres (8 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 4a in the Southern Section. About 94 acres (38 ha) of disturbance areas under Alternative 4a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

The impacts from operations, maintenance, and emergency repairs of Alternative 4a in the Southern Section would be similar to those of operation, maintenance, and emergency repairs of Alternative 4a in the Northern and Southern Sections, with the exception that one new converter station would be located in this section.

4.4.14.5 Alternative 4b

Impacts from Construction

Construction impacts on geology and soils for Alternative 4b would be identical to those under Alternative 4a (see **Section 4.4.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those under Alternative 4a (see **Section 4.4.14.4**).

4.4.14.6 Alternative 4c

Impacts from Construction

Construction impacts on geology and soils for Alternative 4c would be identical to those under Alternative 4a (see **Section 4.4.14.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those under Alternative 4a (see **Section 4.4.14.4**).

4.4.14.7 Alternative 5a

Impacts from Construction

Construction impacts on geology and soils for Alternative 5a would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5a would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

4.4.14.8 Alternative 5b

Impacts from Construction

Construction impacts on geology and soils for Alternative 5b would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5b would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

4.4.14.9 Alternative 5c

Impacts from Construction

Construction impacts on geology and soils for Alternative 5c would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 5c would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

4.4.14.10 Alternative 6a

Impacts from Construction

Under Alternative 6a, approximately 254 acres (103 ha) of surface soils would be impacted in the Southern Section due to the burial of cable along the transmission route or roadways and due to the construction of the Deerfield Substation and Franklin Converter Station. The Deerfield Substation and Franklin Converter Station would be long-term impacts to soils. Disturbance related to the construction of buried cable would impact approximately 9 acres (4 ha). The remaining disturbances (245 acres [99 ha]) would be caused by aboveground construction.

Alternative 6a would be buried with the exception that one new converter station, a long-term impact to soils. Long-term impacts on soils are not anticipated from the burial of the transmission cable with implementation of APMs (see **Appendix H**).

Expansion of the transmission route would require the removal of overhead vegetation and soil disturbance, which could expose soils to additional environmental considerations such as exposure to erosion from additional precipitation or wind. Though these impacts are likely to cause some soil erosion, impacts are expected to be localized and could be mitigated with the implementation of APMs (see **Appendix H**).

Bedrock outcrops or locations where bedrock is near the surface is common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas. Three faults, including the Nonesuch River Fault, occur at 8 locations within the disturbance area; however, the faults are thought to be inactive by New Hampshire's state geologist. Approximately 90 acres (36 ha) of disturbance areas within the Southern Section have a moderate susceptibility to landsliding and a low incidence. All other areas of the Project in the Southern Section for Alternative 6a (101 acres [41 ha]) are considered to have low incidence of landslides; therefore, landslides are not anticipated to be an issue in this area of the Project.

The Southern Section is located within 2 miles (3 km) of one crushed stone and one dimension granite deposit. The crushed stone deposit is located approximately 4 miles (6 km) southeast of MP 140 under Alternative 6a. No short-term impacts are anticipated on these mineral resources as a result of the construction of the Project since they are not within the disturbance area.

Under Alternative 6a, about 254 acres (103 ha) of soil would be impacted in the Southern Section. Approximately 11 acres (4 ha) of hydric soils, 167 acres (68 ha) of partially hydric soils, about 74 acres (30 ha) of soil are not hydric, and about 2 acres (0.8 ha) of unknown soils would be affected by disturbance areas under Alternative 6a in the Southern Section. Approximately 7 acres (3 ha) of Prime Farmland with an additional 0.5 acre (0.2 ha) if these areas are protected from flooding, 17 acres (7 ha) of Farmland of Statewide Importance, and 109 acres (44 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 6a in the Southern Section. About 120 acres (49 ha) of disturbance areas under Alternative 6a are not considered farmland.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts primarily resulting in erosion from maintenance and emergency repairs. These impacts would occur for a shorter duration than construction impacts, but would occur over the life of the Project. Long-term impacts are not anticipated, except for where permanent access roads or structures are needed. Short-term or long-term impacts are not anticipated on geology and soils from the operation of the Project under Alternative 6a.

The Franklin Converter Station and Deerfield Substation would house transformers and other equipment requiring oils and hazardous materials. SPCC plans would have to be developed and implemented for these facilities. Implementation of these plans would decrease the potential of a spill and any soils impacts associated with spills of oils would likely be short term and localized.

4.4.14.11 Alternative 6b

Impacts from Construction

Construction impacts on geology and soils for Alternative 6b would be identical to those under Alternative 6a (see **Section 4.4.14.10**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those under Alternative 6a (see **Section 4.4.14.10**).

4.4.14.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction impacts on geology and soils for Alternative 7 would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be identical to those under Alternative 2 (see **Section 4.4.14.2**).

4.5 WHITE MOUNTAIN NATIONAL FOREST SECTION

The WMNF Section contains areas within both the Northern and Central Sections. All areas discussed in this section are therefore also discussed in the Northern and Central Sections, as appropriate. As such, please note that numbers presented in this section are also presented in previous sections; thus, total Project-wide impacts are obtained by totaling the numbers presented in the Northern, Central, and Southern sections, and excluding numbers presented in the WMNF Section. The environmental consequences within the WMNF are discussed separately here as an aid to readers.

This section includes discussion of potential impacts of the Project as they relate to USFS management of National Forest System (NFS) lands. The Forest Plan provides guidance for managing and protecting natural resources and visitors' experiences on all National Forest lands. Standards and guidelines are the specific, technical direction for managing resources. Forest-wide standards and guidelines apply across all WMNF lands and management activities, unless more restrictive direction exists for a management area (MA). Management Area standards and guidelines apply only to land allocated to a specific MA. Forest-wide and within MAs, a *standard* is a course of action that must be followed, or a level of attainment that must be reached, to achieve management goals and objectives, and can only be changed through an amendment to the Forest Plan. A *guideline* also is a required course of action or level of attainment, but permits operational flexibility to respond to variations in conditions. Guidelines can be modified or not implemented if site-specific conditions warrant, but the rationale for doing so must be documented in a project-level analysis and signed decision.

In some cases, the existing line was constructed on private land that subsequently was purchased by the federal government to become part of the NFS. In those areas, the line is an easement (property right) that remains in effect and guides the rights of the easement holder regarding operation of overhead transmission lines. Standards and guidelines in the Forest Plan would not apply to authorized activities by the easement holder in these areas except when they implement broader state or federal law that applies to all land (e.g., Clean Water Act).

4.5.1 VISUAL RESOURCES

Refer to **Section 4.1.1** for a discussion of general impacts common to all geographic sections.

4.5.1.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.1.2 Alternative 2

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 2. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**.

Construction of the Project would create short-term, localized impacts to users of the ANST, Gordon Pond Trail, and other affected areas with Scenic Integrity Objectives (SIOs) of "Very High" (Unaltered) or "High" (Appears Unaltered). See **Section 4.5.3.2** for a discussion of impacts to the recreation experience. For instance, there is a structure proposed immediately adjacent to the ANST. During construction (likely for a duration of a few days to a week), the ANST would appear like a construction site. In addition, the low-flying helicopters used to transport structures and supplies may be seen (and heard) from some distance for a much longer period of construction.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.1.2**.

The visibility of large industrial-appearing lattice structures that have high form and color contrast with the existing transmission structures and surrounding environment, along with vegetation clearing would result in a long-term visual impact. These long-term impacts resulting from operation are discussed below.

Alternative 2 would not meet the SIO within MA 8.3, as represented by KOPs LI-4 (the ANST crossing) and LI-5 (the view from South Kinsman Mountain). Alternative 2 would require a Forest Plan Amendment for Management Area 8.3 – Appalachian National Scenic Trail, Scenery Management S-1 and S-2. S-1 states: "The AT is a Concern Level 1 Travelway, and middleground and background areas on National Forest lands seen from the AT must be managed for scenery in accordance with Scenic Integrity Objectives identified through the Scenery Management System" (USDA Forest Service 2005a). S-2 states: "All management activities will meet a SIO of 'High' or 'Very High'" (USDA Forest Service 2005a). See **Appendix C** for details on the Forest Plan Amendment.

Similar inconsistencies with SIOs would result in other MAs with a "Very High," "High," or "Moderate" SIO, as summarized in **Table 4-173**.

Table 4-173. WMNF MAs and SIOs in Alternative 2 Project Corridor

MA	SIO
2.1 General Forest Management	High
	Moderate
	Low
6.1 Semi-Primitive Recreation	High
6.3 Semi-Primitive Winter Motorized Recreation	High
8.3 ANST	High to Very High

As proposed, the Project would be consistent with an SIO of "Very Low." The Project would be inconsistent with all other SIOs. Forest-wide, Scenery Management Guideline G-1 states: "All management activities should meet or exceed Scenic Integrity Objectives established for the WMNF through the Scenery Management System (SMS) outlined in *Agriculture Handbook 701, Landscape Aesthetics – A Handbook for Scenery Management*" (USDA Forest Service 2005a). This guideline would not be implemented under Alternative 2 because the Project would only achieve the SIO of "Very Low." While the Project would be inconsistent with the SIOs of certain MAs identified in **Table 4-173**, the Project would be located in the existing PSNH transmission route parallel to an existing PSNH transmission line. Management Area 2.1 – General Forest Management includes two guidelines that would not be implemented under Alternative 2 (Scenery Management G-3 and G-4). Scenery Management G-3 states: "For areas with a "High" Scenic Integrity Objective, created openings should be minimally evident from trail, road, or use area vantage points. Maximum observed size should not exceed 4 to 5 acres. If openings occur, they should appear as natural occurrences and be well-distributed in the viewed landscape" (USDA Forest Service 2005a). The Project under Alternative 2 would be evident from many trail, road, and use area vantage points due to the height of towers proposed. Scenery Management G-4 states: "For areas with a "Moderate" Scenic Integrity Objective, and viewed from superior viewpoints, clearcuts and other noticeable openings should be informal in distribution and designed to be in scale with the observed landscape" (USDA Forest Service 2005a). This guideline would not be implemented because the Project would be evident from a number of open, higher elevation viewpoints affording expansive or large-scale view (superior viewpoints). As discussed in **Section 3.5.1**, the existing PSNH transmission line, which existed prior to the current Forest Plan, also is only consistent with an SIO of Very Low. Refer to **Figure 4-1** for a typical cross-section view of the existing and proposed towers in the transmission route.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 2 would be approximately 0.6 square mile (1.6 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 2 would be approximately 9 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 2 would result in an additional 1 square mile (3 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 2 would increase the average visual magnitude from 1.77 to 2.28, indicating an increase in the number of visible structures. The visual magnitude would be "Low to

Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 2 would result in an additional 0.6 square mile (1.6 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 2 would increase the average scenic impact from 2.39 to 2.75, indicating an increased visibility at sensitive locations. The scenic impact would not increase from the current value of "Low to Moderate." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-174 summarizes landscape assessment impacts in the WMNF Section under Alternative 2.

Table 4-174. Landscape Assessment Impacts under Alternative 2 – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Land Area within Viewshed	6 square miles (16 km^2)	0.6 square mile (1.6 km^2)	6.6 square miles (18 km^2)
Average Visual Magnitude	1.77 (Very Low to Low)	0.6	2.28 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	2.5 square miles (6.5 km^2)	0.6 square mile (1.6 km^2)	2.6 square miles (6.7 km^2)
Average Scenic Impact	2.39 (Low to Moderate)	0.36	2.75 (Low to Moderate)
Aggregate Scenic Impact	15.3	3.96	19.27

Roads-Based Analysis

Under Alternative 2, the Project's overhead structures would not cross any additional publicly-accessible roads that are not crossed by the existing PSNH transmission line. The Project would be visible from approximately 1.1 miles (2 km) of roads from which the existing PSNH transmission line is not currently visible.[106] Approximately 0.7 additional mile (1.1 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," compared with the existing condition. Alternative 2 would increase the average visual magnitude for roads within the viewshed from 1.62 to 2.14, indicating an increase in the number of visible structures. The visual magnitude would not increase from the current value of "Very Low to Low."

Included in the 1.1 miles (2 km) of increased visibility from roads within the viewshed would be 0.1 mile (0.2 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 5 hours per day.[107] These impacts would primarily be to the River Heritage Tour (5 hours per day). For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-175 summarizes roads-based analysis impacts in the WMNF Section under Alternative 2.

Table 4-175. Roads-Based Analysis Impacts under Alternative 2 – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 2)
Miles of Road within Viewshed	4 miles (6 km)	1.1 miles (2 km)	5.1 miles (8 km)
Visual Magnitude	1.62 (Very Low to Low)	0.52	2.14 (Low to Moderate)
Miles of Designated Scenic Roads within Viewshed	0.37 mile (0.6 km)	0.1 mile (0.2 km)	0.47 mile (1.1 km)
Vehicle Exposure on Scenic Roads	16 hours per day	5 hours per day	21 hours per day

[106] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[107] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Viewpoint Assessment

A review of the KOPs in **Appendix E** for the WMNF Section gives an indication of how some existing views would change with the construction of Alternative 2. These KOPs represent the range of viewpoint characteristics and range of long-term impacts that would occur if the Project is constructed, but are only a representative sample of all visual simulations conducted for this analysis. All 73 visual simulations are available for review in the **Visual Impact Assessment**, located on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports). For a description of the contrast-dominance rating refer to **Section 3.1.1.4.**

- KOP EA-3 (Viewpoint EA-3c in **Appendix E**) is a view looking southeast along the existing PSNH transmission route as it crosses Easton Valley Road, which is part of the River Heritage Tour (NH Route 116 in Easton, NH). It shows a view of the existing PSNH transmission route in flat forested land; the existing contrast-dominance rating is "Severe" (37). Under Alternative 2, the contrast-dominance rating would be "Severe" (43), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP FR-2 (Viewpoint FR-2c in **Appendix E**) is a winter vista from the top of Mount Lafayette, on the ANST in Franconia, NH. It shows a winter mountain top vista with snow, and the existing PSNH transmission route in the far distance; the existing contrast-dominance rating is "Negligible" (7). Under Alternative 2, the contrast-dominance rating would be "Weak" (13), which indicates that the visual change would be noticeable, but so small as to be considered unimportant.
- KOP LI-2 (Viewpoint LI-2c in **Appendix E**) is from the White Mountain Trail National Scenic Byway (I-93 northbound in Lincoln, NH). It shows a view toward the WMNF and existing PSNH transmission route from an expressway; the existing contrast-dominance rating is "Negligible" (4). Under Alternative 2, the contrast-dominance rating would remain "Weak" (17), which indicates that the visual change would be noticeable, but so small as to be considered unimportant.
- KOP LI-4 (Viewpoint LI-4c in **Appendix E**) shows the existing PSNH transmission route crossing the ANST; the existing contrast-dominance rating is "Severe" (39). Under Alternative 2, the contrast-dominance rating would be "Severe" (44), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.
- KOP LI-5 (Viewpoint LI-5c in **Appendix E**) is a vista located near the top of South Kinsman Mountain on the ANST looking down into the Bog Pond area. It shows a summer mountain-top vista of a valley with the existing PSNH transmission route; the existing contrast-dominance rating is "Strong" (27). Under Alternative 2, the contrast-dominance rating would remain "Strong" (32), which indicates that the visual change would be large and would likely be considered adverse by a casual observer, and depending on the sensitivity of the setting it may be considered unreasonable.
- KOP WD-4 (Viewpoint WD-4c in **Appendix E**) shows a fall view of the existing PSNH transmission route from the Gordon Pond Trail; the existing contrast-dominance rating is "Strong" (32). Under Alternative 2, the contrast-dominance rating would be "Severe" (40), which indicates that the visual change would be very large, and in sensitive settings would likely be considered unreasonably adverse by a casual observer.

4.5.1.3 Alternative 3

Impacts from Construction

Short-term impacts would result from the construction of Alternative 3. Short-term impacts resulting from construction of underground lines are discussed in **Section 4.1.1.1**. Construction of the Project would result in short-term, localized impacts to visual resources along the ANST. During construction (likely for a duration of a few days to a week), the ANST would appear like a construction site. See **Section 4.5.3.2** for a discussion of impacts to the recreation experience.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from ongoing vegetation management under Alternative 3; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in the existing PSNH transmission route. Vegetation management would increase the viewshed of the existing PSNH transmission line by less than 0.01 square mile (0.03 km^2).

The Project under Alternative 3 would be consistent with all SIOs because it would be buried within the WMNF.

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 3.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.1.4 Alternative 4a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. These impacts would be similar to those described above for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.1.2**.

Long-term operational impacts would result from ongoing vegetation management under Alternative 4a; however, the Project would be located underground. Refer to **Section 4.1.1.2** for a discussion of the long-term operational impacts of the Project where it would be buried in existing roadway corridors.

The Project under Alternative 4a would be consistent with all SIOs because it would be buried within the WMNF.

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 4a.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.1.5 Alternative 4b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. These impacts would be similar to those described above for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4b would be identical to those discussed above for Alternative 4a (see **Section 4.5.1.4**).

The Project under Alternative 4b would be consistent with all SIOs because it would be buried within the WMNF.

4.5.1.6 Alternative 4c

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 4c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. These impacts would be similar to those described above for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 4c would be identical to those discussed above for Alternative 4a (see **Section 4.5.1.4**).

The Project under Alternative 4c would be consistent with all SIOs because it would be buried within the WMNF.

4.5.1.7 Alternative 5a

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5a. General short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. Construction impacts from underground portions of the Project would be similar to those for Alternative 3 (**Section 4.5.1.3**) because both alternatives follow similar alignments. However, these impacts would occur in a roadway corridor. Impacts from overhead portions would be identical to those resulting from Alternative 2 (**Section 4.5.1.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5a and are discussed in **Section 4.1.1.2**.

For the underground portions of Alternative 5a, the Project would be located underground in roadway corridors so long-term operational impacts would be minimal (see **Section 4.1.1.2**). Assuming revegetation, underground portions of the Project would be consistent with all SIOs. Since Alternative 5a would be underground where it would cross the ANST in MA 8.3, the Project would be consistent with MA 8.3 – Appalachian National Scenic Trail, Scenery Management S-1 and S-2.

For overhead portions of Alternative 5a in the WMNF Section, the visibility of large industrial-appearing lattice structures that have high form and color contrast and vegetation clearing would result in a long-term visual impact. Overhead portions of the Project would be consistent with the SIO of "Very Low," and inconsistent with all others. While the Project would be inconsistent with the SIOs of certain MAs, the Project would be located in the existing PSNH transmission route parallel to an existing PSNH transmission line. As discussed in **Section 3.5.1**, the existing PSNH transmission line does not meet the SIOs above "Low."

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5a would be approximately 0.3 square mile (0.8 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5a would be approximately 5 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5a would result in an additional 0.1 square mile (0.3 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 5a would increase the average visual magnitude from 1.77 to 1.91, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current rating of "Very Low to Low." Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5a would result in an additional 0.2 square mile (0.5 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 5a would increase the average scenic impact from 2.39 to 2.5, indicating an increased visibility at sensitive locations. The scenic impact would remain "Low to Moderate," compared with the existing condition. For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-176 summarizes landscape assessment impacts in the WMNF Section under Alternative 5a.

Table 4-176. Landscape Assessment Impacts under Alternative 5a – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5a)
Land Area within Viewshed	6 square miles (16 km^2)	0.3 square mile (0.8 km^2)	6.3 square miles (16.8 km^2)
Average Visual Magnitude	1.77 (Very Low to Low)	0.14	1.91 (Very Low to Low)
Land Area with "High or Very High" Scenic Impact	2.5 square miles (6.5 km^2)	0.2 square mile (0.5 km^2)	2 square miles (6 km^2)
Average Scenic Impact	2.39 (Low to Moderate)	0.11	2.5 (Low to Moderate)
Aggregate Scenic Impact	15.3	1.53	16.84

Roads-Based Analysis

Under Alternative 5a, the Project's overhead structures would not cross any publicly-accessible roads that are not crossed by the existing PSNH transmission line (0 additional road crossings). The Project would be visible from approximately 0.7 mile (1.1 km) of roads from which the existing PSNH transmission line is not currently visible.[108] Approximately 0.3 additional mile (0.5 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," compared with the existing condition. Alternative 5a would increase the average visual magnitude for roads within the viewshed from 1.62 to 1.78, indicating an increase in the number of visible structures. The visual magnitude would not increase from its current rating of "Very Low to Low."

Included in the 0.7 mile (1.1 km) of increased visibility from roads within the viewshed would be 0.01 mile (0.02 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 0.3 hour per day.[109] All of these impacts would all occur to the River Heritage Tour. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-177 summarizes roads-based analysis impacts in the WMNF Section under Alternative 5a.

Table 4-177. Roads-Based Analysis Impacts under Alternative 5a – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5a)
Miles of Road within Viewshed	4 miles (6 km)	0.7 mile (1.1 km)	4.7 miles (7.5 km)
Visual Magnitude	1.62 (Very Low to Low)	0.16	1.78 (Very Low to Low)
Miles of Designated Scenic Roads within Viewshed	0.37 mile (0.6 km)	0.01 mile (0.02 km)	0.38 mile (0.7 km)
Vehicle Exposure on Scenic Roads	16 hours per day	0.3 hour per day	16.3 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 5a.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.

[108] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[109] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.1.8 Alternative 5b

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. Construction impacts from underground portions of the Project would be similar to those for Alternative 3 (**Section 4.5.1.3**) because both alternatives follow similar alignments. However, these impacts would occur in a roadway corridor. Impacts from overhead portions would be identical to those resulting from Alternative 2. These impacts would be similar to those described above for Alternative 3.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5b and are discussed in **Section 4.1.1.2**.

For the underground portions of Alternative 5b, long-term operational impacts would be minimal because the Project would be located underground in roadway corridors (see **Section 4.1.1.2**). Assuming revegetation, underground portions of the Project would be consistent with the Forest Plan, including all SIOs. Since Alternative 5b would be underground where it would cross the ANST in MA 8.3, the Project would be consistent with MA 8.3 – Appalachian National Scenic Trail, Scenery Management S-2.

For overhead portions of Alternative 5b in the WMNF Section, the visibility of large industrial-appearing lattice structures with high form and color contrast and vegetation clearing would result in a long-term visual impact. Alternative 5b would require a Forest Plan Amendment for Management Area 8.3 – Appalachian National Scenic Trail, Scenery Management S-1. S-1 states: "The AT is a Concern Level 1 Travelway, and middleground and background areas on National Forest lands seen from the AT must be managed for scenery in accordance with Scenic Integrity Objectives identified through the Scenery Management System" (USDA Forest Service 2005a). See **Appendix C** for details on the Forest Plan Amendment. Overhead portions of the Project would be consistent with the SIO of "Very Low," and inconsistent with all others. The Project would be inconsistent with all other SIOs. Forest-wide, Scenery Management Guideline G-1 states: "All management activities should meet or exceed Scenic Integrity Objectives established for the WMNF through the Scenery Management System (SMS) outlined in *Agriculture Handbook 701, Landscape Aesthetics – A Handbook for Scenery Management*" (USDA Forest Service 2005a). This guideline would not be implemented under Alternative 5b because the Project would only achieve the SIO of "Very Low." While the Project would be inconsistent with the SIOs of certain MAs, the Project would be located in the existing PSNH transmission route parallel to an existing PSNH transmission line. As discussed in **Section 3.5.1**, the existing PSNH transmission line does not meet the SIOs above "Low."

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5b would be approximately 0.4 square mile (1 km^2) greater than the viewshed of the existing

PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5b would be approximately 7 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5b would result in an additional 0.6 square mile (1.8 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 5b would increase the average visual magnitude from 1.77 to 2.11, indicating an increase in the number of visible structures. The visual magnitude would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5b would result in an additional 0.2 square mile (0.5 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 5b would increase the average scenic impact from 2.39 to 2.64, indicating an increased visibility at sensitive locations. The scenic impact would remain "Low to Moderate." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-178 summarizes landscape assessment impacts in the WMNF Section under Alternative 5b.

Table 4-178. Landscape Assessment Impacts under Alternative 5b – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5b)
Land Area within Viewshed	6 square miles (16 km^2)	0.4 square mile (1 km^2)	6.4 square miles (17 km^2)
Average Visual Magnitude	1.77 (Very Low to Low)	0.34	2.11 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	2.5 square miles (6.5 km^2)	0.2 square mile (0.5 km^2)	2.7 square miles (6 km^2)
Average Scenic Impact	2.39 (Low to Moderate)	0.25	2.64 (Low to Moderate)
Aggregate Scenic Impact	15.3	2.75	18.06

Roads-Based Analysis

Under Alternative 5b, the Project's overhead structures would not cross any additional publicly-accessible roads that are not crossed by the existing PSNH transmission line. The Project would be visible from approximately 0.9 mile (1.4 km) of roads from which the existing PSNH transmission line is not currently visible.[110] Approximately 0.5 additional mile (0.8 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," compared with the existing condition. Alternative 5b would increase the average visual magnitude for roads within the viewshed from 1.62 to 1.93, indicating an increase in the number of visible structures. The visual magnitude would remain "Very Low to Low."

Included in the 0.9 mile (1.4 km) of increased visibility from roads within the viewshed would be 0.07 mile (0.2 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 3 hours per day.[111] These impacts would be to the state-designated River Heritage Tour. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

[110] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[111] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Table 4-179 summarizes roads-based analysis impacts in the WMNF Section under Alternative 5b.

Table 4-179. Roads-Based Analysis Impacts under Alternative 5b – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5b)
Miles of Road within Viewshed	4 miles (6 km)	0.9 mile (1.4 km)	5 miles (8 km)
Visual Magnitude	1.62 (Very Low to Low)	0.31	1.93 (Very Low to Low)
Miles of Designated Scenic Roads within Viewshed	0.37 mile (0.6 km)	0.07 mile (0.2 km)	0.44 mile (1.1 km)
Vehicle Exposure on Scenic Roads	16 hours per day	3 hours per day	19 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 5b.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.1.9 Alternative 5c

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 5c. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. Construction impacts from underground portions of the Project would be similar to those for Alternative 3 (**Section 4.5.1.3**) because both alternatives follow similar alignments. However, these impacts would occur in a roadway corridor. Impacts from overhead portions would be identical to those resulting from Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5c and are discussed in **Section 4.1.1.2**.

For the underground portions of Alternative 5c, long-term operational impacts would be minimal because the Project would be located underground in roadway corridors (see **Section 4.1.1.2**). Assuming revegetation, underground portions of the Project would be consistent with all SIOs. Since Alternative 5c would be underground where it would cross the ANST in MA 8.3, the Project would be consistent with MA 8.3 – Appalachian National Scenic Trail, Scenery Management S-1 and S-2.

For overhead portions of Alternative 5c in the WMNF Section, the visibility of large industrial-appearing lattice structures with high form and color contrast and vegetation clearing would result in a long-term visual impact. Overhead portions of the Project would be consistent with the SIO of "Very Low," and inconsistent with all others. Overhead portions would cross areas of the WMNF where SIOs are guidelines rather than standards and a Forest Plan Amendment would not be necessary. While the Project would be inconsistent with the SIOs of certain MAs, the Project would be located in the existing PSNH transmission route parallel to an existing PSNH transmission line. As discussed in **Section 3.5.1**, the existing PSNH transmission line does not meet the SIOs above "Low."

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 5c would be approximately 0.4 square mile (1 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 5c would be approximately 6 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 5c would result in an additional 0.4 square mile (1 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 5c would increase the average visual magnitude from 1.77 to 2.04, indicating an increase in the number of visible structures. The visual magnitude would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 5c would result in an additional 0.3 square mile (0.8 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 5c would increase the average scenic impact from 2.39 to 2.56, indicating an increased visibility at sensitive locations. The scenic impact would not increase from the current rating of "Low to Moderate." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-180 summarizes landscape assessment impacts in the WMNF Section under Alternative 5c.

Table 4-180. Landscape Assessment Impacts under Alternative 5c – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5c)
Land Area within Viewshed	6 square miles (16 km^2)	0.4 square mile (1 km^2)	6 square miles (17 km^2)
Average Visual Magnitude	1.77 (Very Low to Low)	0.27	2.04 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	2.5 square miles (6.5 km^2)	0.3 square mile (0.8 km^2)	2 square miles (6 km^2)
Average Scenic Impact	2.39 (Low to Moderate)	0.17	2.56 (Low to Moderate)
Aggregate Scenic Impact	15.3	2.09	17.4

Roads-Based Analysis

Under Alternative 5c, the Project's overhead structures would not cross any publicly-accessible roads that are not crossed by the existing PSNH transmission line (0 additional road crossings). The Project would be visible from approximately 0.8 mile (1.3 km) of roads from which the existing PSNH transmission line is not currently visible.[112] Approximately 0.3 additional mile (0.5 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," compared with the existing condition. Alternative 5c would increase the average visual magnitude for roads within the viewshed from 1.62 to 1.81, indicating

[112] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.

an increase in the number of visible structures. The visual magnitude would not increase from the current rating of "Very Low to Low."

Included in the 0.8 mile (1.3 km) of increased visibility from roads within the viewshed would be 0.03 mile (0.1 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 1 hour per day.[113] These impacts would be to the state-designated River Heritage Tour. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-181 summarizes roads-based analysis impacts in the WMNF Section under Alternative 5c.

Table 4-181. Roads-Based Analysis Impacts under Alternative 5c – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 5c)
Miles of Road within Viewshed	4 miles (6 km)	0.8 mile (1.3 km)	5 miles (8 km)
Visual Magnitude	1.62 (Very Low to Low)	0.19	1.81 (Very Low to Low)
Miles of Designated Scenic Roads within Viewshed	0.36 mile (0.6 km)	0.03 (0.1 km)	0.6 mile (1 km)
Vehicle Exposure on Scenic Roads	16 hours per day	1 hours per day	17 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 5c.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.1.10 Alternative 6a

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6a. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. These impacts would be similar to those described above for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor.

[113] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.5.1.4**).

4.5.1.11 Alternative 6b

Impacts from Construction

Short-term visual impacts would result from the construction of Alternative 6b. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. These impacts would be similar to those described above for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those discussed above for Alternative 4a (see **Section 4.5.1.4**).

4.5.1.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term visual impacts would occur during the construction of Alternative 7. Short-term impacts resulting from construction are discussed in **Section 4.1.1.1**. Construction impacts from underground portions of the Project would be similar to those for Alternative 3 (**Section 4.5.1.3**). However, these impacts would occur in a roadway corridor. Impacts from overhead portions would be identical to those resulting from Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term visual impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.1.2**.

For the underground portions of Alternative 7, long-term operational impacts would be minimal because the Project would be located underground in roadway corridors (see **Section 4.1.1.2**). Assuming revegetation, underground portions of the Project would be consistent with all SIOs. Since Alternative 7 would be underground where it would cross the ANST in MA 8.3, the Project would be consistent with MA 8.3 – Appalachian National Scenic Trail, Scenery Management S-1 and S-2.

For overhead portions of Alternative 7 in the WMNF Section, the visibility of large industrial-appearing lattice structures with high form and color contrast and vegetation clearing would result in a long-term visual impact. Overhead portions of the Project would be consistent with the SIO of "Very Low," and inconsistent with all others. Overhead portions would cross areas of the WMNF where SIOs are guidelines rather than standards and a Forest Plan Amendment would not be necessary. The Project would be located in the existing PSNH transmission route parallel to an existing PSNH transmission line.

Landscape Assessment

Based on an assumed maximum visibility distance of 10 miles (16 km), the viewshed of the Project under Alternative 7 would be approximately 0.2 square mile (0.5 km^2) greater than the viewshed of the existing PSNH transmission line (a component of the existing condition). The increased viewshed area would result from vegetation clearing and the visibility of taller towers (when compared with the existing structures). Thus, the viewshed under Alternative 7 would be approximately 4 percent larger than the viewshed of the existing PSNH transmission line.

Alternative 7 would result in an additional 0.05 square mile (0.1 km^2) of the viewshed with a visual magnitude rating of "High or Very High." Alternative 7 would increase the average visual magnitude from 1.77 to 1.85, indicating an increase in the number of visible structures. The visual magnitude would be "Low to Moderate," compared with the rating of "Very Low to Low" for the existing condition. Visual magnitude accounts for the greater visual presence of an object when it is closer to the viewer. For a detailed description of the visual magnitude index refer to **Section 3.1.1.2.**

Alternative 7 would result in an additional 0.1 square mile (0.3 km^2) of the viewshed with a scenic impact rating of "High or Very High." Alternative 7 would increase the average scenic impact from 2.39 to 2.45, indicating an increased visibility at sensitive locations. The scenic impact would not increase from the current rating of "Low to Moderate." For a description of the scenic impact index refer to **Section 3.1.1.2.**

Table 4-182 summarizes landscape assessment impacts in the WMNF Section under Alternative 7.

Table 4-182. Landscape Assessment Impacts under Alternative 7 – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Land Area within Viewshed	6 square miles (16 km^2)	0.2 square mile (0.5 km^2)	6.2 square miles (17 km^2)
Average Visual Magnitude	1.77 (Very Low to Low)	0.08	1.85 (Low to Moderate)
Land Area with "High or Very High" Scenic Impact	2.5 square miles (6.5 km^2)	0.1 square mile (0.3 km^2)	2.1 square miles (5.3 km^2)
Average Scenic Impact	2.39 (Low to Moderate)	0.06	2.45 (Low to Moderate)
Aggregate Scenic Impact	15.3	0.98	16.29

Roads-Based Analysis

Under Alternative 7, the Project's overhead structures would not cross any publicly-accessible roads that are not already crossed by the existing PSNH transmission line. The Project would be visible from approximately 0.4 mile (0.7 km) of roads from which the existing PSNH transmission line is not currently visible.[114] Approximately 0.2 additional mile (0.5 km) of roads within the viewshed would have a visual magnitude rating of "High or Very High," compared with the existing condition. Alternative 7 would increase the average visual magnitude for roads within the viewshed from 1.62 to 1.78, indicating an increase in the number of visible structures. The visual magnitude would not increase from the current rating of "Very Low to Low."

Included in the 0.4 mile (0.7 km) of increased visibility from roads within the viewshed would be 0.2 mile (0.5 km) of designated scenic roads. Given the AADT on these roads, it is estimated that vehicle exposure would increase by approximately 17 hours per day.[115] These impacts would be to the state-designated River Heritage Tour. For a description of vehicle exposure, refer to **Section 3.1.1.3.**

Table 4-183 summarizes roads-based analysis impacts in the WMNF Section under Alternative 7.

[114] Visibility was analyzed for roads within 1.5 miles (2.4 km) of the Project corridors.
[115] For a description of the methods of the Roads-based Analysis, see **Section 3.1.1.3**.

Table 4-183. Roads-Based Analysis Impacts under Alternative 7 – WMNF Section

Indicator	Existing Conditions (Alternative 1)	Net Change (from Existing Conditions)	Proposed Conditions (Alternative 7)
Miles of Road within Viewshed	4 miles (6 km)	0.4 mile (0.7 km)	4.4 miles (7 km)
Visual Magnitude	1.62 (Very Low to Low)	0.16	1.78 (Very Low to Low)
Miles of Designated Scenic Roads within Viewshed	0.36 mile (0.6 km)	0.2 mile (0.5 km)	0.38 mile (0.7 km)
Vehicle Exposure on Scenic Roads	16 hours per day	17 hours per day	33 hours per day

Viewpoint Assessment

The following potential impacts would occur relative to the six KOPs in the WMNF Section under Alternative 7.

- KOP EA-3 (Viewpoint EA-3b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP FR-2 (Viewpoint FR-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-2 (Viewpoint LI-2b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-4 (Viewpoint LI-4b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP LI-5 (Viewpoint LI-5b in **Appendix E**) – There would be no visible change from the existing condition.
- KOP WD-4 (Viewpoint WD-4b in **Appendix E**) – There would be no visible change from the existing condition.

4.5.2 SOCIOECONOMICS

Refer to **Section 4.1.2** for a discussion of general impacts common to all geographic sections.

The WMNF Section is contained within portions of both the Northern and Central Sections. The socioeconomics analysis does not lend itself to the scale of the WMNF. See the Northern and Central Sections for descriptions of environmental consequences resulting from the Project.

4.5.3 RECREATION

Refer to **Section 4.1.3** for a discussion of general impacts common to all geographic sections.

4.5.3.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.3.2 Alternative 2

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 2 in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 191 acres (77 ha) within WMNF. Within the study area of the WMNF are numerous recreational sites, including approximately 4 miles (7 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites or the Ammonoosuc River. The following examples of notable recreational resources are among those that would experience short-term construction impacts under Alternative 2: the WMNF, Reel Brook Trail, and Kinsman Ridge Trail/ANST. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Short-term construction impacts of the Project to the Reel Brook Trail and Kinsman Ridge Trail/ANST would occur under Alternative 2. The ROS zone at the Reel Brook Trail crossing is Semi-Primitive Motorized, and it is designated as WMNF MA 2.1. The ROS zone at the Kinsman Ridge Trail/ANST crossing is Semi-Primitive Non-Motorized, and it is designated as WMNF MA 8.3. The recreation experience on the Kinsman Ridge Trail/ANST would be impacted under Alternative 2. The impact to the Kinsman Ridge Trail/ANST would remain the same as under existing conditions; however, construction of the Project would likely close a portion of the trail for the duration of construction. Additionally, Alternative 2 includes vegetation removal to widen the existing PSNH corridor. At the ANST crossing it is anticipated that the existing corridor would be widened by approximately 40 feet on either side. The ANST is a nationally-significant resource that provides a high-quality recreation experience for users. Impacts to the ANST, such as the presence of machinery and potential short-term closures of the trail, would detract from the experience of users. The experience of through-hikers, in particular, could be impacted by the construction of the Project since these users are generally seeking a more-primitive experience.

The ANST falls within WMNF MA 8.3. Within this MA, the WMNF emphasizes "a remote backcountry experience in a predominantly natural or natural-appearing landscape" (USDA Forest Service 2005b).

Four of the six Recreation Opportunity Spectrum (ROS) zones would be impacted by the Project under Alternative 2. The Rural and Primitive zones would not be affected. The Project would be consistent with Roaded Natural and Urban ROS zones. When compared to existing conditions, Alternative 2 would increase the number of acres impacted in all affected ROS zones, and would result in additional inconsistencies with WMNF ROS objectives. New towers and transmission lines would result in increased development in backcountry areas under Alternative 2.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 2 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.2**, construction and operation of the Project would result in long-term impacts to visual resources. Overstory vegetation removal, the construction of aboveground facilities, and ongoing vegetation management would result in long-term visual impacts and associated impacts to recreation. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 152 additional acres (61 ha) within the WMNF and approximately 0.8 additional mile (1.3 km) of trails. No impacts would occur to recreation point sites.

Additional visual impacts of the Project to the Reel Brook Trail and Kinsman Ridge Trail/ANST would occur under Alternative 2. The ROS zone in this area is Semi-Primitive Non-Motorized, and it is designated as WMNF MA 8.3. The recreation experience on the Kinsman Ridge Trail/ANST would be impacted under Alternative 2. The Franconia Ridge Trail/ANST would also be visually impacted by the Project within the Primitive ROS zone (Pemigewasset Wilderness). The Mount Kinsman Trail would receive a slight increase in visual impacts from the Project. Visual impacts would also occur along the Beaver Brook Trail/ANST and Garfield Ridge Trail/ANST.

Alternative 2 would require Forest Plan Amendments for Forest-wide General Standard S-2 and Management Area 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2 (see **Appendix C**). Forest-wide General Standard S-2 states: "Current development levels in the backcountry will be maintained or lowered where appropriate" (USDA Forest Service 2005a). Alternative 2 would be inconsistent with Standard S-2 because the construction of additional, larger towers and lines within the existing transmission route would increase the development level in the backcountry and increase inconsistencies in some ROS classes. Management Area 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2 states: "Management of the AT experience must be compatible with the prescribed recreation experience opportunity class. Lands within this management area should be managed under the semi-primitive non-motorized (SPNM) Recreation Opportunity Spectrum (ROS) class. There are situations where the AT crosses or follows public roads and snowmobile trails, and where developed facilities are present. Current inconsistencies in this ROS Class, such as Appalachian Mountain Club huts, are acceptable but are managed to minimize impacts on the SPNM experience" (USDA Forest Service 2005a). Construction of additional, larger towers and lines within MA 8.3 results in additional inconsistencies in the SPNM ROS class. While existing inconsistencies are accepted, new inconsistencies would be contrary to this standard. Therefore, the Project would be inconsistent with this standard. Forest-wide – Vegetation Management Guideline G-2 states: "Timber management prescriptions adjacent to trail corridors should be modified to protect trail- and recreation-related values (e.g., uncut zones, slash disposal, trail relocation, and/or use of uneven-aged management)" (USDA Forest Service 2005a). This guideline would not be implemented because the Project is a linear corridor with necessary clearing limits. The trail experience would be affected and trail relocation for trails that cross the Project corridor is not feasible.

Additional visual impacts would occur in each ROS zone, including the Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized zones. Because these ROS zones provide isolation from the sights and sounds of humans, additional visual impacts may affect the recreation experience. Additional visual impacts could result in inconsistencies with ROS objectives in the Primitive zone.

The recreation experience under Alternative 2 would be affected by the construction of the Project because it would result in a modification to the natural environment. The larger, taller metal towers would result in the Project being visible from more locations than the existing PSNH transmission line. The type of structures proposed (i.e., metal, lattice-type towers) could also impact the recreation experience when compared with the existing wooden structures because they would appear less compatible with the natural environment, which would detract from the level of solitude and remoteness experienced on the ANST and in other backcountry areas. These visual impacts would be especially apparent to those seeking more primitive experiences.

4.5.3.3 Alternative 3

Impacts from Construction

Short-term impacts to recreation during the construction of Alternative 3 in the WMNF Section would be similar to those discussed above for Alternative 2 (see **Section 4.5.3.2**). Impacts would occur to the same locations. However, as discussed in **Section 4.1.3.1**, the construction of underground transmission cable could require a longer period of construction and more intense disturbance, resulting in additional disturbance to the recreation experience. Alternative 3 would not include any widening of the existing cleared corridor.

The recreation experience on the Kinsman Ridge Trail/ANST would be impacted under Alternative 3. Impacts to the ANST, such as the presence of machinery and potential short-term closures of the trail, would detract from the experience of users. The experience of through-hikers, in particular, could be impacted by the construction of the Project since these users are generally seeking a more-primitive experience.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 3 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.3**, Alternative 3 would be located underground, and vegetation management would result in long-term visual impacts. Approximately 0.8 additional acre (0.2 ha) of recreational sites would be visually impacted by the Project.

4.5.3.4 Alternative 4a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4a in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 16 acres (6.5 ha) within recreational sites that have a spatial area, and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route. Short-term impacts, including the generation of noise, could impact the recreation experience for users proximate to the Project, but this would add incrementally to noise that is currently being generated by traffic on the roadway.

Alternative 4a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) as an underground transmission cable in one location where there is already an existing road and/or crossing in these locations, and the cable would likely be installed underneath existing bridges. Impacts to recreation are not expected. No other eligible or designated Wild and Scenic Rivers would be impacted.

Because Alternative 4a would follow the I-93 corridor through Franconia Notch, no additional short-term impacts from construction would occur to the Reel Brook Trail or Kinsman Ridge Trail/ANST. A portion of the ANST in the Franconia Notch area would be impacted by the Project under Alternative 4a. Although this impact would occur in a previously-impacted area (along I-93), construction activities could alter the recreation experience on this portion of the ANST. Two of the six ROS zones would be impacted by the Project under Alternative 4a. The Primitive, Semi-Primitive Motorized, and Semi-Primitive Non-Motorized zones would not be impacted. Impacts to the Roaded Natural, and Urban zones would occur, but human modifications and interactions are generally expected in these zones. Neither inconsistencies with WMNF ROS objectives nor development in backcountry areas would be likely to increase under Alternative 4a.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.4**, Alternative 4a would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.5.3.5 Alternative 4b

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4b in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 50 acres

(20 ha) within recreational sites that have a spatial area, and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route. Short-term impacts, including the generation of noise, could impact the recreation experience for users proximate to the Project, but this would add incrementally to noise that is currently being generated by traffic on the roadway.

Alternative 4b would cross two eligible federal Wild and Scenic Rivers (Pemigewasset River and Ammonoosuc River) where there are already existing road crossings. The cable would likely be installed underneath existing bridges and impacts to recreation are not expected. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 4b. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Four of the six ROS zones would be impacted by the Project under Alternative 4b. The Primitive and Semi-Primitive Motorized zones would not be impacted. Impacts to the Roaded Natural, Rural, and Urban zones would occur, but human modifications and interactions are generally expected in these zones. An additional 8 acres (3 ha) of the Semi-Primitive Non-Motorized zone would be impacted. However, because Alternative 4b follows the corridor for NH Route 112/116 through the WMNF, the impacts to the Semi-Primitive Non-Motorized zone would be along this previously-impacted road corridor. Therefore, the impacts would not be expected to alter the recreation experience in that zone. No additional development in backcountry areas would be expected under Alternative 4b.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4b and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.5**, Alternative 4b would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.5.3.6 Alternative 4c

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 4c in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 37 acres (15 ha) within recreational sites that have a spatial area, and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**. As described, the short-term construction impacts of an underground cable in a roadway corridor could be larger than impacts of an overhead line, but smaller than underground cable in a transmission route. Short-term impacts, including the generation of noise, could impact the recreation experience for users proximate to the Project, but this would add incrementally to noise that is currently being generated by traffic on the roadway.

Alternative 4c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) where there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. Impacts to recreation are not expected. No other eligible or designated Wild and Scenic Rivers would be impacted.

A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 4c. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

The Roaded Natural and Semi-Primitive Non-Motorized zones would be the only ROS zones with over 1 acre of impacted area. Human modifications and interactions are generally expected in the Roaded Natural zone. The recreation experience offered in the Semi-Primitive Non-Motorized zone could be temporarily altered; however, since Alternative 4c follows an existing roadway corridor, the impacts would be limited to a previously-disturbed area. The recreation experience in the remaining ROS zones would remain unchanged. No additional development in backcountry areas would be expected under Alternative 4c.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts to recreation would occur during operation, maintenance, and emergency repair of the Project under Alternative 4c and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.6**, Alternative 4c would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.5.3.7 Alternative 5a

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5a in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 27 acres (11 ha) within recreational sites that have a spatial area and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 5a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) in one location where there is already an existing road crossing, and the cable would likely be installed underneath existing bridges. Impacts to recreation are not expected. No other eligible or designated Wild and Scenic Rivers would be impacted.

A portion of the ANST in the Franconia Notch area would be impacted by the Project under Alternative 5a. Although this impact would occur in a previously-impacted area (along I-93), construction activities could alter the recreation experience on this portion of the ANST.

Four of the six ROS zones would be impacted by the Project under Alternative 5a. Only the Primitive zone would not be impacted. Impacts to the Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would occur, between Stark and Groveton, NH. This would result in additional inconsistencies with WMNF ROS objectives. Impacts to the Roaded Natural, Rural, and Urban zones would occur, but human modifications and interactions are generally expected in these zones. Development in backcountry areas would not be likely to increase under Alternative 5a.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5a and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.7**, Alternative 5a would be located both overhead and underground, and the construction and operation would result in long-term visual impacts. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures. Visual impacts would be limited to those areas from which an aboveground structure is visible. In general, visible structures would be those aboveground portions of the Project located outside the WMNF. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 52 additional acres (21 ha) within the WMNF and 0.1 mile (0.1 km) of trails.

Less than 0.1 additional mile (0.1 km) of the Franconia Ridge Trail/ANST, Kinsman Ridge Trail/ANST, and Garfield Ridge Trail/ANST would be visually impacted by the Project. These impacts would likely affect the recreation experience along these portions of the ANST.

Although the majority of the Project in the WMNF Section would be buried under Alternative 5a, the recreation experience would still be affected by the construction of the Project because it would result in a modification to the natural environment. The larger, taller metal towers would result in the Project being visible from more locations than the existing PSNH transmission line. The transmission cable would be buried where it crosses the ANST under Alternative 5a but aboveground portions primarily located outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Five of the six ROS zones would be visually impacted by the Project under Alternative 5a. Only the Urban zone would not be visually impacted. The Primitive, Semi-Primitive Motorized, and Semi-Primitive Non-Motorized zones would be impacted by the Project, which could result in adverse impacts to the recreation experience. As mentioned above, these zones would be primarily impacted by aboveground portions of the Project located outside the WMNF. Impacts to the Roaded Natural and Rural zones would occur, but human modifications and interactions are generally expected in these zones.

4.5.3.8 Alternative 5b

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5b in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 77 acres (31 ha) within recreational sites that have a spatial area and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 5b would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) where there is already an existing road crossing, and the cable would likely be installed underneath existing bridges. Impacts to recreation are not expected. No other eligible or designated Wild and Scenic Rivers would be impacted.

No short-term construction impacts would occur to the Reel Brook Trail or Kinsman Ridge Trail/ANST under Alternative 5b. A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 5b. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Five of the six ROS zones would be impacted by the Project under Alternative 5b. Only the Primitive zone would not be affected. Impacts to the Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would occur, between Stark and Groveton, NH, and in Easton, NH. This would result in additional inconsistencies with WMNF ROS objectives Development in backcountry areas would not be likely to increase under Alternative 5b.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5b and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.8**, Alternative 5b would be located both overhead and underground, and the construction and operation would result in long-term visual impacts. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures. Visual impacts would be limited to those areas from which an aboveground structure is visible. In general, visible structures would be those aboveground portions of the Project located outside the WMNF. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 94 additional acres (38 ha) within the WMNF and 0.1 mile (0.2 km) of trails would be visually impacted by the Project.

Less than 0.1 additional mile (0.1 km) of the Franconia Ridge Trail/ANST and Garfield Ridge Trail/ANST would be visually impacted by the Project. These impacts would likely affect the recreation experience along these portions of the ANST.

Although the majority of the Project in the WMNF Section would be buried under Alternative 5b, the recreation experience would be affected by the construction of the Project because it would result in a modification to the natural environment. The larger, taller metal towers would result in the Project being visible from more locations than the existing PSNH transmission line. The transmission cable would be buried where it crosses the ANST under Alternative 5b but aboveground portions primarily located outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Five of the six ROS zones would be visually impacted by the Project under Alternative 5b. Only the Primitive zone would not be visually impacted. The Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would be impacted by the Project, which could result in adverse impacts to the recreation experience. As mentioned above, these zones would be primarily impacted by aboveground portions of the Project located outside the WMNF.

4.5.3.9 Alternative 5c

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 5c in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 54 acres (22 ha) within recreational sites that have a spatial area and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 5c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) where there is already an existing road crossing. The cable would likely be installed underneath an existing bridge, and is not expected to impact recreation. No other eligible or designated Wild and Scenic Rivers would be impacted.

No short-term construction impacts would occur to the Reel Brook Trail or Kinsman Ridge Trail/ANST under Alternative 5c. The recreation experience on the Kinsman Ridge Trail/ANST would remain unchanged. A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 5b. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Five of the six ROS zones would be impacted by the Project under Alternative 5c. Only the Primitive zone would not be impacted. Impacts to the Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would occur between Stark and Groveton, NH. This would result in additional inconsistencies with WMNF ROS objectives. Impacts to the Roaded Natural, Rural, and Urban zones would occur, but human modifications and interactions are generally expected in these zones. Development in backcountry areas would not be likely to increase under Alternative 5c.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 5c and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.9**, Alternative 5c would be located both overhead and underground, and the construction and operation would result in long-term visual impacts. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures. Visual impacts would be limited to those areas from which an aboveground structure is visible. In general, visible structures would be those aboveground portions of the Project located outside the WMNF. In addition to the recreational resources currently visually affected by the PSNH transmission line (see **Section 3.1.3**), long-term visual impacts would occur to approximately 84 additional acres (34 ha) within the WMNF and 0.1 mile (0.2 km) of trails would be visually impacted by the Project.

Less than 0.1 mile (0.1 km) of the Franconia Ridge Trail/ANST, Garfield Ridge Trail/ANST, and Kinsman Ridge Trail/ANST would be visually impacted by the Project. These impacts would likely affect the recreation experience along these portions of the ANST.

Although the majority of the Project in the WMNF Section would be buried under Alternative 5c, the recreation experience would be affected by the construction of the Project because it would result in a modification to the natural environment. The larger, taller metal towers would result in the Project being visible from more locations than the existing PSNH transmission line. The transmission cable would be buried where it crosses the ANST under Alternative 5b but aboveground portions primarily located outside the WMNF would be visible from the trail, which could impact the recreation experience of users.

Five of the six ROS zones would be visually impacted by the Project under Alternative 5c. Only the Primitive zone would not be visually impacted. Both the Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would be impacted by the Project, which could result in adverse impacts to the recreation experience. As mentioned above, these zones would be impacted by aboveground portions of the Project located outside the WMNF. Impacts to the Roaded Natural, Rural, and Urban zones would occur, but human modifications and interactions are generally expected in these zones.

4.5.3.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.5.3.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.5.3.4**).

4.5.3.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 4b (see **Section 4.5.3.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4b (see **Section 4.5.3.5**).

4.5.3.12 Alternative 7 – Proposed Action

Impacts from Construction

Short-term impacts to recreation would occur during the construction of Alternative 7 in the WMNF Section. Short-term, localized impacts due to construction activity would occur to approximately 50 acres (20 ha) within recreational sites that have a spatial area and less than 0.1 mile (0.1 km) of trails. It is likely that recreational use of additional portions of these trails would be impacted because trails would likely be closed at the trailhead during construction. No impacts would occur to recreation point sites. For a discussion of the types of impacts that would occur at these locations, see **Section 4.1.3.1**.

Alternative 7 would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River) where there is already an existing road crossing. The cable would likely be installed underneath existing bridges and is not expected to impact the recreational experience. No other eligible or designated Wild and Scenic Rivers would be impacted.

No short-term construction impacts would occur to the Reel Brook Trail or Kinsman Ridge Trail/ANST under Alternative 7. The recreation experience on the Kinsman Ridge Trail/ANST would remain unchanged. A short segment of the Beaver Brook Trail/ANST in the Kinsman Notch area would be impacted by the Project under Alternative 7. Although this impact would occur in a previously-impacted area (along NH Route 112), construction activities could alter the recreation experience on this portion of the ANST.

Four of the six ROS zones would be impacted by the Project under Alternative 7. The Primitive zone would not be impacted. Impacts to the Semi-Primitive Motorized and Semi-Primitive Non-Motorized zones would occur between Stark and Groveton, NH. This would result in additional inconsistencies with WMNF ROS objectives. Impacts to the Roaded Natural and Rural zones would occur, but human modifications and interactions are generally expected in these zones. Development in backcountry areas would not be likely to increase under Alternative 7.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts would occur during operation, maintenance, and emergency repair of the Project under Alternative 7 and are discussed in **Section 4.1.3.2**.

As discussed in **Section 4.5.1.12**, Alternative 7 would be located underground, and the construction and operation would result in long-term impacts resulting from vegetation management. Therefore, long-term impacts to recreation would occur but would be due to limited aboveground structures.

4.5.4 HEALTH AND SAFETY

Refer to **Section 4.1.4** for a discussion of general impacts common to all geographic sections.

4.5.4.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.4.2 Alternative 2

Impacts from Construction

With regards to hazardous materials and waste under Alternative 2, care would need to be taken when removing the existing utility poles. The existing 115 kV HVAC transmission lines in the existing PSNH transmission route within the WMNF would be replaced under Alternative 2. The existing utility poles are creosote-treated. Adherence to EPA guidance should ensure that the workers and the public are protected and that the creosote-treated poles are disposed of properly. There are no known potentially contaminated sites on the lands crossed within the WMNF.

The USFS has the capability to fight fires that occur within the WMNF. The presence of USFS firefighting crews would decrease the potential of the fire spreading and the potential for regional impacts.

This alternative would cross roadways and construction could result in safety risks to the public and workers (see **Section 4.1.4.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

There are no known potentially contaminated sites on the lands crossed within the WMNF. No provisions would be needed for underground pipelines because there are no pipeline crossings on Alternative 2, and there would be no transition stations in the WMNF.

Fires could occur during operation and maintenance. Measures to prevent fires are included in the NESC, which the Project is required to adopt. Therefore, the likelihood of a fire is low. The USFS has the capability to fight fires that occur on NFS lands. The presence of USFS firefighting crews would decrease the potential of the fire spreading and the potential for regional impacts.

4.5.4.3 Alternative 3

Impacts from Construction

There are no known potentially contaminated sites on the lands crossed within the WMNF.

In the WMNF, Alternative 3 would cross no known pipelines; therefore, no provisions need to be made.

The USFS has the capability to fight fires that occur within the WMNF. The presence of USFS firefighting crews would decrease the potential of the fire spreading and the potential for regional impacts.

This alternative would cross roadways and construction could result in safety risks to the public and workers (see **Section 4.1.4.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Since Alternative 3 would be located underground, the potential for a fire would be less than for overhead transmission lines. In addition, the USFS has the capabilities to respond to fires on NFS lands, thereby minimizing potential regional impacts and increasing the potential that impacts from fires would be localized and short-term.

Many public safety hazards associated with accident conditions of the overhead transmission lines would be reduced by burying the transmission cable. Since the transmission cable would be buried, the potential for breakage and falling during extreme weather events or from an object falling on the line would be eliminated, thus decreasing the potential for fires or potential electrical shock. Lightning strikes would not affect operation under Alternative 3. The likelihood of a fire during operation would be diminished because the transmission cable would be buried.

4.5.4.4 Alternative 4a

Impacts from Construction

Alternative 4a would cross about 10 miles (16 km) of the WMNF within existing roadway corridors. No known locations that currently or historically have had soil or groundwater contamination are within 250 feet (76 m) of the any of the disturbance areas for this alternative. Because Alternative 4a would be located underground through the WMNF, construction impacts would be similar to those for Alternative 3; however, unlike Alternative 3, the underground cable would be buried in a roadway corridor, thus increasing the potential for accidents on roadways. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Although they would follow a different alignment, both Alternative 4a and Alternative 3 would be buried in the WMNF Section. Therefore, impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4a would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.4.3**).

4.5.4.5 Alternative 4b

Impacts from Construction

A historic gas station site is located at 770 Lost River Road in North Woodstock which is in close proximity to the Alternative 4b disturbance area. Although no contamination is known to be located at this site, gas stations could have had leaking underground storage tanks. In the WMNF, Alternative 4b would cross no known pipelines; therefore, no provisions need to be made.

The USFS has the capability to fight fires that occur within the WMNF. The presence of USFS firefighting crews would decrease the potential of the fire spreading and the potential for regional impacts.

Under Alternative 4b, 19 miles (31 km) of the transmission cable would be buried in a roadway corridor; thus, there would be the potential for accidents on roadways. The potential for accidents would be minimized by the APMs (see **Appendix H**) including the implementation of a transportation management plan that would control the flow of traffic and protect both workers and the public.

Impacts from Operations, Maintenance, and Emergency Repairs

Although they would follow a different alignment, both Alternative 4b and Alternative 3 would be buried in the WMNF Section. Therefore, impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4b would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.4.3**).

4.5.4.6 Alternative 4c

Impacts from Construction

Construction impacts under Alternative 4c would be similar to those described for the Project under Alternative 4b in the WMNF Section, except only 10 miles (16 km) would be buried in roadways which would result in fewer risks associated with construction in roadways.

Impacts from Operations, Maintenance, and Emergency Repairs

Although they would follow a different alignment, both Alternative 4c and Alternative 3 would be buried in the WMNF Section. Therefore, impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4c would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.4.3**).

4.5.4.7 Alternative 5a

Impacts from Construction

No known locations that currently or historically have had soil or groundwater contamination are within 250 feet (76 m) of the disturbance areas for this alternative. Construction impacts for the underground portion of Alternative 5a would be similar to those for Alternative 4a (see **Section 4.5.4.4**), except 2 miles (3 km) would be buried in roadways in the WMNF which would result in fewer risks associated with construction in roadways. Construction impacts for the overhead portion of Alternative 5a would be similar to those for Alternative 2 (see **Section 4.5.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.4.2**), and effects for underground portions would be similar to those described for Alternative 3 (see **Section 4.5.4.3**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.5.4.8 Alternative 5b

Impacts from Construction

Construction impacts under Alternative 5b would be similar to those described for the Project under Alternative 4b (see **Section 4.5.4.5**) in the WMNF Section, except 10 miles (16 km) would be buried in roadway corridors in the WMNF which would result in fewer risks associated with construction in roadways. Construction impacts for the overhead portion of Alternative 5b would be similar to those for Alternative 2 (see **Section 4.5.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.4.2**), and effects for underground portions would be similar to those described for Alternative 3 (see **Section 4.5.4.3**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.5.4.9 Alternative 5c

Impacts from Construction

Construction impacts under Alternative 5c would be similar to those described for the Project under Alternative 4b (see **Section 4.5.4.5**) in the WMNF Section, except 10 miles (16 km) would be buried in roadway corridors in the WMNF which would result in fewer risks associated with construction in roadways. Construction impacts for the overhead portion of Alternative 5c would be similar to those for Alternative 2 (see **Section 4.5.4.2**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.4.2**), and effects for underground portions would be similar to those described for Alternative 3 (see **Section 4.5.4.3**). The alternatives would be buried in different alignments but the types of impacts would be identical.

4.5.4.10 Alternative 6a

Impacts from Construction

Construction impacts under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.4.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.4.4**).

4.5.4.11 Alternative 6b

Impacts from Construction

Construction impacts under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.4.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.4.5**).

4.5.4.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction impacts under Alternative 7 would be identical to those described for the Project under Alternative 5c in the WMNF Section (see **Section 4.5.4.9**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 7 would be identical to those described for the Project under Alternative 5c in the WMNF Section (see **Section 4.5.4.9**).

4.5.5 TRAFFIC AND TRANSPORTATION

Refer to **Section 4.1.5** for a discussion of general impacts common to all geographic sections.

4.5.5.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.5.2 Alternative 2

Impacts from Construction

The Project under Alternative 2 would impact 1 interstate, 1 federal highway, 3 state routes, and 3 public roads in the WMNF Section. These impacts would result from the stringing of overhead transmission lines across public roads. Construction of Project components that cross public roadways (i.e., overhead transmission lines) may require access to one or more roadway lanes to be temporarily restricted. The Project would result in the stringing of overhead transmission lines across public roads in eight locations. As discussed in **Section 4.1.5.1**, partial or full roadway closures could reduce average speed and affect traffic patterns.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 4 percent on I-93 (Woodstock, NH) to 156 percent on NH Route 116 in Easton, NH. The 156 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 742 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. Some localized, short-term transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**. Impacts to traffic patterns due to potential roadway closures would result in short-term, localized inconvenience or delay and would not likely interrupt overall area traffic patterns and flow.

No airfields were identified in the WMNF Section; therefore, no impacts to air would be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Any adverse impact on public roadways that may occur during operation and maintenance would be short-term through the implementation of a transportation management plan (see **Appendix H**). See **Section 4.1.5.2** for more detailed discussion.

4.5.5.3 Alternative 3

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.5.5.2**; however, fewer construction vehicles would be needed for burial of underground cable in the existing PSNH transmission route than would be needed for overhead transmission lines in the existing PSNH transmission route.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 3 percent on I-93 in Woodstock, NH, to 128 percent on NH Route 116 in Easton, NH. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

No airfields were identified in the WMNF Section; therefore, no impacts to air would be expected.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 3.

4.5.5.4 Alternative 4a

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.5.5.2**. However, roadway corridor would be disturbed for buried cables. The Project under Alternative 4a would be located within the I-93 and US Route 3 roadway corridors in the WMNF Section, Alternative 4a would impact 1 interstate highway, 1 federal highway, 2 state routes and 4 public roads in the WMNF Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project under Alternative 4a would result in the disturbance of approximately 10 miles (16 km) of roadway corridors for burial of the transmission cable.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 3 percent on I-93 (Woodstock, NH) to 168 percent on NH Route 141 in Franconia, NH. The 168 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4a.

4.5.5.5 Alternative 4b

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 4a in **Section 4.5.5.4**. However, Alternative 4b would be buried in different roadway corridors. The Project under Alternative 4b would be located within the I-93, US Route 3, NH Route 112 and NH Route 116 roadway corridors in the WMNF Section. Alternative 4b would impact 1 interstate highway, 1 federal highway, 2 state routes, and 12 public roads in the WMNF Section.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. Alternative 4b would result in the disturbance of approximately 19 miles (31 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 3 percent on I-93 (Woodstock, NH) to 168 percent on NH Route 141 in Franconia, NH. The 168 percent increase in traffic volumes on NH Route 141 is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4b.

4.5.5.6 Alternative 4c

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 4a in **Section 4.5.5.4**. However, Alternative 4c would be buried in different roadway corridors. The Project under Alternative 4c would be located within the NH Route 112 and NH Route 116 roadway corridors.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would impact 2 state routes and 7 local roads within the WMNF. The Project would result in the disturbance of approximately 10 miles (16 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 4 percent on I-93 (Woodstock, NH) and 128 percent on NH Route 116 in Easton, NH. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 4c.

4.5.5.7 Alternative 5a

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.5.5.2**. However, roadway corridors would be disturbed for buried cables. The Project under Alternative 5a would be located within the I-93 roadway corridor.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the stringing of overhead transmission lines across public roads in one location, and would result in the disturbance of approximately 2 miles (3 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles ranges from 3 percent on I-93 in Woodstock, NH, to 168 percent on NH Route 141 in Franconia, NH. The 168 percent increase in traffic volumes on NH Route is an increase from an estimated 220 vehicles per day to 590 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5a.

4.5.5.8 Alternative 5b

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.5.5.2**. However, roadway corridors would be disturbed for buried cables. The Project under Alternative 5b would be located within the NH Route 112 and NH Route 116 roadway corridors.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the stringing of overhead transmission lines across public roads in seven locations within the WMNF, and would result in the disturbance of approximately 10 miles (16 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 4 percent on I-93 (Woodstock, NH) to 128 percent on NH Route 116 in Easton, NH. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5b.

4.5.5.9 Alternative 5c

Impacts from Construction

The types of impacts on public roadways that may occur during construction would be similar to those described for the Project under Alternative 2 in **Section 4.5.5.2**. However, roadway corridors would be disturbed for buried cables. The Project under Alternative 5c would be located within the NH Route 112 and NH Route 116 roadway corridors.

As discussed in **Section 4.1.5.1**, restrictions on roadways are expected to be greater in frequency and length in sections where the transmission line would be buried in a public road corridor. The Project would result in the stringing of overhead transmission lines across public roads in one location within the WMNF, and would result in the disturbance of approximately 10 miles (16 km) of roadway corridor for burial of cables.

The maximum increase in traffic volumes from construction vehicles on roadways analyzed in the WMNF Section ranges from 3 percent on I-93 (Woodstock, NH) and 128 percent on NH Route 116 in Easton, NH. The 128 percent increase in traffic volumes on NH Route 116 is an increase from an estimated 290 vehicles per day to 660 vehicles per day; therefore, due to low existing traffic volumes, the roadway is assumed to have additional capacity. During construction, short-term and localized transportation impacts would result from the Project. Impacts would be avoided or minimized with the implementation of APMs listed in **Appendix H**.

Impacts from Operations, Maintenance, and Emergency Repairs

Refer to **Section 4.1.5.2** for a discussion of impacts that would result from operation, maintenance, and emergency repairs under Alternative 5c.

4.5.5.10 Alternative 6a

Impacts from Construction

Construction impacts under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.5.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.5.4**).

4.5.5.11 Alternative 6b

Impacts from Construction

Construction impacts under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.5.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.5.5**).

4.5.5.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction impacts under Alternative 7 would be similar to those described for the Project under Alternative 5c in the WMNF Section (see **Section 4.5.5.4**), except that Alternative 7 would not cross through the WMNF south of North Woodstock, NH.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 7 would be similar to those described for the Project under Alternative 5c in the WMNF Section (see **Section 4.5.5.4**).

4.5.6 LAND USE

Refer to **Section 4.1.6** for a discussion of general impacts common to all geographic sections.

The WMNF Section of the Project is bounded by the borders of the WMNF and includes all of the Project corridors within the WMNF. The WMNF Section overlaps with portions of the Northern and Central Sections, but the Project corridor on NFS lands are discussed separately in this section. The lands discussed here are included in the discussions of the Northern and Central Sections above.

4.5.6.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.6.2 Alternative 2

All impacts of Alternative 2 in the WMNF Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 2 in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the WMNF Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes.

Less than 1 percent (2 acres [1 ha]) of the Alternative 2 Project corridor is currently coded as a developed use. All of the developed land has a land cover category of Rural Residential and Recreation Uses. Alternative 2 would not pass through more intensive land use areas, such as population centers, village areas, and commercial centers and no lands within the transmission route experienced development activity between 2001 and 2011. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 2 Project corridor, which guide any development or use of NFS lands. Construction of Alternative 2 would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 2 in the WMNF Section would impact approximately 181 acres (73 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance and installation of aboveground structures associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

In the WMNF Section Alternative 2 would not cross any designated or eligible federal Wild and Scenic Rivers or State-protected rivers.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 2 would be located within the existing PSNH transmission route in the WMNF Section. Part of the Alternative 2 Project corridor is governed by six individual easements within the WMNF. A review of these six easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 2 within lands covered by those easements. The approval process for constructing Alternative 2 in the WMNF is further discussed, below, under Easements and SUPs.

Road Crossings

Construction of Alternative 2 would require eight aerial road crossings, and no underground road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur.

Refer to **Section 4.5.5.2** for a discussion of traffic and transportation impacts under Alternative 2.

Public Roadway Corridor Ownership Status

Alternative 2 would not be buried within any public roadway corridors in the WMNF Section. Therefore, no impacts are expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

The purpose and need described in **Chapter 1** and the alternatives described in **Chapter 2** were reviewed to determine consistency with the Forest-wide Goals and Objectives, as well as the specific Standards and Guidelines for MAs in which the Project would occur. The action alternatives were compared against pertinent Forest-wide and MA standards and guidelines. The standards and guidelines were analyzed against each resource analyzed and the determinations are presented in tabular format in **Appendix F**. A Forest Plan Amendment would be required for Alternative 2 (see **Appendix C**).

Easements and Special Use Permits

The existing PSNH transmission line on the WMNF is located within a ROW defined through a combination of existing transmission easements and existing SUPs (see maps contained in the **Land Use Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Existing transmission easements on the WMNF are held by PSNH as an outstanding property right, which authorizes the holder to erect, repair, maintain, rebuild, operate, and patrol electric transmission lines and distribution lines. The portions of the Project that are located on land held under these existing easements do not require the Applicant to obtain USFS authorization for construction of an overhead transmission line (USDA Forest Service 2004a). All of these existing easements allow for the installation of aboveground cable (see **Section 4.5.6.3**). The portions of the Project located on an existing SUP would require a new authorization and would need to be in compliance with the management direction provided in the Forest Plan.

Approximately 5 miles (8 km) of the Project corridor is located on the existing PSNH transmission route authorized by an easement. Approximately 6 miles (10 km) of the Project corridor is located within a corridor managed under an existing SUP issued to PSNH. A new authorization from the USFS would be required for this alternative. The new authorization would be required for all portions of the Project within the WMNF not located on lands authorized by existing easements. Forest Plan Amendments would be required to provide project consistency with (see **Appendix C**):

1. Forest-wide – Recreation General Standard S-2;
2. MA 8.3 – Appalachian National Scenic Trail, Recreation Standard S-2;
3. MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1; and
4. MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-2.

Forest-wide and Management Area guidelines would also not be implemented, including:

1. Forest-wide – Scenery Management Guideline G-1;
2. Forest-wide – Vegetation Management Guideline G-2;
3. Forest-wide – Rare and Unique Features, Gray Wolf Guideline G-2;
4. Forest-wide – Wildlife Habitat Management G-6;
5. Forest-wide – Riparian and Aquatic Habitats Guideline G-2;

6. Forest-wide – Riparian and Aquatic Habitats Guideline G-11;
7. Forest-wide – Riparian and Aquatic Habitats Guideline G-15;
8. Forest-wide – Water Resources, Floodplains and Wetlands Guideline G-1;
9. MA 2.1 – Scenery Management Guideline G-3; and
10. MA 2.1 – Scenery Management Guideline G-4

Consistency with Forest-wide Lands, Land Use Authorizations (Special Uses) S-1 and G-1, and MA 8.3 Lands-Special Uses S-3 is to be determined.

Inventoried Roadless Areas

The only overlap between Alternative 2 and any Roadless Area Conservation Rule (RACR) IRA or area identified during Forest Plan Revision as having roadless characteristics (Plan Revision IRA) would be the proposed helicopter landing area. Two sites have been proposed for this facility, each less than 1 acre (0.4 ha) in size and both are within a RACR and Plan Revision IRA. Only one of these helicopter landing areas would be constructed under Alternative 2. Thus, overlap between Alternative 2 and an IRA would be less than 1 acre (0.4 ha).

The Kinsman, Mount Wolf-Gordon Pond, and North Carr Mountain IRAs would experience noise-related impacts from the construction and maintenance of Alternative 2. Although these IRAs are already impacted by the presence of the existing PSNH transmission line, construction and maintenance could have additional incremental effects to opportunities for solitude.

4.5.6.3 Alternative 3

All impacts of Alternative 3 in the WMNF Section would occur within the existing PSNH transmission route.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 3 in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

All of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route in the WMNF Section. As a result, no land use conversions are expected under this alternative, as these areas would continue their existing use as transmission routes.

Less than 1 percent (2 acres [1 ha]) of the Alternative 3 Project corridor is currently coded as a developed use. All of the developed land has a land cover category of Rural Residential and Recreation Uses. Alternative 3 would not pass through more intensive land use areas, such as population centers, village areas, and commercial centers and no lands within the transmission route experienced development activity between 2001 and 2011. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 3 Project corridor, which guide any development or use of NFS lands. Construction of Alternative 3 would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 3 in the WMNF Section would impact approximately 181 acres (73 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance associated with the construction of the Project.

The Project could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1**.

Protected Rivers

In the WMNF Section Alternative 3 would not cross any designated or eligible federal Wild and Scenic Rivers or State-protected rivers.

Rights-of-Way

New and Existing Transmission Routes

All of the Project corridor of Alternative 3 would be located within the existing PSNH transmission route in the WMNF Section. The Alternative 3 Project corridor is governed by six individual easements within the WMNF. A review of these six easements for the existing PSNH transmission route indicate the Applicant is not authorized to utilize underground transmission lines in the WMNF corridor, as they authorize only overhead transmission. The approval process for constructing Alternative 3 in the WMNF is further discussed, below, under Easements and Special Use Permits.

Road Crossings

Construction of Alternative 3 would require eight underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.3** for a discussion of traffic and transportation impacts under Alternative 3.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 3 would not be buried within any public roadway corridors in the WMNF Section. Therefore, no impacts would be expected to public roadway corridors.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

Approximately 5 miles (8 km) of the Alternative 3 Project corridor is located on the existing PSNH transmission route authorized by an easement. A review of the easements for the existing PSNH transmission route indicate the Applicant is not authorized to utilize underground transmission lines in the WMNF corridor, as they authorize only overhead transmission. New easements or SUPs would have to be granted by the WMNF in order to construct Alternative 3.

Approximately 6 miles (10 km) of the Alternative 3 Project corridor is located within an existing SUP issued to PSNH. These portions of the Project would require a new authorization and would need to be in compliance with the management direction provided in the Forest Plan. The new authorization would be required for all portions of the Project within the WMNF. Under Alternative 3, two Forest-wide guidelines would not be implemented, including:

1. Forest-wide – Water Resources, Floodplains and Wetlands Guideline G-4; and
2. Forest-wide – Riparian and Aquatic Habitats Guideline G-11.

Through the implementation of APMs, the Project under Alternative 3 would be consistent with all other Forest Plan Management Direction.

Inventoried Roadless Areas

Alternative 3 would follow the same alignment as Alternative 2 in the WMNF Section, but as there are no helicopter landing areas proposed for Alternative 3, there would be no direct overlap between Alternative 3 and any RACR or Plan Revision IRA.

The ongoing presence and operation of Alternative 3 is expected to have a minimal impact on IRA values on the Kinsman, Mount Wolf-Gordon Pond, and North Carr Mountain IRAs. Although these IRAs are already impacted by the presence of the existing PSNH transmission line, construction and maintenance could have additional incremental noise-related effects to opportunities for solitude.

4.5.6.4 Alternative 4a

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4a in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4a would traverse the WMNF within roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Alternative 4a would not be expected to result in a long-term impact to developed lands and lands with development potential as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the approximately 9 acres (4 ha) of NFS lands in the Alternative 4a WMNF Section Project corridor. Alternative 4a would intersect with each of these parcels in the alignment buried within the roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

In the WMNF Section, Alternative 4a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) in one location and pass within 1,000 feet (305 m) of it in another location. This crossing and construction in close proximity is not expected to impact the potential future designation of this eligible river, as there is already an existing road and/or crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 4a would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.4**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4a Project corridor would be located within a new transmission route in the WMNF Section. While Alternative 4a would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 4a would require eight underground road crossings, and no aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.4** for a discussion of traffic and transportation impacts under Alternative 4a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4a would be buried within the US Route 3 and I-93 roadway corridors in the WMNF Section. US Route 3 and I-93 are a US Highway and Interstate, respectively, that both fall under the jurisdiction of the FHWA. The Project would require authorizations for this use from both the WMNF and FHWA (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

All of Alternative 4a would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, the Project under Alternative 4a would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 4a study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRA.

4.5.6.5 Alternative 4b

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4b in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4b would traverse the WMNF within roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Alternative 4b would not be expected to result in a long-term impact to developed lands and lands with development potential as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the approximately 30 acres (12 ha) of NFS lands in the Alternative 4b WMNF Section Project corridor. Alternative 4b would intersect with each of these parcels in the alignment buried within the roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

In the WMNF Section, Alternative 4b would cross two eligible federal Wild and Scenic Rivers (the Pemigewasset River and the Wild Ammonoosuc River). These crossings are not expected to impact the potential future designation of these eligible rivers, as there is already an existing road crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 4b would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.5**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4b Project corridor would be located within a new transmission route in the WMNF Section. While Alternative 4b would be constructed underground within existing roadway corridors, this use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 4b would require 16 underground road crossings, and no aerial road crossings, in the WMNF Section. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.5** for a discussion of traffic and transportation impacts under Alternative 4b.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4b would be buried within the US Route 3, I-93, NH Route 112, and NH Route 116 roadway corridors in the WMNF Section. I-93 and US Route 3 fall under the jurisdiction of the FHWA. NH Routes 112 and 116 are state highways under the jurisdiction of NHDOT. The Project would require authorizations for this use from both the WMNF and FHWA (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

All of Alternative 4b would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, the Project under Alternative 4b would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 4b study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRAs.

4.5.6.6 Alternative 4c

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 4c in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 4c would traverse the WMNF within roadway corridors. As a result, no land use conversions are expected under this alternative, as these areas would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Construction of Alternative 4c would not be expected to result in a long-term impact to developed lands and lands with development potential as the Project corridor would be restored to its pre-construction condition and would continue its existing use as a roadway corridor.

Conservation Lands

The ongoing presence and operation of the Project is expected to have a minimal impact on conservation values on the approximately 22 acres (9 ha) of NFS lands in the Alternative 4c WMNF Section Project corridor. Alternative 4c would intersect with each of these parcels in the alignment buried within the roadway corridors. As the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor, no impacts are expected from the ongoing presence of the transmission lines under the existing road corridors.

Protected Rivers

In the WMNF Section, Alternative 4c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River). This crossing is not expected to impact the potential future designation of this eligible river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 4c would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.6**.

Rights-of-Way

New and Existing Transmission Routes

All of the Alternative 4c Project corridor would be located within a new transmission route in the WMNF Section. While Alternative 4c would be constructed as underground transmission facilities within existing roadway corridors, this use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 4c would require nine underground road crossings, and no aerial road crossings, in the WMNF Section. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.6** for a discussion of traffic and transportation impacts under Alternative 4c.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 4c would be buried within the NH Route 112 and, NH Route 116 roadway corridors in the WMNF Section. NH Routes 112 and 116 fall under the jurisdiction of the NHDOT. The Project would require authorizations for this use from both the WMNF and FHWA (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

All of Alternative 4c would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, the Project under Alternative 4c would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 4c study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRAs.

4.5.6.7 Alternative 5a

Where Alternative 5a would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5a would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5a in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 5a would traverse the WMNF aboveground in the existing PSNH transmission route from approximately MP 50 to MP 52 in Stark, NH near MP 103 in Woodstock, NH, and near MP 109 in Thornton, NH. Additionally, Alternative 5a would traverse the WMNF underground in the I-93 corridor from approximately MP 89 to MP 91, near MP 95, and near MP 92. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the I-93 corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Approximately 16 percent (4 acres [2 ha]) of the Alternative 5a Project corridor is currently coded as a developed use. Approximately 56 percent of the developed land has a land cover category of Rural Residential and Recreation Uses and approximately 44 percent of the developed land has a land cover category of Developed Residential, Commercial and Industrial Uses. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 5a Project corridor, which guide any development or use of NFS lands. Construction of Alternative 5a would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 5a in the WMNF Section would impact approximately 21 acres (8 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance (for overhead and underground portions) and installation of aboveground structures (in the Alternative 2 alignment) associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

In the WMNF Section, Alternative 5a would cross the Pemigewasset River (an eligible federal Wild and Scenic River) in one location and pass within 1,000 feet (305 m) of it in another location. This crossing and construction in close proximity is not expected to impact the potential future designation of this eligible river, as there is already an existing road and/or crossing in these locations, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 5a would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.7**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 2 miles (3 km) of the Project corridor of Alternative 5a would be located within a new transmission route in the WMNF Section. About 1 mile (2 km) of the Project in the WMNF Section would be located within the existing PSNH transmission route. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5a within the existing corridor.

All of the Alternative 5a Project corridor that would be located in a new transmission route would be constructed underground within existing roadway corridors. This new use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 5a would require five underground road crossings, and one aerial road crossing. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.7** for a discussion of traffic and transportation impacts under Alternative 5a.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 5a would be buried within the I-93 roadway corridor in the WMNF Section and falls under the jurisdiction of the FHWA. The Project would require authorizations from both the WMNF and FHWA for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

Approximately 1 mile (2 km) of the Alternative 5a Project corridor is located on the existing PSNH transmission route authorized by an easement. The remainder of the Project would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, the Project under Alternative 5a would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 5a study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRA.

4.5.6.8 Alternative 5b

Where Alternative 5b would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5b would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5b in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 5b would traverse the WMNF aboveground in the existing PSNH transmission route from approximately MP 50 to MP 52 in Stark, NH, near MP 93 to MP 94 in Easton, NH, near MP 107 to 110 in Woodstock, NH, and near MP 115 in Thornton, NH. Additionally, Alternative 5b would traverse the WMNF underground in the roadway corridors of NH Routes 112 and 116 from MP 94 to MP 107. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Approximately 31 percent (21 acres [9 ha]) of the Alternative 5b Project corridor is currently coded as a developed use. More than 99 percent of the developed land has a land cover category of Rural Residential and Recreation Uses. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 5b Project corridor, which guide any development or use of NFS lands. Construction of Alternative 5b would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 5b in the WMNF Section would impact approximately 65 acres (26 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance and installation of aboveground structures (in the Alternative 2 alignment) associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

In the WMNF Section, Alternative 5b would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River). This crossing is not expected to impact the potential future designation of this eligible river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 5b would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.8**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 10 miles (16 km) of the Project corridor of Alternative 5b would be located within a new transmission route in the WMNF Section. About 3 miles (4 km) of the Project in the WMNF Section would be located within the existing PSNH transmission route authorized by an easement or SUP. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5b within the existing corridor.

All of the Alternative 5b Project corridor that would be located in a new transmission route would be constructed underground within existing roadway corridors. This new use would create a new transmission route within these public roadway corridors. New SUPs would need to be approved by the WMNF to accommodate the Project in these areas.

Road Crossings

Construction of Alternative 5b would require eight underground road crossings, and seven aerial road crossings. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.8** for a discussion of traffic and transportation impacts under Alternative 5b.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

Alternative 5b would be buried within the NH Routes 116 and 112 roadway corridors. Both routes fall under the jurisdiction of NHDOT. The Project would require authorizations from both the WMNF and FHWA for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

Approximately 2 miles (3 km) of the Alternative 5b Project corridor would be located on the existing PSNH transmission route on land covered by an existing easement. Approximately 1 mile (2 km) of the Alternative 5b corridor would be located within a Project corridor authorized under an existing SUP issued to PSNH. A new authorization would be required for all portions of the Project within the WMNF not located on lands authorized through existing easements. Through the implementation of APMs, the Project under Alternative 5b would be consistent with Forest Plan Management Direction.

The remainder of the Alternative 5b Project corridor would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. A Forest Plan Amendment would be required to provide project consistency with MA 8.3 – Appalachian National Scenic Trail, Scenery Management Standard S-1 (see **Appendix C**). Forest-wide and Management Area guidelines would also not be implemented, including:

1. Forest-wide – Scenery Management Guideline G-1;
2. Forest-wide – Rare and Unique Features, Gray Wolf Guideline G-2;
3. Forest-wide – Wildlife Habitat Management G-6;
4. Forest-wide – Riparian and Aquatic Habitats Guideline G-2;
5. Forest-wide – Riparian and Aquatic Habitats Guideline G-15; and
6. MA 2.1 – Scenery Management Guideline G-3.

Through the implementation of APMs, the Project under Alternative 5b would be consistent with all other Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 5b study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRAs.

4.5.6.9 Alternative 5c

Where Alternative 5c would be overhead in the Alternative 2 alignment, the impacts would occur within the existing PSNH transmission route. Where Alternative 5c would be underground, the impacts would occur within an existing roadway corridor.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 5c in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 5c would traverse the WMNF aboveground in the existing PSNH transmission route from approximately MP 50 to MP 52 in Stark, NH, near MP 110 in Woodstock, NH and near MP 115 in

Thornton, NH. Additionally, Alternative 5c would traverse the WMNF underground in the roadway corridors of NH Routes 112 and 116 from approximately MP 93 to MP 104. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadways corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Approximately 64 percent (38 acres [15 ha]) of the Alternative 5c corridor is currently coded as a developed use. More than 99 percent of the developed land has a land cover category of Rural Residential and Recreation Uses. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 5c Project corridor, which guide any development or use of NFS lands. Construction of Alternative 5c would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 5c in the WMNF Section would impact approximately 56 acres (23 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance and installation of aboveground structures (in the Alternative 2 alignment) associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 5a could result in long-term impacts to conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

In the WMNF Section, Alternative 5c would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River). This crossing is not expected to impact the potential future designation of this eligible river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 5c would not cross any State-protected rivers.

Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.9**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 10 miles (16 km) of the Project corridor of Alternative 5c would be located within a new transmission route in the WMNF Section. About 1 mile (2 km) of the Project in the WMNF Section would be located within the existing PSNH transmission route authorized by an easement. A review of a representative sampling of the easements for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain the Project as outlined in Alternative 5c within the existing corridor.

All of the Alternative 5c Project corridor that would be located in a new transmission route would be constructed as underground transmission facilities within existing roadway corridors. This new use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 5c would require nine underground road crossings, and one aerial road crossing. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.9** for a discussion of traffic and transportation impacts under Alternative 5c.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the project was constructed, then the location of a future water utility within this roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, who would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

NH Routes 112 and 116 are state highways, that both fall under the jurisdiction of the NHDOT. The Project would require authorizations from both the WMNF and FHWA for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

Approximately 1 mile (2 km) of the Alternative 5c Project corridor would be located on the existing PSNH transmission route authorized by an easement. The remainder of the Alternative 5c Project corridor would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would be required to apply for and be granted an authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, the Project, as outlined in Alternative 5c, would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 5c study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRAs.

4.5.6.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those discussed above for Alternative 4a (see **Section 4.5.6.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4a (see **Section 4.5.6.4**).

4.5.6.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those discussed above for Alternative 4b (see **Section 4.5.6.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs would be identical to those discussed above for Alternative 4b (see **Section 4.5.6.5**).

4.5.6.12 Alternative 7 – Proposed Action

All impacts of Alternative 7 in the WMNF Section would occur within either the existing PSNH transmission route or existing roadway corridors.

Impacts from Construction

Both short- and long-term impacts to land use would occur during the construction of Alternative 7 in the WMNF Section. For a discussion of the types of impacts that would occur, refer to **Section 4.1.6.1**.

Land Use and Land Cover

Alternative 7 would traverse the WMNF between approximately MP 50–52 within the Alternative 2 alignment as an overhead transmission line in the existing PSNH transmission route. Additionally, Alternative 7 would traverse the WMNF between approximately MP 94–109 buried underneath the NH Route 116, 112, and US Route 3 roadway corridors. As a result, no land use conversions are expected under this alternative, as the existing PSNH transmission route would continue its existing use and the roadway corridors would be restored to their preconstruction condition and would continue their existing use as roadway corridors.

Approximately 69 percent (38 acres [15] ha) of the Alternative 7 project corridor is currently coded as a developed use. More than 99 percent of the developed land has a land cover category of Rural Residential and Recreation Uses. The Forest Plan has allocated land management prescriptions across the WMNF, including the Alternative 7 Project corridor, which guide any development or use of NFS lands. Construction of Alternative 7 would not be expected to impact developed lands or lands with a high development potential in the WMNF Section.

Conservation Lands

Construction of Alternative 7 in the WMNF Section would impact approximately 68 acres (28 ha) of NFS lands and no other conservation lands. These impacts would result from ground disturbance and installation of aboveground structures (in the Alternative 2 alignment) associated with the construction of the Project.

Where the Project would be located outside of a public roadway corridor, Alternative 7 could result in long-term impacts to the conservation values of these lands, including impacts to visual resources, wildlife habitat and species, water resources, and recreation resources, as described in **Section 4.1.6.1.**

No long-term impacts are expected from the ongoing presence of the transmission lines where the Project would be underground in a public roadway corridor, as the Project corridor would be restored to its preconstruction condition and would continue its existing use as a roadway corridor.

Protected Rivers

In the WMNF Section, Alternative 7 would cross the Wild Ammonoosuc River (an eligible federal Wild and Scenic River). This crossing is not expected to impact the potential future designation of this eligible river, as there is already an existing road crossing in this location, and the cable would likely be installed underneath existing bridges. No other eligible or designated Wild and Scenic Rivers would be impacted.

In the WMNF Section Alternative 7 would not cross any State-protected rivers. Impacts to the recreational value of protected rivers are discussed in **Section 4.5.3.9**.

Rights-of-Way

New and Existing Transmission Routes

Approximately 6 miles (10 kilometers) of Alternative 7 would be located within a new transmission corridor in the WMNF Section. About 1 mile (2 kilometers) of the Project in the WMNF Section would be located within the existing PSNH transmission route authorized by an easement. A review of this easement for the existing PSNH transmission route indicate the Applicant has the ability to construct, operate, and maintain Alternative 7 within the existing corridor.

All of the Alternative 7 corridor that would be located in a new transmission corridor would be constructed as underground transmission facilities within existing roadway corridors. This new use would create a new transmission route within these public roadway corridors.

Road Crossings

Construction of Alternative 7 would require nine underground road crossings in the WMNF Section. The presence of the Project would not affect the overall function of public roads, although some short-term impacts such as temporary lane closures may occur. Refer to **Section 4.5.5.12** for a discussion of traffic and transportation impacts under Alternative 7.

The construction of the Project in roadway corridors could potentially complicate, but not preclude, the installation of future underground infrastructure (e.g., utilities such as water and gas services) in these roadways. For example, if the Project was constructed, then the location of a future water utility within the roadway corridor may have to be buried deeper to accommodate the Project. Additionally, construction of the Project in roadway corridors could also complicate road maintenance activities for NHDOT, which would have to be mindful of the location of the Project when completing digging or other work in the roadway corridor.

Public Roadway Corridor Ownership Status

NH Routes 112 and 116 are state highways; both fall under the jurisdiction of the NHDOT. US Route 3 is a US Highway that falls under the jurisdiction of the FHWA. The Project would require authorizations from both the WMNF and FHWA for this use (see **Section 4.1.6.1**).

Impacts from Operations, Maintenance, and Emergency Repairs

Operation, maintenance, and emergency repair activities would result in short-term impacts to land use, land cover, and conservation lands. Refer to **Section 4.1.6.2** for a discussion of these impacts. No long-term land use impacts from operations, maintenance, and emergency repairs would be expected.

Forest Plan Management Direction

Easements and Special Use Permits

Approximately 1 mile (2 km) of the Alternative 7 Project corridor would be located on the existing PSNH transmission route authorized by an easement. The remainder of the Alternative 7 corridor would be constructed within existing transportation easements, which were issued for road or highway purposes only. Any other use or occupancy of NFS land, even when co-located in the transportation easement area, would require authorization for that specific use. As a result, portions of the Project involving underground cables in transportation easements would need a new authorization and to be in compliance with the management direction provided in the Forest Plan. Through the implementation of APMs, Alternative 7 would be consistent with Forest Plan Management Direction.

Inventoried Roadless Areas

No IRAs are present in the Alternative 7 study area. Noise from construction, maintenance, and emergency repair activities could have incremental effects to opportunities for solitude in the adjacent IRAs.

4.5.7 NOISE

Refer to **Section 4.1.7** for a discussion of general impacts common to all geographic sections.

4.5.7.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.7.2 Alternative 2

Impacts from Construction

Under Alternative 2 in the WMNF Section, construction activities would include vegetation removal and overhead transmission line installation. These construction activities would likely cause short-term, adverse impacts to nearby outdoor recreational uses. The overhead line would cross the ANST near MP 97. See **Section 4.5.3** for a discussion of other trails and recreation sites that could be impacted. The estimated composite construction noise level at 50 feet (15 m) from the centerline of the transmission lines (adjusted for quantity of equipment and utilization factor) is 87 dBA for vegetation clearing, 91 dBA for structure foundation construction, 96 dBA for structure assembly, and 96 dBA for wire stringing. Some of these noise levels are above the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. The construction activities would cause short-term, adverse effects to hikers along the trail should they cross over the route during construction.

Impacts from Operations, Maintenance, and Emergency Repairs

The audible noise due to the corona effect of the overhead HVDC line would not exceed the EPA guidance level of Ldn of 55 dBA for outdoor areas beyond the transmission route and would not present a long-term impact (see **Section 4.1.7.2**).

Ongoing maintenance activities under the Project would include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. In addition, Northern Pass would conduct visual inspections via helicopter of the transmission lines periodically. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations, and noise generated during helicopter inspections would be short-term and localized. These operational noise sources could also cause adverse effects to nearby outdoor recreational uses.

4.5.7.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the WMNF Section, construction activities would include vegetation removal and underground cable installation. These construction activities would likely cause short-term, adverse impacts to nearby outdoor recreational uses. The buried cable would cross the ANST near MP 97. The estimated composite construction noise level at 50 feet (15 m) from the centerline of the transmission lines (adjusted for quantity of equipment and utilization factor) is 87 dBA for vegetation clearing and 88 dBA for burying cable. These noise levels are below the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. The construction activities would cause short-term, adverse effects to hikers along the trail should they cross over the route during construction.

Impacts from Operations, Maintenance, and Emergency Repairs

Project operation, maintenance, and emergency repairs under Alternative 3 in the WMNF Section would also include normal, periodic transmission route maintenance activities (mowing) and routine road maintenance, such as grading to maintain the private and public dirt and gravel access roads in a passable condition. Noise generated during repair or maintenance of the transmission lines would occur intermittently and for short durations. These operational noise sources could also cause adverse effects to nearby outdoor recreational uses.

Because the Project would be located underground, no long-term operational impacts would occur.

4.5.7.4 Alternative 4a

Impacts from Construction

Under Alternative 4a in the WMNF Section, construction activities would include minimal vegetation clearing and burial of HVDC cables as described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.7.3**). The construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. There are no noise sensitive receptors located within 50 feet (15 m). The ANST passes under a bridge along US Route 3 where burial of the cable would take place on the roadway above. The construction activities would cause short-term, adverse effects to hikers along the trail should they cross under the highway during construction. However, there are already noise impacts at this location due to traffic.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4a in the WMNF Section would be identical to those under Alternative 3.

4.5.7.5 Alternative 4b

Impacts from Construction

Under Alternative 4b in the WMNF Section, construction activities would include minimal vegetation clearing and burial of HVDC cables as described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.7.3**). The construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. The Project would pass within 500 feet (152 m) of a campground within the WMNF Section. The buried cable would cross the ANST south of Beaver Pond. The construction activities would cause short-term, adverse effects to hikers along the trail should they cross over the route while construction is active in the area. However, there are already noise impacts at this location due to traffic.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4b in the WMNF Section would be identical to those under Alternative 3.

4.5.7.6 Alternative 4c

Impacts from Construction

Under Alternative 4c in the WMNF Section, construction activities would include minimal vegetation clearing and burial of HVDC cables as described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.7.3**). The construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. The Project would pass within 500 feet (152 m) of a campground within the WMNF Section. The buried cable would cross the ANST in the same location as Alternative 4b and noise impacts would be identical to those under Alternative 4b.

Impacts from Operations, Maintenance, and Emergency Repairs

Although the Project would follow a different alignment, the types of impacts resulting from operation of the Project under Alternative 4c in the WMNF Section would be identical to those under Alternative 3.

4.5.7.7 Alternative 5a

Impacts from Construction

Under Alternative 5a in the WMNF Section, construction activities would include overhead HVDC transmission line, buried cable construction, and vegetation clearing. Construction impacts from underground portions of the Project would be similar to those for Alternative 4a (see **Section 4.5.7.4**) because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.7.2**).

The estimated composite construction noise level at 50 feet (15 m) from the centerline of the transmission cables (adjusted for quantity of equipment and utilization factor) is 87 dBA for vegetation clearing for overhead line construction, 91 dBA for structure foundation construction, 96 dBA for structure assembly, 96 dBA for wire stringing, and 88 dBA for burying cable. These noise levels are above the USDOT noise guideline of 90 dBA for daytime construction noise in a residential land use area. These construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. However, there are already noise impacts at this location due to traffic. The buried cable would cross the ANST in the same location as Alternative 4a (see **Section 4.5.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5a would be identical to those described for the Project under Alternative 2 in the WMNF Section (see **Section 4.5.7.2).** Impacts resulting from underground portions would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.7.4**).

4.5.7.8 Alternative 5b

Impacts from Construction

Noise impacts for the Project under Alternative 5b in the WMNF Section would be similar to those for Alternative 4b (see **Section 4.5.7.5)** because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.7.2)**. The Project would pass within 500 feet (152 m) of a campground within the WMNF. These construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. However, there are already noise impacts at this location due to traffic. The buried cable would cross the ANST in the same location as Alternative 4b (see **Section 4.5.7.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

The types of impacts from operations, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5b would be identical to those described for the Project under Alternative 2 in the WMNF Section (see **Section 4.5.7.2).** The types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.7.4**).

4.5.7.9 Alternative 5c

Impacts from Construction

Noise impacts for the Project under Alternative 5c in the WMNF Section would be similar to those for Alternative 4c (see **Section 4.5.7.6**) because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.7.2**).

The Project would pass within 500 feet (152 m) of a campground within the WMNF. These construction activities would likely cause short-term, adverse effects to nearby outdoor recreational uses. However, there are already noise impacts at this location due to traffic. Under Alternative 5c, the buried cable would cross the ANST in the same location as that described under Alternative 4b (see **Section 4.5.7.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

The types of impacts from operations, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 5b would be identical to those described for the Project under Alternative 2 in the WMNF Section (see **Section 4.5.7.2**). The types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.7.4**).

4.5.7.10 Alternative 6a

Impacts from Construction

Construction-related noise impacts under Alternative 6a in the WMNF Section would be identical to those under Alternative 4a (see **Section 4.5.7.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 6a in the WMNF Section would be identical to those under Alternative 4a (see **Section 4.5.7.4**).

4.5.7.11 Alternative 6b

Impacts from Construction

Construction-related noise impacts under Alternative 6b in the WMNF Section would be identical to those under Alternative 4b (see **Section 4.5.7.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Noise impacts from operations, maintenance, and emergency repairs under Alternative 6a in the WMNF Section would be identical to those under Alternative 4b (see **Section 4.5.7.5**).

4.5.7.12 Alternative 7 – Proposed Action

Impacts from Construction

Construction-related noise impacts under Alternative 7 in the WMNF Section would be the same as those under Alternative 5c, but the route would not cross through the WMNF south of North Woodstock, NH (see **Section 4.5.7.9)**.

Impacts from Operations, Maintenance, and Emergency Repairs

The types of impacts from operations, maintenance, and emergency repairs of the overhead portions of the Project under Alternative 7 would be identical to those described for the Project under Alternative 2 in the WMNF Section (see **Section 4.5.7.2**). The types of impacts resulting from underground portions would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.7.4**).

4.5.8 HISTORIC AND CULTURAL RESOURCES

Refer to **Section 4.1.8** for a discussion of general impacts common to all geographic sections. For more information about resource types and potential impacts, see **Section 3.5.8** and the **Cultural Resources Technical Report** (Sections 2.4 and 3.4).

Table 4-184 and **Table 4-185** summarize the number of archaeological resources (or sites) and archaeologically-sensitive areas within the direct APE (consisting of the entire width of the new transmission route and existing PSNH transmission route) that would be potentially affected by the Project in the WMNF Section. Archaeological resources may consist of pre-Contact Native American archaeological sites, post-Contact Euro-American archaeological sites, and/or multi-component archaeological sites that contain pre-Contact Native American and post-Contact Euro-American archaeological remains (see Section 2.1.1.1 of the **Cultural Resources Technical Report**). Archaeologically sensitive areas are those areas that have the potential to contain archaeological resources, although no archaeological resources have been previously identified or were observed within these areas. These areas may be sensitive for containing pre-Contact Native American archaeological resources, post-Contact Euro-American archaeological resources, and/or multi-component (pre-Contact Native American and post-Contact Euro-American) archaeological resources (see Section 2.1.1.2 of the **Cultural Resources Technical Report**). These archaeological resources (sites) and archaeologically sensitive areas could be physically impacted by the Project.

Table 4-186 summarizes the number of architectural resources (buildings, structures, or other built resources) within both the indirect APE and direct APE that would be potentially affected by the Project in the Northern Section. Architectural resources may consist of individual buildings, structures, or other built resources (for example, residences; farm complexes [residences, barns, and other outbuildings]; religious buildings [churches, meeting houses, and chapels]; cabins and cottages; civic buildings [libraries, post offices, town halls, etc.]; cemeteries; bridges; railroads; and trails) (see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources may also include historic districts, which are groups of buildings, structures, and other built resources that are related physically and/or thematically (also see Section 2.1.1.3 of the **Cultural Resources Technical Report**). Architectural resources within the indirect APE (1 mile [1.6 km] on each side of alternative centerlines) could be visually impacted by the Project, while architectural resources within the direct APE could be physically impacted by the Project. More detail is found in **Sections 4.5.8.2** through **4.5.8.12**.

Table 4-184. Number of Archaeological Resources Potentially Impacted in the WMNF Section during Construction

Alternative	Within Direct APE	NRHP-Listed	NRHP-Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2	--	--	--	--
3	--	--	--	--
4a	3	0	--	3
4b	9	0	0	9
4c	6	0	0	6
5a	--	--	--	--
5b	4	0	0	4
5c	6	0	0	6
6a	Identical to Alternative 4a			
6b	Identical to Alternative 4b			
7 (Proposed Action)	16	0	0	16

Source: Claesson et al. 2014a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

Table 4-185. Number of Archaeologically Sensitive Areas Potentially Impacted in the WMNF Section during Construction

Alternative	Within Direct APE	Total Land Area within Potentially Disturbed Areas acres (ha)
1 (No Action)	--	--
2	6	3 (1)
3	6	2 (1)
4a	0	0 (0)
4b	4	Less than 1 (less than 0.4)
4c	4	Less than 1 (less than 0.4)
5a	--	--
5b	4	Less than 1 (less than 0.4)
5c	4	Less than 1 (less than 0.4)
6a	Identical to Alternative 4a	
6b	Identical to Alternative 4b	
7 (Proposed Action)	4	Less than 1 (less than 0.4)

Source: Claesson et al. 2014a, 2015b; Claesson and Peone 2016; Freedman et al. 2015

Table 4-186. Number of Architectural Resources Potentially Impacted in the WMNF Section during Construction

Alternative	Within Indirect APE	Within Direct APE	NRHP-Listed or -Eligible	Not Yet Evaluated for NRHP Eligibility
1 (No Action)	--	--	--	--
2	11	4	2	9
3	4	4	1	3
4a	1	1	1	0
4b	4	3	2	2
4c	4	3	2	2
5a	1	1	1	0
5b	4	3	2	2
5c	4	3	2	2
6a	Identical to Alternative 4a			
6b	Identical to Alternative 4b			
7 (Proposed Action)	6	4	2	4

Source: Claesson et al. 2014b; Higgins et al. 2015, 2016a, 2016b, 2016c, 2016e, 2016f

4.5.8.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.8.2 Alternative 2

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, approximately 96 acres (39 ha) of land in the WMNF Section would be disturbed. The majority of the disturbance area (approximately 76 acres [31 ha]) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route, while the remainder of the disturbance area (20 acres [8 ha]) would be associated with new or improved access roads.

The archaeological investigation did not identify any archaeological sites within the direct APE or the disturbance area for the WMNF Section under Alternative 2.

The archaeological investigation identified six archaeologically sensitive areas within the direct APE or the disturbance area for the WMNF Section under Alternative 2. All six of these archaeologically sensitive areas are located within the disturbance area for the WMNF Section under Alternative 2, covering an approximate total land area of 3 acres (1 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified 11 architectural resources within the indirect APE of the WMNF Section under Alternative 2. Of the 11 architectural resources, two have previously been determined NRHP-eligible (including the ANST) or are being treated as NRHP-eligible. Nine architectural resources have not been evaluated for NRHP eligibility and it is not known whether they are NRHP-eligible (Claesson et al. 2014b; Higgins et al. 2016a, 2016b).

Construction of Project components would result in changes to the settings of, or views to and from, the NRHP-eligible historic property. Because its setting is a character-defining feature that contributes to its importance, construction of the Project would result in short-term, adverse visual impacts to the historic property.

Four of the 11 architectural resources are also located within the direct APE: the NRHP-eligible ANST and three resources for which NRHP-eligibility is unknown because they have not yet been evaluated for NRHP-eligibility (Higgins et al. 2016b). One of the four architectural resources located in the direct APE, the NRHP-eligible ANST, is also located within the disturbance area for the WMNF Section of Alternative 2. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 2, operation of the Project in the WMNF Section would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in long- and short-term visual impacts on the four architectural resources located within the indirect or direct APE for the WMNF Section under Alternative 2. These impacts, which would include ongoing overstory vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2.**

4.5.8.3 Alternative 3

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, approximately 52 acres (21 ha) of land in the WMNF Section would be disturbed. All of the disturbance area would be associated with the installation of the underground HVDC transmission cable within the existing PSNH transmission route (approximately 51 acres [21 ha]), and new or improved access roads (approximately 1 acre [0.4 ha]).

The archaeological investigation did not identify any archaeological sites within the direct APE or the disturbance area for the WMNF Section under Alternative 3 (Claesson et al. 2014a, 2015b; Freedman et al. 2015).

The archaeological investigation identified six archaeologically sensitive areas within the direct APE or the disturbance area for the WMNF Section under Alternative 3 (Claesson et al. 2014a, 2015b; Freedman et al. 2015). All six of the archaeologically sensitive areas are located within the disturbance area for the WMNF Section under Alternative 3, covering an approximate total land area of 2 acres (1 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the indirect APE of the WMNF Section under Alternative 3. Of the four architectural resources, one, the ANST, is NRHP-eligible. None of the remaining three architectural resources are considered historic properties, because they have not yet been evaluated for NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015).

Construction of Project components would result in changes to the settings of, or views to and from, the NRHP-eligible historic property. Because its setting is a character-defining feature that contributes to its importance, construction of the Project would result in short-term, adverse visual impacts to the historic property.

The four architectural resources are also located within the direct APE. One of the four architectural resources located on in the direct APE, the NRHP-eligible ANST, is also located within the disturbance area for the WMNF Section of Alternative 3 (Higgins et al. 2015). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 3, operation of the Project in the WMNF Section would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in short-term visual impacts on the four architectural resources located within the indirect or direct APE for the WMNF Section under Alternative 3, similar to those under Alternative 2 (see **Section 4.5.8.2)**. However, the long-term, adverse visual impacts to architectural resources would be less due to the absence of new overhead transmission structures in the existing PSNH transmission route.

4.5.8.4 Alternative 4a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, approximately 3 acres (1 ha) of land in the WMNF Section would be disturbed. All 3 acres (1 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors.

The archaeological investigation identified three archaeological sites within the direct APE for the WMNF Section under Alternative 4a (Freedman et al. 2015). However, none of these three archaeologically sensitive areas are located within the disturbance area for Alternative 2 in the WMNF Section.

The archaeological investigation did not identify any archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 4a (Freedman et al. 2015).

Long-term construction impacts could occur to archaeological resources within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified one architectural resource (the NRHP-eligible ANST) within the indirect APE of the WMNF Section under Alternative 4a. However, it is not located in the disturbance area in the WMNF Section.

Construction of Project components would result in changes to the settings of, or views to and from, the portions of the NRHP-eligible historic property that are on WMNF land within the indirect APE. Because the setting of the NRHP-eligible historic property is a character-defining feature that contributes to its importance, construction of the Project would result in short-term, adverse visual impacts.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4a, operation of the Project in the WMNF Section would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in short- and long-term visual impacts on the architectural resource located within the indirect or direct APEs for the WMNF Section under Alternative 4a. These impacts, which would include ongoing vegetation management, have the potential to alter the setting of this resource.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.5 Alternative 4b

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4b, approximately 8 acres (3 ha) of land in the WMNF Section would be disturbed. All 8 acres (3 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified nine archaeological sites within the direct APE for the WMNF Section under Alternative 4b. None of the archaeological sites are located within the disturbance area. None have not been evaluated for NRHP eligibility and it is not known whether they are NRHP-eligible (Freedman et al. 2015).

The archaeological investigation identified four archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 4b (Freedman et al. 2015). Two of these archaeologically sensitive areas are located within the disturbance area for the WMNF Section under Alternative 4b, covering an approximate total land area of less than 1 acre (less than 0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas on WMNF land within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the direct and indirect APEs in the WMNF Section under Alternative 4b. Two of these four architectural resources were determined to be NRHP-eligible (including the ANST), or are being treated as eligible for listing in the NRHP, and are considered historic properties (Higgins et al. 2015). The two remaining architectural resources are not considered historic properties because they have not yet been evaluated for NRHP eligibility.

Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

One of the three architectural resources located within the direct APE is also within the disturbance area: the NRHP-eligible ANST (Higgins et al. 2015). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in short- and long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4b, operation of the WMNF Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in short- and long-term visual impacts on the four architectural resources located within the indirect or direct APE for the WMNF Section under Alternative 4b. These impacts, which would include ongoing vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.6 Alternative 4c

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4c, approximately 6 acres (2 ha) of land would be disturbed in the WMNF Section. All of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors, and would generally be located in areas that have been previously disturbed by road construction, improvements, and maintenance.

The archaeological investigation identified six archaeological sites within the direct APE for the WMNF Section under Alternative 4c. These six archaeological sites have not been evaluated for NRHP-eligibility and it is not known whether they are NRHP-eligible (Freedman et al. 2015).

The archaeological investigation identified four archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 4c (Freedman et al. 2015). Two of these archaeologically sensitive areas are located within the disturbance area for the WMNF Section under Alternative 4c, covering an approximate total land area of less than 1 acre (less than 0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the indirect and direct APEs of the WMNF Section under Alternative 4c. Two of these four architectural resources have been determined to be NRHP-eligible, or are being treated as NRHP-eligible, and are considered historic properties (Higgins et al. 2015). The two remaining architectural resources are not considered historic properties because they have not yet been evaluated for NRHP eligibility.

Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

One architectural resources discussed above, the NRHP-eligible ANST, is also located within the disturbance area for Alternative 4c (Higgins et al. 2015). Surface and subsurface ground disturbance associated with construction activities would have the potential to result in short- and long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 4c, operation of the WMNF Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in long-term visual impacts on the architectural resources located within the indirect or direct APE for the WMNF Section under Alternative 4c. These impacts, which would include ongoing overstory vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.7 Alternative 5a

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5a, approximately 12 acres (5 ha) of land in the WMNF Section would be disturbed. Approximately 6 acres (2 ha) of the disturbance area would be associated with the installation of the new overhead HVDC transmission line in existing PSNH transmission corridor. Approximately 3 acres (1 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors, with the remaining 3 acres (1 ha) of disturbance associated with aboveground construction of transition stations (0.7 [0.3 ha]), and new or improved access roads (2 acres [0.8 ha]).

The archaeological investigation did not identify any archaeological sites or archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 5a (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Therefore, there would be no impacts to these resources under Alternative 5a.

Architectural Resources

The assessment of architectural resources identified one architectural resource (the NRHP-eligible ANST) within the indirect APE of the WMNF Section under Alternative 5a. This previously identified architectural resource is considered a historic property. However, it is not located in the disturbance area in the WMNF Section.

Construction of Project components would result in changes to the settings of, or views to and from, the portions of the ANST that are within the indirect APE. Because the setting of the ANST is a character-defining feature that contributes to its importance, construction of the Project would result in short-term, adverse visual impacts to this historic property.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

The archaeological investigation did not identify any archaeological sites or archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 5a. Therefore, there would be no impacts to these resources under Alternative 5a.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in short-term visual impacts on the NRHP-eligible property. These impacts, which would include ongoing overstory vegetation management, have the potential to temporarily alter the setting of this resource.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.8 Alternative 5b

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5b, approximately 29 acres (12 ha) of land in the WMNF Section would be disturbed. Approximately 18 acres (7 ha) of disturbance area would be associated with the installation of the new overhead HVDC transmission line in existing PSNH transmission corridor. Approximately 6 acres (2 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors. The remainder of the disturbance area (approximately 5 acres [2 ha]) would be associated with the transition stations (approximately less than 1 acre [less than 0.4 ha]) and new or improved access roads (approximately 5 acres [2 ha]).

The archaeological investigation identified four archaeological resources within the direct APE for the WMNF Section under Alternative 5b. None of the four archaeological sites are located within the disturbance area for the WMNF Section under Alternative 5b. None of the four archaeological sites have been evaluated for NRHP eligibility and it is not known whether they are NRHP-eligible (Claesson et al. 2014a, 2015b; Freedman et al. 2015).

The archaeological investigation identified four archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 5b (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Two of these archaeologically sensitive areas are located within the disturbance area for the WMNF Section under Alternative 5b, covering an approximate total land area of less than 1 acre (less than 0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the direct and indirect APEs of the WMNF Section under Alternative 5b. Two of these architectural resources have been determined NRHP-eligible (including the ANST), or are being treated as NRHP-eligible, and are thus considered historic properties (Claesson et al. 2014b, Higgins et al. 2015). The remaining two architectural resources have not yet been evaluated for NRHP eligibility.

Construction of Project components would result in changes to the settings of, or views to and from, these resources. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

One of these resources (the NRHP-eligible ANST) is also located within the disturbance area for the WMNF Section under Alternative 5b. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in short- and long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5b, operation of the WMNF Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in short- and long-term visual impacts on the architectural resources located within the indirect or direct APE for the WMNF Section under Alternative 5b. These impacts, which would include ongoing overstory vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.9 Alternative 5c

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5c, approximately 15 acres (6 ha) of land in the WMNF Section would be disturbed. Approximately 6 acres (2 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors. Approximately 7 acres (3 ha) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route. The remainder of the disturbance area would be associated with new or improved access roads (2 acres [0.8 ha]).

The archaeological investigation identified six archaeological resources within the direct APE for the WMNF Section under Alternative 5c. None of these six archaeological sites are located within the disturbance area for the WMNF Section under Alternative 5c. None of these six archaeological sites have been evaluated for NRHP eligibility and it is not known whether they are NRHP-eligible (Claesson et al. 2014a, 2015b; Freedman et al. 2015).

The archaeological investigation identified four archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 5c (Claesson et al. 2014a, 2015b; Freedman et al. 2015). Two of these areas are located within the disturbance area for the WMNF Section under Alternative 5c, covering an approximate total land area of less than 1 acre (less than 0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified four architectural resources within the direct and indirect APEs of the WMNF Section under Alternative 5c. Two of these architectural resources are previously identified architectural resources that were previously evaluated for NRHP eligibility and are determined NRHP-eligible (including the ANST) or are being treated as eligible for listing in the NRHP (Claesson et al. 2014b, Higgins et al. 2015). The remaining two resources have not yet been evaluated for NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015).

Construction of Project components would result in changes to the settings of, or views to and from, the historic property and the NRHP-eligible ANST. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

One of these resources (the NRHP-eligible ANST) is located within the disturbance area for the WMNF Section under Alternative 5c. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in short- and long-term, adverse impacts on these three resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 5c, operation of the WMNF Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in long-term visual impacts on the architectural resources located within the indirect and direct APEs for the WMNF Section under Alternative 5c. These impacts, which include ongoing overstory vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.8.10 Alternative 6a

Impacts from Construction

Impacts from construction under Alternative 6a would be identical to those under Alternative 4a in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those under Alternative 4a in the WMNF Section.

4.5.8.11 Alternative 6b

Impacts from Construction

Impacts from construction under Alternative 6b would be identical to those under Alternative 4b in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those under Alternative 4b in the WMNF Section.

4.5.8.12 Alternative 7 – Proposed Action

Impacts from Construction

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 7, approximately 12 acres (5 ha) of land in the WMNF Section would be disturbed. Approximately 6 acres (2 ha) of the disturbance area would be associated with the installation of the underground HVDC transmission cable in existing roadway corridors. Approximately 4 acres (2 ha) would be associated with the construction of the new overhead HVDC transmission line in existing PSNH transmission route. The remainder of the disturbance area would be associated with new or improved access roads (approximately 2 acres [1 ha]).

The archaeological investigation identified 16 archaeological resources within the direct APE for the WMNF Section under Alternative 7. None of these 16 archaeological sites are located within the disturbance area for the WMNF Section under Alternative 7. None of these 16 archaeological sites have been evaluated for NRHP eligibility and it is not known whether they are NRHP-eligible (Claesson et al. 2014a, 2015b; Freedman et al. 2015; Claesson and Peone 2016).

The archaeological investigation identified four archaeologically sensitive areas within the direct APE for the WMNF Section under Alternative 7 (Claesson et al. 2014a, 2015b; Freedman et al. 2015; Claesson and Peone 2016). Two of these areas are located within the disturbance area for the WMNF Section under Alternative 7, covering an approximate total land area of less than 1 acre (less than 0.4 ha).

Both short- and long-term construction impacts could occur to archaeological resources and archaeologically sensitive areas within the direct APE, resulting from surface and subsurface ground disturbance (see **Section 4.1.8.1**).

Architectural Resources

The assessment of architectural resources identified six architectural resources within the direct and indirect APEs of the WMNF Section under Alternative 7. Two of these architectural resources are previously identified architectural resources that were previously evaluated for NRHP eligibility and are determined NRHP-eligible (including the ANST) or are being treated as eligible for listing in the NRHP (Claesson et al. 2014b, Higgins et al. 2015, 2016b, 2016c, 2016e, 2016f). The remaining four resources have not yet been evaluated for NRHP eligibility (Claesson et al. 2014b, Higgins et al. 2015, 2016b, 2016c, 2016e, 2016f).

Construction of Project components would result in changes to the settings of, or views to and from, the historic properties and the NRHP-eligible ANST. Because their settings are a character-defining feature that contribute to their importance, construction of the Project would result in short-term, adverse visual impacts on these resources, as well as any other architectural resources in the indirect APE.

One of these resources, the NRHP-eligible ANST, is located within the disturbance area for the WMNF Section under Alternative 7. Surface and subsurface ground disturbance associated with construction activities would have the potential to result in short- and long-term, adverse impacts on these resources if they cannot be avoided.

Impacts from Operations, Maintenance, and Emergency Repairs

Archaeological Resources and Archaeologically Sensitive Areas

Under Alternative 7, operation of the WMNF Section of the Project would have no impacts on archaeological resources or archaeologically sensitive areas, including those resources that are NRHP-listed or -eligible, because operation would not result in any further surface or subsurface ground disturbance.

Impacts from maintenance and emergency repair activities would be as described in **Section 4.1.8.2**.

Architectural Resources

Operation, maintenance, and emergency repair activities would result in long-term visual impacts on the architectural resources located within the indirect and direct APEs for the WMNF Section under Alternative 7. These impacts, which include ongoing overstory vegetation management, have the potential to alter the setting of these resources.

More detailed descriptions of the types of impacts resulting from operation, maintenance, and emergency repair activities are described in **Section 4.1.8.2**.

4.5.9 ENVIRONMENTAL JUSTICE

The WMNF Section is contained within both the Northern and Central sections. Because land within the WMNF is generally not inhabited, impacts relating to environmental justice are discussed in **Sections 4.2.9** and **4.3.9**.

4.5.10 AIR QUALITY

Refer to **Section 4.1.10** for a discussion of general impacts common to all geographic sections.

Air quality impacts within the WMNF Section are expected to be similar to those estimated for the Central Section under each alternative. Construction emissions would be localized to some extent within the construction corridors, but emissions are not contained within WMNF borders; therefore, it is more conservative but appropriate to consider all emissions in the Central Section (see **Section 4.3.10**).

This Project would not result in any major stationary sources; therefore, PSD requirements established by the Regional Haze Rule do not apply. The Project would result in short-term adverse impacts to air quality, and could also have long-term, beneficial impacts to air quality within the ISO-NE region. Additionally, the Project would not have an adverse air quality impact in the nearby congressionally designated wilderness areas that are Class I Airsheds.

The WMNF Section is part of the Central Section, which is located within Grafton and Belknap counties. This section is in attainment for all NAAQS; therefore, General Conformity does not apply. Project related construction would result in short-term impacts to air quality in the WMNF Section. Long-term maintenance, emergency repairs, and operating emissions (e.g., vegetation management) would not result in measurable impacts to air quality. Construction and maintenance emissions would be more limited for the portions of the Project with underground cable compared to the aboveground lines. The Project would also result in a minimal loss of forested areas in this section and, therefore, some loss of carbon sequestration capacity. The reduction in forest carbon sink would have adverse, long-term, and regional impacts.

4.5.10.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.10.2 Alternative 2

Impacts from Construction

Under Alternative 2, the transmission line in the WMNF would be located in the existing PSNH transmission route for approximately 11 miles (18 km). Total emissions and loss of carbon sink from the construction activities would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 2. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.3 Alternative 3

Impacts from Construction

Under Alternative 3 in the WMNF Section, the underground transmission cable would be located in the existing PSNH transmission route for about 11 miles (18 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 3. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance would also be more limited for the underground cable in Alternative 3 compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.4 Alternative 4a

Impacts from Construction

Under Alternative 4a in the WMNF Section, underground transmission cable would be located in an existing roadway corridor for about 10 miles (16 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 4a. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance would also be more limited for the underground cable in Alternative 4a compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.5 Alternative 4b

Impacts from Construction

Under Alternative 4b in the WMNF Section, underground transmission cable would be located in an existing roadway corridor for about 19 miles (31 km). The transmission cable would be installed underground in this section, along Routes 112 and 116 through the WMNF. Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 4b. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance requirements would also be more limited for the underground cable in Alternative 4b compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.6 Alternative 4c

Impacts from Construction

Under Alternative 4c in the WMNF Section, underground transmission cable would be located in an existing roadway corridor for about 10 miles (16 km), along NH Routes 112 and 116 through the WMNF and along US Route 3 from North Woodstock to Ashland, NH. Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 4c. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance would also be more limited for the underground cable in Alternative 4c compared to the aboveground lines in Alternative 2. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.7 Alternative 5a

Impacts from Construction

Under Alternative 5a in the WMNF Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 1 mile (2 km), and underground transmission cable would be located in an existing roadway corridor for 2 miles (3 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 5a. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.8 Alternative 5b

Impacts from Construction

Under Alternative 5b in the WMNF Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 3 miles (5 km), and underground transmission cable would be located in an existing roadway corridor for 10 miles (16 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 5b. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance requirements would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.9 Alternative 5c

Impacts from Construction

Under Alternative 5c in the WMNF Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 1 mile (2 km), and underground transmission cable would be located in an existing roadway corridor for 10 miles (16 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 5c. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.10.10 Alternative 6a

Impacts from Construction

Construction impacts under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.10.4**).

4.5.10.11 Alternative 6b

Impacts from Construction

Construction impacts under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.10.5**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts to air quality from operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.10.5**).

4.5.10.12 Alternative 7 – Proposed Action

Impacts from Construction

Under Alternative 7 in the WMNF Section, the overhead transmission line would be located in the existing PSNH transmission route for approximately 1 mile (2 km), and underground transmission cable would be located in an existing roadway corridor for 10 miles (16 km). Total emissions and loss of carbon sink from the construction activities in the WMNF Section would be a fraction of emissions and loss of carbon sink within the Central Section under Alternative 7. Construction emissions would be short-term, and the changes to the carbon sink would be minimal in the Central Section; therefore, it is assumed that they would also be minimal in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Emissions from vegetation management, emergency repairs, and maintenance for the transmission line would be a small fraction of the Project's short-term emissions from construction in the WMNF Section under this alternative. Maintenance would also be more limited for the portions of the underground cable compared to the aboveground lines. Long-term operating emissions would not result in measurable impacts to air quality. Long-term, beneficial impacts to air quality could result from the Project as discussed in **Section 4.1.10**.

4.5.11 WILDLIFE

Refer to **Section 4.1.11** for a discussion of general impacts common to all geographic sections.

The Project has the potential to impact wildlife resources. **Table 4-65** and **Table 4-66** in **Section 4.1.11** present a summary of Project-wide effects to federally- and state-listed species and the determination for federally-listed species. **Table 4-187** presents a summary of Project-wide effects to USFS MIS and RFSS wildlife species, which are species listed specifically within the WMNF. Because the nature of impacts to federally- and state-listed species is similar to that for non-listed species, all impacts are discussed in the General Wildlife discussion.

Table 4-187. Determination Summary of Project-wide Effects for USFS MIS and RFSS Wildlife Species

Species	Determination of Effects by Alternative
RFSS	
Bicknell's Thrush (*Catharus bicknelli*)	**Impact for All Alternatives:** Species not detected and no suitable habitat within the study area, no effect
Common Loon (*Gavia immer*)	**Impact for All Alternatives:** No lakes and few large rivers in the study area, no effect
Osprey (*Pandion haliaetus*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Peregrine Falcon (*Falco peregrinus*)	**Impact for All Alternatives:** Limited habitat in the study area, no effect
Pied-billed Grebe (*Podilymbus podiceps*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
White Mountain arctic Butterfly (*Oeneis melissa semidea*)	**Impact for All Alternatives:** Project does not cross alpine habitats, no effect
White Mountain fritillary Butterfly (*Boloria chariclea montinus*)	**Impact for All Alternatives:** Project does not cross alpine habitats, no effect
Mayfly (*Ameletus brownii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Mayfly (*Ameletus tertius*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Appalachian tiger beetle (*Cicindela ancocisconensis*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Incurvate emerald (*Somatochlora incurvata*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Eastern Small-footed Bat (*Myotis leibii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Northern Bog Lemming (*Synaptomys borealis sphagnicola*)	**Impact for Alternatives 2 and 3:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction and maintenance activities. All other Alternatives: no effect.
Little brown Myotis (*Myotis lucifugus*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Tri-colored Bat (*Perimyotis subflavus*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Timber Rattlesnake (*Crotalus horridus*)	**Impact for All Alternatives:** Not located in study area, no effect
Wood Turtle (*Glyptemys insculpta*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability

Table 4-187. Determination Summary of Project-wide Effects for USFS MIS and RFSS Wildlife Species

Species	Determination of Effects by Alternative
MIS	
Blackburnian Warbler (*Setophaga fusca*)	**Impact for All Alternatives:** Limited habitat in the study area, no effect
Chestnut-sided Warbler (*Setophaga pensylvanica*)	**Impact for All Action Alternatives:** Localized, long-term adverse effects resulting from construction and operation of the new transmission route in the Northern Section and widening of the existing PSNH transmission route throughout Project corridor
Magnolia Warbler (*Setophaga magnolia*)	**Impact for All Action Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction; localized, long-term, adverse effects resulting from loss of forested habitats
Ruffed Grouse (*Bonasa umbellus*)	**Impact for All Action Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction; localized, long-term, adverse effects resulting from loss of forested habitats
Scarlet Tanager (*Piranga olivacea*)	**Impact for All Alternatives:** Localized, short-term, adverse effects resulting from disturbance/displacement during construction; localized, long-term, adverse effects resulting from loss of forested habitats

4.5.11.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.11.2 Alternative 2

Impacts from Construction

Aquatic Species

Impacts to aquatic species could result from direct mortality or injury to individuals, sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation. In addition, the widening of the existing transmission corridor through the WMNF Section within riparian areas could lead to adverse effects related to sun exposure and an increase in stream water temperatures. With the implementation of a SWPPP, avoidance of in-stream disturbance, and restoration of aquatic habitat following construction (see **Appendix H**), impacts to aquatic species would be minimized.

Terrestrial Species

Impacts to terrestrial species could result from the same general effects as for aquatic species: direct mortality or injury to individuals, sensory disturbance, and increased depredation. During construction, any mobile terrestrial wildlife (e.g., white-tailed deer, birds) would be expected to flush or flee the area, prior to construction equipment physically clearing vegetation. Impacts would be short-term (wildlife would return to the Project corridor following construction, particularly as vegetation returns) and localized to regional (depending upon the extent of active construction activities). The potential for wildlife collisions with vehicles traveling during construction along access roads or Project corridors would increase causing increased mortalities and/or injuries.

Alternative 2 would result in the disturbance of 96 acres (39 ha) of wildlife habitat in the WMNF Section. Of this total, the majority of the disturbance (38 acres [15 ha]), would result from construction pads; impacts would occur to forestlands (11 acres [4 ha]), scrub-shrub (18 acres [7 ha]), and wetlands (6 acres [2 ha]). Widening of the existing transmission corridor would account for approximately 36 acres (15 ha) of disturbance; impacts would occur to forestlands (26 acres [11 ha]), scrub-shrub (5 acres [2 ha]), and wetlands (4 acres [2 ha]). Access roads would account for 20 acres (8 ha) of disturbance; impacts would occur to scrub-shrub (12 acres [5 ha]), wetlands (5 acres [2 ha]), and mowed ROW (3 acres [1 ha]). This habitat loss during construction would displace the majority of wildlife species within the transmission route.

Forest fragmentation and human disturbance may have impacts on mammal species such as Canada lynx and American marten. No Canada lynx were identified during Project-specific winter tracking and camera trap surveys within the WMNF Section. Forest clearing associated with construction in the WMNF Section would be limited to the edges of the existing PSNH transmission route, as well as limited vegetation within the existing PSNH transmission route. The loss of forestland could result in disturbance to suitable denning or foraging habitats.

Construction-related impacts on the Canada lynx and lynx habitat in the WMNF Section would be short-term to long-term depending upon the location of habitat. For example, foraging habitat could be impacted in the short-term and denning habitat in the long term. The clearing within the existing PSNH transmission route would likely limit the presence of snowshoe hare within the transmission route until vegetation returns, including the development of shrubs, saplings, and their woody browse on a five- to ten-year timeframe. The Forest Plan includes multiple standards and guidelines to manage lynx and their habitats in the WMNF. In order to facilitate management of lynx and their habitats, the WMNF has established 13 Lynx Analysis Units (LAUs), which either contain suitable foraging or denning habitat or have the potential to provide this habitat. Within Alternative 2, the Project crosses three LAUs (1, 8, and 12), the majority of which lies within LAU 12. In addition, the study area crosses suitable lynx denning and lynx foraging habitats, as identified by the USFS. The Forest Plan indicates that the Canada lynx standards and guidelines listed in the Rare and Unique Features guidelines, apply only to habitat within a LAU and those lands not located within an easement; for Alternative 2, the only LAU located entirely within an easement is LAU 1. Additional discussion regarding impacts to LAUs is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

In total, the Alternative 2 study area overlaps with LAU 12 for approximately 86 acres (35 ha), but the disturbance area is limited to 77 acres (31 ha). **Table 4-188** presents a summary of lynx habitat within the study area.

Table 4-188. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 2 Study Area in the WMNF Section

Boundaries	Alternative 2 acres (ha)
Lynx Analysis Units	86 (35)
Lynx Denning	3 (1)
Lynx Foraging	4 (2)
Total Lynx Habitat	39 (16)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat that is not currently suitable, but is potential denning or foraging habitat.

Alternative 2 proposes clearing of vegetation to widen the existing PSNH transmission route in an area that is currently suitable foraging habitat. Long-term maintenance typically would remove existing scrub-shrub communities that provide snowshoe hare habitat within the existing corridor periodically. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure currently suitable lynx foraging habitat in areas authorized through a SUP would remain suitable lynx foraging habitat after implementation.

Project-specific surveys did not detect any American marten tracks within the WMNF Section; however, this species has been recorded in Grafton County, NH (NHFG 2005a). Construction activities in the WMNF Section would remove potentially suitable habitat for American marten, primarily the forestlands at the edge of the existing PSNH transmission route. The effect of forest fragmentation and human disturbance on American martens is poorly studied, but some literature shows that American marten populations decline when forested habitat is removed, although American martens have been observed crossing open areas of various sizes (Buskirk and Ruggiero 1994a). The clearing of the 37 acres (15 ha) of forested habitats along the edge of the existing PSNH transmission route would result in the removal of potentially suitable habitat for the American marten.

Forest-dwelling bat species such as the Indiana and northern long-eared bats may also be impacted by fragmentation and removal of forest and woodland habitats. Bat species such as the Indiana bat typically roost near forest edges or openings. Alternative 2 in the WMNF Section would not create new habitat edges but would widen the existing PSNH transmission route. The loss of forestland along the PSNH transmission route could further reduce summer roosting habitat in the WMNF. However, the extent of this habitat removal would be limited compared to the scale of adjoining forestlands (less than 0.1 percent removal of forestlands in the WMNF). The total area of the WMNF is approximately 796,700 acres (322,400 ha). Based on a review of the NHWAP Habitat data for the WMNF, approximately 2 million acres (809,371 ha) of forestlands are located within Grafton and Coös counties, most of which would remain undisturbed during construction and would continue to provide suitable habitat. Consequently, this habitat loss is not expected to have any long-term adverse effects on northern long-eared or Indiana bats.

Habitat fragmentation would impact MIS and RFSS within the WMNF. Specifically, the MIS include the Blackburnian warbler, chestnut-sided warbler, magnolia warbler, ruffed grouse, and scarlet tanager; all of these species inhabit forested habitats. The loss of 37 acres (15 ha) of forested habitat would result in long-term adverse impacts to these species; however, given the vast extent of forested habitats within Grafton and Belknap counties (approximately 1,100,000 acres), no long-term adverse impacts are expected.

Impacts to RFSS species would be limited. There would be no impacts to the White Mountain fritillary or the White Mountain arctic butterfly because the Project would not impact alpine habitats. The eastern small-footed bat would experience short-term, adverse impacts resulting from disturbance/displacement during construction, if present. The little brown Myotis or tricolored bats could be affected through the removal of suitable roost trees and experience short-term disturbance to foraging areas during construction. The wood turtle, if present, could be physically injured or crushed if present in the Project corridor and not observed by construction crews. Any osprey present would likely readily avoid any disturbance areas and not expected any impacts, based on vast extent of suitable habitat outside of the study area. The common loon was identified in habitats outside the existing PSNH transmission route during BBSs. This species inhabits large, open water habitats, so would not be affected by the Project. No impacts to the White Mountain arctic butterfly are expected, as this species inhabits alpine habitats, and no alpine habitats are located within the study area in the WMNF.

The Alternative 2 corridor crosses a Deer Wintering Yard, as defined by the USFS. The crossing is approximately 1,270 feet (388 m) in length, totaling 1.1 acres (0.4 ha), and located toward the southern end of the WMNF Section, in the vicinity of Woodstock, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 2 would impact this deer yard and include the clearing of vegetation. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Habitat Connectivity

Habitat fragmentation impacts to state and federally-listed species would vary based on the habitat requirements of the listed species. Forest interior dwelling species would experience long-term adverse effects based on habitat loss and fragmentation. Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience short-term habitat loss while the Project corridor revegetates in areas of temporary disturbance. As construction would occur over a limited time period, the duration of the impacts to those species would be short-term for herbaceous and scrub-shrub communities, and long-term for interior species. Because the Project under Alternative 2 in the WMNF Section would be predominately located within the existing PSNH transmission route, tree clearing would generally be limited to the widening of the existing PSNH transmission route and any potential impacts to forest interior dwelling species would be limited.

The Project under Alternative 2 would be located within an existing PSNH transmission route and no additional new habitat barriers would be created.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repair activities would be similar to those discussed for construction, except that these impacts would occur for shorter periods of time throughout the duration of the Project. There could be short-term, adverse effects resulting from direct mortality or injury to individuals (including collision and electrocution of birds), sensory disturbance including noise, ground disturbance, turbidity, or visual activity, and increased depredation.

The impacts of habitat loss, type conversion, and fragmentation described for construction would persist in the long term. Habitat loss and/or modification of existing habitats in the study area during the operation of the Project would also have adverse impacts. Wildlife which forage and reproduce in herbaceous and scrub-shrub communities would experience long-term beneficial effects through the increase in these habitat types throughout the operation of the Project. The majority of the disturbance would result from limited expansion of the existing PSNH transmission route; these areas would be revegetated and would be typical of a maintained transmission route habitat throughout the operation of the Project. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project.

During operation of the Project under Alternative 2, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. Because a deer yard would be impacted by Alternative 2, Forest-wide – Rare and Unique Features, Gray Wolf Guideline G-2 and Forest-wide – Wildlife Habitat Management G-6 would not be implemented. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable to the extent possible; however, an impact would still occur. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.3 Alternative 3

Impacts from Construction

Aquatic Species

Construction-related impacts to aquatic wildlife associated with habitat loss/modification would be similar to those discussed in Alternative 2, although at a reduced scale, based on the smaller disturbance area for Alternative 3, as a narrower construction corridor would be utilized. However, impacts to waterbody crossings would be greater for disturbances for underground transmission cable installation involving excavation of banks and channels for cable installation. Impacts would include disturbance in the trench area and suspension of sediments, resulting in short-term adverse impacts at the specific waterbody crossings.

The primary aquatic habitat in the WMNF Section is Bog Pond, located near Kinsman Ridge and the ANST. As this open water area is surrounded by a large bog wetland complex, the Applicant would need to work with the USFS to develop an appropriate construction technique to bury the cable through this sensitive habitat. In addition, there would be seven main stream crossings in the WMNF Section (from west to east: Reel Brook, Eliza Brook, Bog Pond, Gordon Pond Brook, Boles Brook, Mt. Moosilauke Brook, and Pike Brook). Many of these stream crossings are high gradient systems, which likely preclude any sizeable fish populations, but Mt. Moosilauke Brook and some of the other waterbodies likely contain fish species, including game species, such as trout. With the application of APMs (see **Appendix H**), long-term adverse impacts to aquatic species would be minimized. Additional discussion regarding construction related impacts to wetland communities is located in the water resources section (see **Section 4.5.13.3**).

Terrestrial Species

Under Alternative 3, approximately 52 acres (21 ha) of wildlife habitat would be impacted by the Project. Of the 52 acres (21 ha) affected, approximately 38 acres (15 ha) of impacts would result from general construction activities related to the buried cable in the existing PSNH transmission route and 13 acres (5 ha) from the buried cable trench area. Construction activities surrounding the trench in the existing PSNH transmission route would result in impacts to 24 acres (10 ha) of scrub-shrub habitat; the remaining impacts would occur to other habitat types. The buried cable trench area itself would result in impacts to 8 acres (3 ha) of scrub-shrub habitat; the remaining impacts would occur to other habitat types. Approximately 0.1 acre (<0.1 ha) of forests would be cleared, which would be limited to the edge of the existing PSNH transmission route.

Habitat fragmentation impacts on the Canada lynx would be limited since the Project under Alternative 3 would be located in the existing PSNH transmission route. The widening of the existing PSNH transmission route would not affect Canada lynx movements. The small amount of forest habitat that would be cleared is not expected to have an impact on the species denning or foraging habitats. Also, the species is a wide-ranging species and the loss of approximately 0.1 acre (<0.1 ha) of forest habitat would not adversely affect this species. However, construction activities would result in vegetation disturbance in portions of LAU 1, 8, and 12. **Table 4-189** presents a summary of lynx habitat within the study area. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan. The Applicant would consult with the USFS regarding the existing extent of disturbance to WMNF LAUs, to ensure that the Canada lynx standards are met. Additional discussion regarding impacts to LAUs is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 4-189. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 3 Study Area in the WMNF Section

Boundaries	Alternative 3 acres (ha)
Lynx Analysis Units	48 (19)
Lynx Denning	2 (0.8)
Lynx Foraging	2 (0.8)
Total Lynx Habitat	21 (9)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

Project-specific surveys did not detect any American marten tracks within the WMNF Section; however, this species has been recorded in Grafton County, NH (NHFG 2005a). Construction activities in the WMNF Section would remove potentially suitable habitat for American marten, primarily the forestlands at the edge of the existing PSNH transmission route. Forest-dwelling bat species such as the Indiana and northern long-eared bats may also be impacted by fragmentation and removal of forest and woodland habitats. Alternative 3 in the WMNF Section would not create new habitat edges but would widen the existing PSNH transmission route. The loss of forestland along the PSNH transmission route could further reduce summer roosting habitat in the WMNF. However, the extent of this habitat removal would be limited compared to the scale of adjoining forestlands (less than 0.1 percent removal of forestlands in the WMNF). The total area of the WMNF is approximately 796,700 acres (322,400 ha). Based on a review of the NHWAP Habitat data for the WMNF, approximately 2 million acres (809,371 ha) of forestlands are located within Grafton and Coös counties, most of which would remain undisturbed during construction and would continue to provide suitable habitat. Consequently, this habitat loss is not expected to have any long-term adverse effects on American marten or any listed bats.

Habitat fragmentation would impact MIS and RFSS within the WMNF. Specifically, the MIS include the Blackburnian warbler, chestnut-sided warbler, magnolia warbler, ruffed grouse, and scarlet tanager; all of these species inhabit forested habitats. Based on the small extent of forest, the loss of 0.1 acre (<0.1 ha) of forested habitat would result in adverse impacts to these species; however, given the vast extent of forested habitats within Grafton and Belknap counties (approximately 1,100,000 acres), no long-term adverse impacts are expected.

Impacts to RFSS species would be limited. There would be no impacts to the White Mountain fritillary or the White Mountain arctic butterfly because the Project would not impact alpine habitats. The eastern small-footed bat would experience short-term, adverse impacts resulting from disturbance/displacement during construction. The little brown Myotis or tricolored bats could be affected through the removal of suitable roost trees and experience short-term disturbance to foraging areas during construction. The wood turtle, if present, could be physically injured or crushed if present in the Project corridor and not observed by construction crews. Any osprey present would likely readily avoid any disturbance areas and not expected any impacts, based on vast extent of suitable habitat outside of the study area.

The Alternative 3 corridor crosses a Deer Wintering Yard, as defined by the USFS. The crossing is approximately 1,270 feet (388 m) in length, totaling 1 acre (0.4 ha), and located toward the southern end of the WMNF Section, in the vicinity of Woodstock, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 3 would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer

Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Habitat Connectivity

In the WMNF Section, the Project under Alternative 3 would be located within an existing PSNH transmission route and would require no widening of the existing PSNH transmission route. Therefore, no additional habitat fragmentation or new habitat edges would be created, and impacts would be similar to Alternative 1 in the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Potential impacts related to operation and maintenance equipment, vehicles, and personnel would generally be similar to those occurring during the construction phase, except that these impacts would occur for shorter periods of time throughout the duration of the Project. Other, long-term impacts resulting from the Project would generally be similar to those discussed for Alternative 2 (see **Section 4.5.11.2**), although the cable would be buried, eliminating the operational effects related to an overhead transmission line.

Impacts during operation and maintenance activities would be identical to those under the existing condition, as the majority of the disturbance area is located within the existing PSNH transmission route within the WMNF Section. Any maintenance activities would likely require activity within a localized portion of the transmission route, which could result in the mortality of some less mobile species and temporarily displace any listed or important non-listed species. Wildlife that forage and reproduce in herbaceous and scrub-shrub communities would experience no effects from the operation of the Project, as conditions during operation would not be expected to change substantially from the existing condition. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project.

During operation of the Project under Alternative 3, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) “May Affect, but Not Likely to Adversely Affect” the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project “May impact individuals, but not likely to result in a trend towards federal listing or loss of viability” of the 15 RFSS species listed in **Table 4-187**.

4.5.11.4 Alternative 4a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.5.11.3**); however, Alternative 4a would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead line.

Terrestrial Species

As Alternative 4a would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.5.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat.

Under Alternative 4a, approximately 3 acres (1 ha) of disturbance would occur. Impacts would occur to 1 acre (0.4 ha) of mowed ROW, 1 acre (0.4 ha) of developed and 0.3 acre (<0.1 ha) of forested habitats.

The study area of Alternative 4a is located outside of LAU 12, but does cross LAUs 8 and 10, including 3 acres (1 ha) of LAU 10. **Table 4-190** presents a summary of lynx habitat within the study area. As Alternative 4a is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan. The Applicant would consult with the USFS regarding the existing extent of disturbance to WMNF LAUs, to ensure that the Canada lynx standards are met. Additional discussion regarding impacts to LAUs is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Table 4-190. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 4a Study Area in the WMNF Section

Boundaries	Alternative 4a acres (ha)
Lynx Analysis Units	3 (1)
Lynx Denning	0.2 (<0.1)
Lynx Foraging	<0.1 (<0.1)
Total Lynx Habitat	1 (0.4)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

Construction of the Project under Alternative 4a may result in impacts to individuals of certain USFS RFSS and MIS species, as presented in **Table 4-190**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 4a.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 4a would require minimal forest removal (approximately 0.3 acre [<0.1 ha]) and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to impacts from construction, as well as impacts described for Alternative 3 (see **Section 4.5.11.3**), although adverse impacts would be reduced, as this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would be adapted to inhabiting disturbed areas and edge habitats. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project; the loss of forested wetlands could displace additional wildlife species throughout the operation of the Project.

Any maintenance activities which require repair work in streams or rivers would result in adverse impacts to aquatic communities, as aquatic habitats would be re-disturbed and aquatic species would experience short-term adverse impacts, similar to those that occurred during construction. However, these effects are expected to be localized to the repair area.

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) “May Affect, but Not Likely to Adversely Affect” the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project “May impact individuals, but not likely to result in a trend towards federal listing or loss of viability” of the 15 RFSS species listed in **Table 4-187**.

4.5.11.5 Alternative 4b

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.5.11.3**); however, Alternative 4b would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead line.

Terrestrial Species

As Alternative 4b would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.5.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting disturbed areas and edge habitats.

Under Alternative 4b, approximately 8 acres (3 ha) of disturbance would result from the Project. Impacts would occur to approximately 4 acres (2 ha) of developed lands, 3 acres (1 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats.

In total, the study area of Alternative 4b overlaps with LAUs 8, 10, 12, and 13 for a total of approximately 8 acres (3 ha). **Table 4-191** presents a summary of lynx habitat within the study area. Within these LAUs, lynx foraging, denning and total lynx habitat would be disturbed as a result of the construction of Alternative 4b.

Table 4-191. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 4b Study Area in the WMNF Section

Boundaries	Alternative 4b acres (ha)
Lynx Analysis Units	8 (3)
Lynx Denning	0.6 (0.2)
Lynx Foraging	0.3 (0.1)
Total Lynx Habitat	7 (3)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 4b is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

The Alternative 4b corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 4b would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Construction of the Project under Alternative 4b may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-191**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 4b.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.5.11.4**) but would occur along a different alignment.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.5.11.4**) but would occur along a different alignment.

During operation of the Project under Alternative 4b, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) “May Affect, but Not Likely to Adversely Affect” the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project “May impact individuals, but not likely to result in a trend towards federal listing or loss of viability” of the 15 RFSS species listed in **Table 4-187**.

4.5.11.6 Alternative 4c

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.5.11.3**); however, Alternative 4c would be located along existing roadways which would limit its impact to aquatic species. With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects when compared with overhead line.

Terrestrial Species

As Alternative 4c would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.5.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting disturbed areas and edge habitats.

Under Alternative 4c, approximately 6 acres (2 ha) of wildlife habitat would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of developed lands, 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats; the remaining impacts would occur to other habitat types.

In total, the study area of Alternative 4c overlaps with LAU 12 and 13 for approximately 6 acres (2 ha). **Table 4-192** presents a summary of lynx habitat within the study area.

Table 4-192. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 4c Study Area in the WMNF Section

Boundaries	Alternative 4c acres (ha)
Lynx Analysis Units	6 (2)
Lynx Denning	0.5 (0.2)
Lynx Foraging	0.3 (0.1)
Total Lynx Habitat	5 (2)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 4c is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

The Alternative 4c corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 4c would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Construction of the Project under Alternative 4c may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-192** similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 4c.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be similar to those described above under Alternative 4a (see **Section 4.5.11.4**) but would occur along a different alignment.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects would be similar to those described for Alternative 4a (see **Section 4.5.11.4**) but would occur along a different alignment.

During operation of the Project under Alternative 4c, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.7 Alternative 5a

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.5.11.2**) for aboveground portions, and Alternative 4a (see **Section 4.5.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects. The underground portions of Alternative 5a would be located along existing roadways which would limit the impact to aquatic species.

Terrestrial Species

In the WMNF Section, Alternative 5a would include an overhead transmission line and underground cable. For the overhead portion, approximately 9 acres (4 ha) of wildlife habitats would be impacted by the Project. Of this, impacts would occur to approximately 6 acres (2 ha) of scrub-shrub, and 2 acres (0.8 ha) of forested habitats; the remaining impacts would occur to other habitat types. Construction pads would account for approximately 4 acres (2 ha) of disturbance and the aboveground transition stations would account for 0.7 acre (0.3 ha) of disturbance. All impacts to forests would result from tree clearing for widening of the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

For the underground portion, approximately 3 acres (1 ha) of disturbance would occur. Impacts would occur to approximately 2 acres (1 ha) of mowed ROW. Potential removal of forestlands would be negligible, amounting to approximately 0.3 acre (0.1 ha), although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project.

The study area of Alternative 5a is located within LAUs 1, 8, and 10 for a total of 12 acres (5 ha). **Table 4-193** presents a summary of lynx habitat within the study area.

Table 4-193. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 5a Study Area in the WMNF Section

Boundaries	Alternative 5a acres (ha)
Lynx Analysis Units	12 (5)
Lynx Denning	0.1 (<0.1)
Lynx Foraging	0 (0)
Total Lynx Habitat	4 (2)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 5a is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

Construction of the Project under Alternative 5a may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-187**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because a portion of the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 5a.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5a would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.11.2**), and effects for underground portions would be identical to those described for Alternative 4a (see **Section 4.5.11.4**).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187**.

4.5.11.8 Alternative 5b

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.5.11.2**) for aboveground portions, and Alternative 3 (see **Section 4.5.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects. Underground portions of Alternative 5b would be located along existing roadways which would limit the impact to aquatic species. See **Section 4.5.13.8** for impacts to water resources.

Terrestrial Species

In the WMNF Section, Alternative 5b would include overhead transmission line, underground cable, and aboveground transition stations. For the overhead portion, approximately 23 acres (9 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 8 acres (3 ha) of forested habitats, 8 acres (3 ha) of mowed ROW, and 6 acres (2 ha) of scrub-shrub; the remaining impacts would occur to other habitat types. Construction pads would account for approximately 10 acres (4 ha) of disturbance, clearing for the new/widened transmission corridor would account for 8 acres (3 ha) of disturbance, and the aboveground transition stations would account for 0.7 acre (0.3 ha) of disturbance. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project.

For the underground portion, approximately 6 acres (2 ha) of wildlife habitats would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of developed lands, 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

In total, the study area of Alternative 5b overlaps with LAU 12 for approximately 9 acres (4 ha). **Table 4-194** presents a summary of lynx habitat within the study area.

Table 4-194. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 5b Study Area in the WMNF Section

Boundaries	Alternative 5b acres (ha)
Lynx Analysis Units	20 (8)
Lynx Denning	0.5 (0.2)
Lynx Foraging	0.3 (<0.1)
Total Lynx Habitat	12 (5)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 5b is located within a roadway corridor, disturbance within lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

The Alternative 5b corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 5b would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Construction of the Project under Alternative 5b may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-187,** similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because portions of the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 5b.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5b would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.11.2**), and effects for underground portions would be identical to those described for Alternative 4b (see **Section 4.5.11.5**).

During operation of the Project under Alternative 5b, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. Because a deer yard would be impacted by Alternative 5b, Forest-wide – Rare and Unique Features, Gray Wolf Guideline G-2 and Forest-wide – Wildlife Habitat Management G-6 would not be implemented. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable to the extent possible; however, an impact would still occur. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.9 Alternative 5c

Impacts from Construction

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.5.11.2**) for aboveground portions, and Alternative 3 (see **Section 4.5.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects. Alternative 5c is located along existing roadways which would limit its impact to aquatic species. See **Section 4.5.13.8** for impacts to water resources.

Terrestrial Species

In the WMNF Section, Alternative 5c would include overhead transmission line and underground cable. For the overhead portion, approximately 9 acres (4 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 3 acres (1 ha) of forested habitats, and 6 acres (2 ha) of scrub-shrub habitat; the remaining impacts would occur to other habitat types. Construction pads would account for 4 acres (2 ha) of disturbance. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project. See **Section 4.5.13.9** for impacts to water resources.

For the underground portion, approximately 6 acres (2 ha) of wildlife habitats would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of developed lands, 2 acres (0.8 ha) of mowed

ROW and 1 acre (0.4 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

In total, the study area of Alternative 5c overlaps with LAUs 1, 8, 12, and 13 for approximately 15 acres (6 ha). **Table 4-195** presents a summary of lynx habitat within the study area.

Table 4-195. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 5c Study Area in the WMNF Section

Boundaries	Alternative 5c acres (ha)
Lynx Analysis Units	15 (6)
Lynx Denning	0.5 (0.2)
Lynx Foraging	0.3 (0.1)
Total Lynx Habitat	8 (3)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 5c is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

The Alternative 5c corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 5c would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Construction of the Project under Alternative 5c may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-195**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 5c.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 5c would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.11.2**), and effects for underground portions would be identical to those described for Alternative 4c (see **Section 4.5.11.6**).

During operation of the Project under Alternative 5c, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.10 Alternative 6a

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be similar to those discussed for Alternative 4a (see **Section 4.5.11.4**).

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.5.11.3**). With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects. Alternative 6a is located along existing roadways which would limit its impact to aquatic species.

Terrestrial Species

As Alternative 6a would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.5.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat.

Under Alternative 6a, approximately 3 acres (1 ha) of disturbance would occur. Impacts would occur to 1 acre (0.4 ha) of mowed ROW, 1 acre (0.4 ha) of developed lands, and 0.3 acre (0.1 ha) of forested habitats.

The study area of Alternative 6a is located outside of LAU 12, but does cross LAUs 8 and 10, including 3 acres (1 ha) of LAU 10. **Table 4-196** presents a summary of lynx habitat within the study area.

Table 4-196. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 6a Study Area in the WMNF Section

Boundaries	Alternative 6a acres (ha)
Lynx Analysis Units	3 (1)
Lynx Denning	0.2 (<0.1)
Lynx Foraging	<0.1 (<0.1)
Total Lynx Habitat	1 (0.4)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 6a is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

Construction of the Project under Alternative 6a may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-187**, similar to those discussed above under Alternative 2 (see

Section 4.5.11.2). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 6a.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 6a would require minimal forest removal (approximately 0.3 acre [0.1 ha]) and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4a (see **Section 4.5.11.4**).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.11 Alternative 6b

Impacts from Construction

Impacts from construction to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4b (see **Section 4.5.11.5**).

Aquatic Species

Impacts to aquatic species would be similar to those discussed under Alternative 3 (see **Section 4.5.11.3**). With the buried cable, aquatic species would be more exposed to short-term, localized, adverse effects. Alternative 6b is located along existing roadways which would limit its impact to aquatic species.

Terrestrial Species

As Alternative 6b would be a buried cable, construction-related effects would be similar to those described for Alternative 3 (see **Section 4.5.11.3**). However, adverse impacts would be reduced because this alternative would parallel an existing roadway, which currently provides limited wildlife habitat. The majority of the species which utilize these areas would likely adapt to inhabiting disturbed areas and edge habitats.

Under Alternative 6b, approximately 8 acres (3 ha) of disturbance would result from the Project. Impacts would occur to approximately 4 acres (2 ha) of developed lands, 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats.

In total, the study area of Alternative 6b overlaps with LAUs 8, 10, 12, and 13 for a total of approximately 8 acres (3 ha). **Table 4-197** presents a summary of lynx habitat within the study area. Within these LAUs, lynx foraging, denning and total lynx habitat would be disturbed as a result of the construction of Alternative 6b.

Table 4-197. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 6b Study Area in the WMNF Section

Boundaries	Alternative 6b acres (ha)
Lynx Analysis Units	8 (3)
Lynx Denning	0.6 (0.2)
Lynx Foraging	0.3 (0.1)
Total Lynx Habitat	7 (3)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 6b is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

Construction of the Project under Alternative 6b may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-187**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 6b.

The Alternative 6b corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 6b would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors. The Project under Alternative 6b would require minimal forest removal (approximately 5 acres [2 ha]) and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from operation, maintenance, and emergency repairs to terrestrial and aquatic wildlife species would be identical to those discussed for Alternative 4b (see **Section 4.5.11.5**).

During operation of the Project under Alternative 6b, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) "May Affect, but Not Likely to Adversely Affect" the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project "May impact individuals, but not likely to result in a trend towards federal listing or loss of viability" of the 15 RFSS species listed in **Table 4-187.**

4.5.11.12 Alternative 7 – Proposed Action

Impacts from Construction

Aquatic Species

Under Alternative 7, impacts to aquatic species would be similar to those discussed under Alternative 2 (see **Section 4.5.11.2**) for aboveground portions, and Alternative 3 (see **Section 4.5.11.3**) for underground portions. Impacts from the aboveground portions would be short-term. For the underground portions, aquatic species would be more exposed to short-term, localized, adverse effects. Alternative 7 is located along existing roadways which would limit its impact to aquatic species. See **Section 4.5.13.8** for impacts to water resources.

Terrestrial Species

In the WMNF Section, Alternative 7 would include overhead transmission line and underground cable. For the overhead portion, approximately 6 acres (2 ha) of wildlife habitat would be impacted by the Project. Of this, impacts would occur to approximately 1 acre (0.4 ha) of forested habitats, and 4 acres (2 ha) of scrub-shrub habitat; the remaining impacts would occur to other habitat types. Construction pads would account for 2 acres (0.8 ha) of disturbance, clearing for the new/widened transmission corridor would account for 2 acres (0.8 ha) of disturbance, and access roads would account for approximately 2 acres (0.8 ha) of disturbance. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat. Forested wetland habitats would be converted, but scrub-shrub and herbaceous wetland habitats would persist during operation of the Project. See **Section 4.5.13.9** for impacts to water resources.

For the underground portion, approximately 6 acres (2 ha) of habitats would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of developed lands, 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats; the remaining impacts would occur to other habitat types. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

In total, the study area of Alternative 7 overlaps with LAUs 1, 12, and 13 for approximately 12 acres (5 ha). **Table 4-198** presents a summary of lynx habitat within the study area.

Table 4-198. Summary of the Acreage of USFS Lynx Designated Habitats that Intersect the Alternative 7 Study Area in the WMNF Section

Boundaries	Alternative 7 acres (ha)
Lynx Analysis Units	12 (5)
Lynx Denning	0.5 (0.2)
Lynx Foraging	0.3 (0.1)
Total Lynx Habitat	5 (2)

Note: Total Lynx Habitat includes denning, foraging, other and non-habitat, that is not currently suitable, but is potential denning or foraging habitat.

As Alternative 7 is located within a roadway corridor, disturbance within these lynx habitat is expected to be minor, as roadway corridors do not provide suitable lynx foraging or denning habitat. With the application of APMs (see **Appendix H**), the Project would be consistent with the Forest Plan.

The Alternative 7 corridor crosses a known Deer Wintering Yard, as defined by the USFS. The total acreage of the crossing is approximately 5 acres (2 ha), and located on the western side of the WMNF Section, in Easton, NH. No significant deer sign was observed during the 2013 Project-specific winter field surveys. The construction of Alternative 7 would include the clearing of vegetation within this deer yard. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that known Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

Construction of the Project under Alternative 7 may result in impacts to individuals for certain USFS RFSS and MIS species, as presented in **Table 4-187**, similar to those discussed above under Alternative 2 (see **Section 4.5.11.2**). However, because the Project would be located underground in an existing roadway corridor, impacts would be less under Alternative 7.

Habitat Connectivity

Impacts to habitat fragmentation, forest interior species, and edge habitats would be minimal because the Project would be located underground in previously disturbed roadway corridors, or overhead in the existing PSNH transmission route. The Project under Alternative 7 would require minimal vegetation removal and would not create any additional habitat fragmentation or new edge habitat.

Impacts from Operations, Maintenance, and Emergency Repairs

Operation and maintenance-related effects for aboveground portions would be identical to those described for Alternative 2 (see **Section 4.5.11.2**), and effects for underground portions would be identical to those described for Alternative 4c (see **Section 4.5.11.6**).

During operation of the Project under Alternative 7, maintenance activities would include the clearing of vegetation within identified Deer Wintering Yards. Long-term maintenance activities would typically remove existing herbaceous or scrub-shrub communities that may provide dense cover or pockets of browse for wintering deer. As part of the APMs (see **Appendix H**), the Applicant would work with the USFS to ensure that any identified Deer Wintering Yards in areas authorized through a SUP would remain suitable Deer Wintering Yards after implementation. Additional discussion regarding impacts to Deer Wintering Yards is provided in the **Wildlife Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports).

With the implementation of APMs (see **Appendix H**), the Project (including construction, operation, maintenance, and emergency repairs) “May Affect, but is Not Likely to Adversely Affect” the Canada lynx, the northern long-eared bat, and the Indiana bat in New Hampshire. These ESA determinations are pending further consultations with the USFWS. In addition, the Project “May impact individuals, but is not likely to result in a trend towards federal listing or loss of viability” of the 15 RFSS species listed in **Table 4-187.**

4.5.12 VEGETATION

Refer to **Section 4.1.12** for a discussion of general impacts common to all geographic sections.

The Project has the potential to impact vegetation. **Table 4-68** presents a summary of Project-wide effects to federally- and state-listed plant species and the determination for the one federally-listed species. **Table 4-199** presents a summary of Project-wide effects to USFS MIS and RFSS vegetation species, which are species listed specifically within the WMNF.

Table 4-199. Determination Summary of Project-wide Effects for USFS MIS and RFSS Vegetation Species

Species	Determination of Effects by Alternative
RFSS	
Green rockcress (*Arabis missouriensis*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Alpine manzanita (*Arctostaphylos alpine*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Dragon's mouth (*Arethusa bulbosa*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Arnica (*Arnica lanceolata*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Robbin's milkvetch (*Astragalus robbinsii* var. *minor*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Dwarf white birch (*Betula minor*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Alpine bittercrest (*Cardamine concatenate*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Bailey's sedge (*Carex baileyi*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Capitate sedge (*Carex capitata* ssp. *arctogena*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Clustered sedge (*Carex cumulate*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Bulrush sedge (*Carex scripoidea*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Wiegand's sedge (*Carex wiegandii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Fogg's goosefoot (*Chenopodium foggii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Autumn coralroot (*Corallorhiza odontorhiza*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Greater yellow lady's-slipper (*Cypripedium parviflorum* var. *makasin*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Fragrant wood fern (*Dryopteris fragrans*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Goldie's woodfern (*Dryopteris goldiana*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Oake's eyebright (*Euphrasia oakesii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Boreal bedstraw (*Galium kamtschaticum*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Northern comandra (*Geocaulon lividum*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability

Table 4-199. Determination Summary of Project-wide Effects for USFS MIS and RFSS Vegetation Species

Species	Determination of Effects by Alternative
Mountain avens (*Geum peckii*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Mossplant (*Harrimanella hypnoides*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Butternut (*Juglans cinerea*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Auricled twayblade (*Neottia auriculata*), formerly *Listeria* genus	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Twayblade (*Neottia convallarioides*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Heartleaf twayblade (*Neottia cordata*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Prairie goldenrod (*Oligoneuron album*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Alpine arctic cudweed (*Omalotheca supina*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Northern adder's-tongue fern (*Ophioglossum pusillum*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Mountain sweet-cicely (*Osmorhiza berteroi*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
American ginseng (*Panax quinquefolius*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Silvery nailwort (*Paronychia argyrocoma*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Sweet colt's foot (*Petasites frigidua* var. *palmatus*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Canada mountain ricegrass (*Piptatherum canadense*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Wavy bluegrass (*Poa laxa* ssp. *fernaldiana*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Alpine meadow grass (*Poa pratensis* ssp. *alpigena*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Douglas' knotweed (*Polygonum douglasii*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Viviparous knotweed (*Polygonum viviparum*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Robbins' cinquefoil (*Potentilla robbinsiana*)	**Impact for All Action Alternatives:** No effect, study area does not cross suitable habitat
Boott's rattlesnake-root (*Prenanthes boottii*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Pink wintergreen (*Pyrola asarifolia*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability

Table 4-199. Determination Summary of Project-wide Effects for USFS MIS and RFSS Vegetation Species

Species	Determination of Effects by Alternative
Northern willow (*Salix argyrocarpa*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
New England dwarf willow (*Salix herbacea*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Large-fruited sanicle (*Sanicula trifoliata*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
White Mountain saxifrage (*Saxifraga paniculata*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Alpine brook saxifrage (*Saxifraga rivularis*)	**Impact for All Action Alternatives:** No effect, study area does not cross suitable habitat
Arizona cinquefoil (*Sibbaldia procumbens*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Moss campion (*Silene acaulis* var. *exscapa*)	**Impact for Alternatives 2 and 3:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability **Impact for Alternatives 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7:** No effect, study area does not cross suitable habitat
Nodding pogonia (*Triphora trianthophora*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Northern blueberry (*Vaccinium boreale*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
Mountain hairgrass (*Vahlodea atropurpurea*)	**Impact for All Action Alternatives:** May impact individuals, but not likely to result in a trend towards federal listing or loss of viability
MIS	
Robbins' cinquefoil (*Potentilla robbinsiana*)	**Impact for All Action Alternatives:** Project does not cross alpine habitats, no effect

4.5.12.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.12.2 Alternative 2

Impacts from Construction

Under Alternative 2, approximately 96 acres (22 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 37 acres (13 ha) of forested habitats, 35 acres of scrub-shrub, 15 acres of wetland, and 8 acres of mowed ROW (the remaining acre of disturbance is located in developed areas, open water, or cliff/rocky ridge). Of the 37 acres (13 ha) of impacts to forests, 26 acres (12 ha) of impacts would result from tree clearing for new transmission route or widening of the existing PSNH transmission route, and the remaining acre of disturbance would result from relocated or new towers. For a discussion of impacts to wetland communities, see **Section 4.5.13.2** for impacts to water resources.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 2 would be associated with the structure footprints and would be approximately 0.1 acre (0.05 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in these areas. In addition, sensitive resources, such as the Bog Pond area, is an exemplary natural community, in the State of New Hampshire, as it contains poor-level fen-bog and medium level fen system. These locations may not contain listed plant species, but they represent unique habitats and contain unique vegetation resources. Construction of the Project through these areas would result in short to long-term adverse effects to vegetation resources. The application of APMs as discussed in **Appendix H**, would minimize these long-term adverse effects.

One federally threatened species is known to occur within WMNF. There are three extant occurrences of the small whorled pogonia, a federally threatened species reported by the USFS; two located in New Hampshire and one in Maine, none of which are located in the study area. A predicted habitat model for this species found no potentially suitable habitat within the WMNF Section study area. During the 2013 and 2014 survey field season, no small whorled pogonias were observed. There are also 51 USFS RFFS species (see **Table 4-187**), which are listed for the WMNF; two of these species are only found in alpine habitats which are not crossed by the Alternative 2 study area; however, during Project-specific field survey efforts in 2013 and 2014, none of these listed species were observed within the WMNF Section study area. One historical record exists in the WMNF Section based on NHB data for the Wiegand's sedge (*Carex wiegandii*), a RFSS species and state-listed as endangered. Short-term adverse effects could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized.

The issue of non-native invasive plant species is a primary concern for the WMNF for maintaining ecosystem integrity. Implementation of APMs listed in **Appendix H** would minimize the potential for introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.3 Alternative 3

Impacts from Construction

Under Alternative 3, approximately 52 acres (21 ha) of vegetated habitats would be impacted by the Project. Of this, approximately 38 acres (15 ha) of impacts would result from the burial of the cable in the existing PSNH transmission route and 13 acres (5 ha) would be associated with the buried cable trench area within the existing PSNH transmission route. Disturbance within the existing PSNH transmission route would result in impacts to approximately 24 acres (10 ha) of scrub-shrub habitat, while the trench area would impact 8 acres (3 ha) of scrub-shrub habitat.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized.

As under Alternative 2, there is a potential for the introduction or spread of invasive plant species, which may be greater along the construction corridor for the underground cable installation due to creating a more continuous linear area of exposed soils. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.4 Alternative 4a

Impacts from Construction

Under Alternative 4a, approximately 2 acres (0.8 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 1 acre (0.4 ha) of mowed ROW, and 0.3 acre (0.1 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternative 3. The potential for spreading infestation areas may be greater when compared to Alternative 3 since more invasive plants are known to be present in the I-93 and other roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.5 Alternative 4b

Impacts from Construction

Under Alternative 4b, approximately 4 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 3 acres (1 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternative 4a as infestation areas of invasive plant species may be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.6 Alternative 4c

Impacts from Construction

Under Alternative 4c, approximately 3 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternative 4a as infestation areas of invasive plant species may be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.7 Alternative 5a

Impacts from Construction

In the WMNF Section, Alternative 5a would be constructed as both an overhead transmission line and underground cable. For the overhead portion, approximately 9 acres (2 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 2 acres (1 ha) of forested habitats, 6 acres (2 ha) of scrub-shrub communities, and the remaining impacts associated with other vegetation habitats (see **Section 4.1.12**). The 2 acres (1 ha) of impacts to forests would result from tree clearing for widening the existing PSNH transmission route. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state, providing many important functions of wildlife habitat.

For the underground portion, approximately 3 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 2 acres (1 ha) of mowed ROW. Potential removal of forestlands would be negligible, amounting to up to 0.3 acre (0.1 ha), although many areas would return to a scrub-shrub/young sapling state.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 5a would be associated with the installation of the underground portion and would be approximately 3 acres (1 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in these areas.

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternatives 3 and 4a since the study area includes segments that follow both transmission routes and roadway corridors. Infestation areas of invasive plant species can be expected to be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.8 Alternative 5b

Impacts from Construction

In the WMNF Section, Alternative 5b would be constructed as both an overhead transmission line and underground cable. For the overhead portion, approximately 23 acres (9 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 8 acres (3 ha) of forested habitats, 6 acres (2 ha) of scrub-shrub communities, and the remaining impacts associated to other vegetation habitats (see **Section 4.1.12**). Of the 8 acres (3 ha) of impacts to forests, 5 acres (2 ha) would result from tree clearing for widening the existing PSNH transmission route.

For the underground portion, approximately 3 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 2 acres (1 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

For example, long-term impacts under Alternative 5b would be associated with the installation of the underground portion and would be approximately 3 acres (1 ha) of vegetated habitats. Vegetation resources of any forestlands or wetlands would be permanently removed in these areas.

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. Short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternatives 3 and 4a since the study area includes segments that follow both transmission and roadway corridors. Infestation areas of invasive plant species can be expected to be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.9 Alternative 5c

Impacts from Construction

In the WMNF Section, Alternative 5c would be constructed as both an overhead transmission line and underground cable. For the overhead portion, approximately 9 acres (3 ha) of vegetated habitats would be impacted by the Project. Of this, impacts would occur to approximately 3 acres (1 ha) of forested habitats, and 6 acres (1 ha) of scrub-shrub communities. Approximately 2 acres (1 ha) of impacts to forestlands would result from tree clearing for widening the existing PSNH transmission route.

For the underground portion, approximately 3 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

As discussed under Alternative 2, there are no known occurrences of the small whorled pogonia in the existing transmission corridor and one historical record for the Wiegand's sedge a RFSS species and a state-listed endangered. short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternatives 3 and 4a since the study area includes segments that follow both transmission route and roadway corridors. Infestation areas of invasive plant species can be expected to be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.12.10 Alternative 6a

Impacts from Construction

In the WMNF Section, the Project under Alternative 6a would be identical to the Project under Alternative 4a. Construction impacts would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a in the WMNF Section (see **Section 4.5.12.4**).

4.5.12.11 Alternative 6b

Impacts from Construction

In the WMNF Section, the Project under Alternative 6b would be identical to the Project under Alternative 4b. Construction impacts would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.10.4**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4b in the WMNF Section (see **Section 4.5.12.4**).

4.5.12.12 Alternative 7 – Proposed Action

Impacts from Construction

In the WMNF Section, Alternative 7 would be constructed as both an overhead transmission line and underground cable. For the overhead portion, approximately 6 acres (2 ha) of vegetated habitats would be impacted by the Project, of which approximately 1 acre (0.4 ha) would be forested habitats and 4 acres (2 ha) would be scrub-shrub communities. All of these impacts would result from tree clearing for widening the existing PSNH transmission route.

For the underground portion, approximately 3 acres (1 ha) of vegetated habitats would be impacted by the Project. Impacts would occur to approximately 2 acres (0.8 ha) of mowed ROW and 1 acre (0.4 ha) of forested habitats. The forestlands would be permanently removed, although many areas would return to a scrub-shrub/young sapling state.

Where vegetation is able to regenerate (e.g., short-term disturbances from construction), impacts would be short-term; however, if vegetation is altered or not able to regenerate (e.g., overstory vegetation removal in the transmission route), impacts would occur in the long term (see **Section 4.1.12.1**).

There are no known occurrences of listed plants within the Alternative 7 corridor within the WMNF Section. If species are present, short-term adverse effects during construction could include direct mortality or disturbance through mowing or grading activities. With the incorporation of the APMs, long-term adverse effects would be minimized. Potential impacts of the introduction and spread of invasive plants would be similar to those described for Alternatives 3 and 4a since the study area includes segments that follow both transmission route and roadway corridors. Infestation areas of invasive plant species can be expected to be more likely encountered in the roadway corridors. Implementation of APMs listed in **Appendix H** would prevent the introduction or spread of invasive plants along the transmission route.

Impacts from Operations, Maintenance, and Emergency Repairs

Long-term vegetation management within the transmission route would involve mowing and trimming of vegetation to control the regrowth of trees, thereby maintaining the corridor in scrub-shrub or grassland conditions (see **Section 4.1.12.2**).

4.5.13 WATER RESOURCES

Refer to **Section 4.1.13** for a discussion of general impacts common to all geographic sections. As discussed in **Section 4.1.13.1**, short-term and long-term impacts to water resources would result from construction of the Project. In general, construction activities including overstory vegetation removal and installation of aboveground and underground facilities would result in ground disturbance and associated impacts to water quality including erosion and sedimentation. With APMs listed in **Appendix H**, such as developing an EPSC Plan, short-term and long-term impacts would be avoided or minimized.

Table 4-200 presents direct, temporary and secondary wetland impacts in the WMNF Section for all alternatives. Direct disturbance includes the permanent loss from placement of structures such as towers, substations, and converter and transitions stations within wetlands. Temporary disturbance includes alteration of wetlands such as cutting trees and use of swamp mats during construction. Secondary disturbance includes the permanent conversion of forested wetlands to either scrub-shrub or emergent wetland. Refer to the **Water Resources Technical Report** (http://www.northernpasseis.us/library/final-eis/technical-reports) for impact to wetland by type (e.g., PEM, PFO, and PSS).

Table 4-200. Wetlands Impacts within the Study Area of the WMNF Section

Alternatives	Direct Disturbance acres (ha)	Temporary Disturbance acres (ha)	Secondary Disturbance acres (ha)
1 (No Action)	0 (0)	0 (0)	0 (0)
2	<0.5 (<0.5)	15 (6)	0 (0)
3	<0.5 (<0.5)	12 (5)	0 (0)
4a	0 (0)	<0.5 (<0.5)	0 (0)
4b	0 (0)	<0.5 (<0.5)	0 (0)
4c	0 (0)	0 (0)	0 (0)
5a	<0.5 (<0.5)	0.7 (<0.5)	0 (0)
5b	0 (0)	1 (<0.5)	0 (0)
5c	0 (0)	0.6 (<0.5)	0 (0)
6a	0 (0)	<0.5 (<0.5)	0 (0)
6b	0 (0)	<0.5 (<0.5)	0 (0)
7 (Proposed Action)	0 (0)	0.5 (<0.5)	0 (0)

4.5.13.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.13.2 Alternative 2

Impacts from Construction

Watersheds

Under Alternative 2, construction disturbance in the WMNF Section would impact multiple watersheds including 29 acres (12 ha) of the Moosilauke Brook Watershed, which is the watershed with the largest total disturbance areas in the WMNF Section.

Surface Water

Under Alternative 2, approximately 1 mile (2 km) of waterbodies would be crossed by the Project in the WMNF Section. None of the waterbodies crossed are on the 303(d) list. With the application of APMs, the Project would be consistent with Forest Plan standards and guidelines.

Groundwater

Under Alternative 2 in the WMNF Section, approximately 3 acres (1 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 2 in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 125 acres (51 ha) of disturbance would occur in SWPAs under Alternative 2 in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance, excavation, and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. No disturbance would occur in WHPAs under Alternative 2 in the WMNF Section.

Floodplains

Under Alternative 2 in the WMNF Section, approximately 96 acres (22 ha) of disturbance would occur in FEMA Flood Zones: less than 1 acre (<0.5 ha) of Zone A; 55 acres (22 ha) of Zone X; and 40 acres (16 ha) of undesignated areas.[116] As all land on the WMNF is accounted for in the FEMA mapping, this indicates that the entirety of Alternative 2 would be located within a floodplain. However, much of the WMNF is classified as "undesignated" and, therefore, are not identified as a floodplain. There could be short-term disturbance in floodplains associated with construction.

Wetlands

In the WMNF Section, approximately less than 0.5 acre (<0.5 ha) wetlands would experience direct, long-term impacts from installation of structures such as towers. Temporary, short-term impacts would affect approximately 15 acres (6 ha) of wetlands (see **Table 4-200**). Of the 15 acres (6 ha) of temporary impacts, approximately 6 acres (2 ha) would be to PEM wetlands and 9 acres (3 ha) would be to PSS wetlands. No wetlands would experience secondary impacts.

To minimize wetland impacts, Alternative 2 includes implementation of APMs listed in **Appendix H** for containment of trench material and minimizing sedimentation to the adjacent portions of a wetland, and APMs for restoring wetland contours and hydrology following transmission cable installation.

Vernal Pools

No vernal pools would be impacted by construction activities under Alternative 2 within the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts from operations, maintenance and emergency repairs would be similar to short-term construction activities but would occur for shorter durations over the life of the Project.

[116] Zone A are areas subject to inundation by the 1-percent-annual-chance flood event; Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods; Zone X are areas subject to inundation by the 0.2-percent-annual-chance flood event.

Long-term impacts are anticipated on water resources from the operation of the Project under Alternative 2 in the WMNF Section. New or relocated towers could be located in floodplains or disturb wetland areas or other surface drainage features. The towers are not anticipated to have a long-term impact on flood zones as their footprint is relatively small in comparison to the local flood zone and any displacement of water during a flood event is expected to be minimal.

Forest-wide – Riparian and Aquatic Habitats Guidelines G-2, G-11, and G-15 would not be implemented under Alternative 2.

Forest-wide – Riparian and Aquatic Habitats Guideline G-2 states: "Uneven-aged silvicultural practices should be used within the Riparian Management Zone (RMZ) along all perennial streams, lakes, ponds, and vernal pools. Cuts should be designed to maintain a relatively continuous forest canopy for the protection and maintenance of water quality, dead wood recruitment, hydrologic function, wildlife habitat, and scenic values. Regeneration group cuts should be limited to less than 1 acre in size. Exceptions may apply in areas deemed important for maintaining beaver colonies. In the absence of on-the-ground riparian mapping, width of RMZs should be defined as in the Table 2-01 [of the Forest Plan] (USDA Forest Service 2005a). Vegetation must be cleared to protect infrastructure and ensure safe operation of the lines and some clearing would occur near perennial streams. Shrubs would be planted in the riparian management zone in areas authorized by a SUP to provide shade, bank stability, and some riparian habitat.

Forest-wide – Riparian and Aquatic Habitats Guideline G-11 states: "Naturally occurring vernal pools identified during project planning should not be altered as a result of skidding or construction activities" (USDA Forest Service 2005a). Vernal pools would be impacted by construction activities. With implementation of APMs listed in **Appendix H**, impacts to vernal pools would be minimized.

Forest-wide – Riparian and Aquatic Habitats Guideline G-15 states: "Trees that directly provide structure to the streambanks and channels of intermittent streams should be retained" (USDA Forest Service 2005a). Trees must be removed to protect infrastructure and some may be along the banks of intermittent streams. Shrubs would be planted in the riparian management zone in areas authorized by a SUP to provide shade, bank stability and some riparian habitat.

Forest-wide – Water Resources, Floodplains and Wetlands Guideline G-1 would not be implemented under Alternative 2. This guideline states: "New campgrounds and facilities should be located outside the 100-year floodplain and wetlands" (USDA Forest Service 2005a). New towers are proposed for placement in wetlands. Associated impacts to wetland resources have been minimized to the extent practicable through siting and design modifications, but cannot be completely avoided.

4.5.13.3 Alternative 3

Impacts from Construction

Watersheds

Under Alternative 3, construction disturbance in the WMNF Section would impact multiple watersheds including 17 acres (7 ha) of the impact of the Moosilauke Brook Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 3.

Surface Water

Under Alternative 3, approximately 0.6 mile (1 km) of waterbodies would be crossed by the Project in the WMNF Section. None of the waterbodies crossed are on the 303(d) list.

Groundwater

Under Alternative 3 in the WMNF Section, approximately 2 acres (0.8 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 3 in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 68 acres (28 ha) of disturbance would occur in SWPAs under Alternative 3 in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. Under Alternative 3 in the WMNF Section, no disturbance will occur in WHPAs.

Floodplains

Under Alternative 3 in the WMNF Section, approximately 52 acres (21 ha) of disturbance would occur in FEMA Flood Zones: less than 1 acre (<0.5 ha) of Zone A; 30 acres (12 ha) of Zone X; and 22 acres (9 ha) of undesignated areas.

Wetlands

Less than 0.5 acre (<0.5 ha) of wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the WMNF Section under Alternative 3. Temporary, short-term impacts, primarily from underground transmission cable installation, would affect approximately 12 acres (5 ha) of wetlands (see **Table 4-200**). Of the 12 acres (5 ha) of temporary impacts, approximately 5 acres (2 ha) would be to PEM wetlands and approximately 7 acres (3 ha) would be to PSS wetlands. There would be no secondary impacts to wetlands.

Impacts to wetlands are considered temporary; however, due to the amount of trenching proposed, there would be an increased risk of damage to wetland function and values. For example, Alternative 3 proposes to construct a trench in Bog Pond.

Vernal Pools

No vernal pools would be impacted by construction activities under Alternative 3 within the WMNF Section.

Impacts from Operations, Maintenance, and Emergency Repairs

The entirety of Alternative 3 would be underground. Maintenance grading and drainage control would present potential impacts associated with erosion, runoff, flooding potential and sedimentation from vehicle use.

Forest-wide – Riparian and Aquatic Habitats Guidelines G-11 and Forest-wide – Water Resources, Floodplains and Wetlands Guideline G-4 would not be implemented under Alternative 3. Forest-wide – Riparian and Aquatic Habitats Guidelines G-11 states: “Naturally occurring vernal pools identified during project planning should not be altered as a result of skidding or construction activities” (USDA Forest Service 2005a). Vernal pools would be impacted by construction activities. With implementation of APMs listed in **Appendix H**, impacts to vernal pools would be minimized. Forest-wide – Water Resources, Floodplains and Wetlands Guideline G-4 states: “Fragmentation of floodplains and wetlands should be avoided when planning corridors (e.g., for power lines, roads, or trails)” (USDA Forest Service 2005a). Alternative 3 would have temporary impacts to wetlands due to the burial of the transmission line. This could create fragmentation to wetlands present if impacts are not properly restored. Furthermore, groundwater hydrology could be impacted due to the burial of the line, which could fragment the flow of groundwater and the surface wetland.

4.5.13.4 Alternative 4a

Impacts from Construction

Watersheds

Under Alternative 4a, construction disturbance in the WMNF Section would impact multiple watersheds including 2 acres (0.8 ha) of the Meadow Brook-Gale River Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 4a.

Surface Water

Under Alternative 4a, less than 0.5 mile (0.8 km) of surface waters would be impacted. Of the less than 0.5 mile (0.8 km) of waterbodies disturbed, less than 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 4a in the WMNF Section, approximately 1 acre (<0.5 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 4a in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 6 acres (2 ha) of disturbance would occur in SWPAs under Alternative 4a in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. Under Alternative 4a in the WMNF Section, no disturbance will occur in WHPAs.

Floodplains

Under Alternative 4a in the WMNF Section, approximately 3 acres (2 ha) of disturbance would occur in FEMA Flood Zones: less than 0.5 acre (<0.5 ha) has a Zone AE designation; and 3 acres (1 ha) have a Zone X designation.

Wetlands

No wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the WMNF Section under Alternative 4a. Temporary, short-term impacts, primarily from transmission cable installation, would affect less than 0.5 acre (<0.5 ha) of PEM wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 4a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

For Alternative 4a in the WMNF Section, impacts from operations, maintenance and emergency repairs would be similar to Alternative 3 (see **Section 4.5.13.3**) as the Project would be underground for both alternatives; however, impacts under Alternative 4a would occur along roadway corridors. Therefore, access for maintenance and emergency repairs would be easier than under Alternative 3, resulting in fewer impacts to water resources.

4.5.13.5 Alternative 4b

Impacts from Construction

Watersheds

Under Alternative 4b, construction disturbance in the WMNF Section would impact multiple watersheds including 3 acres (1 ha) of the Headwaters of the Wild Ammonoosuc River Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 4b.

Surface Water

Under Alternative 4b, approximately less than 0.5 mile (0.8 km) of surface waters would be impacted. Of the less than 0.5 mile (0.8 km) of waterbodies disturbed, less than 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 4b in the WMNF Section, approximately 2 acres (0.8 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 4b in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 15 acres (6 ha) of disturbance would occur in SWPAs under Alternative 4b in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. No disturbance would occur in WHPAs as a result of construction and operational activities under Alternative 4b in the WMNF Section.

Floodplains

Under Alternative 4b in the WMNF Section, approximately 8 acres (5 ha) of disturbance would occur in FEMA Flood Zones: less than 0.5 acre (<0.5 ha) has a Zone AE designation; and 8 acres (3 ha) have a Zone X designation.

Wetlands

No wetlands would experience direct, long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the WMNF Section under Alternative 4b. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately less than 0.5 acre (<0.5 ha) of PEM wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 4b Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs for Alternative 4b in the WMNF Section would be similar to those for Alternative 4a (see **Section 4.5.13.3**) as the Project would be underground roadway corridors for both alternatives.

4.5.13.6 Alternative 4c

Impacts from Construction

Watersheds

Under Alternative 4c, construction disturbance in the WMNF Section would impact multiple watersheds including 3 acres (1 ha) of the Headwaters of the Wild Ammonoosuc River Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 4c.

Surface Water

Under Alternative 4c, less than 0.5 mile (0.8 km) of surface waters would be impacted. Of the less than 0.5 mile (0.8 km) of waterbodies disturbed, none are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 4c in the WMNF Section, approximately 1 acre (<0.5 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 4c in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 11 acres (4 ha) of disturbance would occur in SWPAs under Alternative 4c in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. No disturbance would occur in WHPAs as a result of construction and operational activities under Alternative 4c in the WMNF Section.

Floodplains

Under Alternative 4c in the WMNF Section, approximately 6 acres (2 ha) of disturbance would occur in FEMA Flood Zones, with all 6 acres (2 ha) in Zone X designation.

Wetlands

No wetlands would experience direct short- or long-term impacts because there would be no aboveground structures (e.g., towers and transition stations) in the WMNF Section under Alternative 4c (see **Table 4-200**). No wetlands would experience secondary impacts.

Vernal Pools

No vernal pools were identified in the Alternative 4c Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs on Alternative 4c would be similar to those for Alternative 4a (see **Section 4.5.13.3**) as the Project would be underground roadway corridors for both alternatives.

4.5.13.7 Alternative 5a

Impacts from Construction

Construction impacts from underground portions of the Project would be similar to those for Alternative 4a (see **Section 4.5.13.4)** because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.13.2)**.

Watersheds

Under Alternative 5a, the Project would affect multiple watersheds, including up to 6 acres (1 ha) of the Upper Ammonoosuc River Watershed.

Surface Water

Under Alternative 5a, less than 0.5 mile (0.8 km) of surface waters would be impacted.

Groundwater

Under Alternative 5a in the WMNF Section, approximately 1 acre (<0.5 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 5a in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 14 acres (6 ha) of disturbance would occur in SWPAs under Alternative 5a in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance and excavation activities, and construction activities which could result in increased erosion and sedimentation via runoff. Under Alternative 5a in the WMNF, no disturbance would occur in WHPAs.

Floodplains

Under Alternative 5a in the WMNF Section, approximately up to 12 acres (5 ha) of disturbance would occur in FEMA Flood Zones: less than 0.5 acre (<0.5 ha) has a Zone AE designation; and 12 acres (5 ha) have a Zone X designation.

Wetlands

Under Alternative 5a, less than 0.5 acre (<0.5 ha) wetlands would experience direct, long-term impacts from installation of structures such as towers. Temporary, short-term impacts, primarily from transmission cable installation, would affect 0.7 acre (<0.5 ha) of PEM and PSS wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 5a Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Since the transmission lines/cable would be installed both overhead in the existing PSNH transmission route and underground along roadway corridors, impacts from operations, maintenance, and emergency repairs under Alternative 5a would be similar to Alternative 2 for overhead portions (see **Section 4.5.13.2**) and Alternative 4a for underground portions (see **Section 4.5.13.4**).

4.5.13.8 Alternative 5b

Construction impacts from underground portions of the Project would be similar to those for Alternative 4b (see **Section 4.5.13.5**) because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.13.2**).

Watersheds

Under Alternative 5b, construction disturbance in the WMNF Section would impact multiple watersheds including 11 acres (4 ha) of the Moosilauke River Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 5b.

Surface Water

Under Alternative 5b, less than 0.5 mile (0.8 km) of surface waters would be impacted. Of the 0.5 mile (0.8 km) of waterbodies disturbed, less than 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 5b in the WMNF Section, approximately 130 acres (53 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 5b in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 39 acres (16 ha) of disturbance would occur in SWPAs under Alternative 5b in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance, excavation, and burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. No disturbance would occur in WHPAs as a result of construction and operational activities under Alternative 5b in the WMNF Section.

Floodplains

Under Alternative 5b in the WMNF Section, approximately 29 acres (12 ha) of disturbance would occur in FEMA Flood Zones: less than 0.5 acre (<0.5 ha) has a Zone A designation; and 29 acres (12 ha) have a Zone X designation.

Wetlands

Under Alternative 5b, no wetlands would experience direct, long-term impacts from installation of structures such as towers and transition stations. Temporary, short-term impacts, primarily from transmission cable installation, would affect approximately 1 acre (<0.5 ha) of PEM and PSS wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 5b Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 5b would be similar to Alternative 5a (see **Section 4.5.13.7**), as both alternatives would be located aboveground and belowground.

Forest-wide – Riparian and Aquatic Habitats Guidelines G-2 and G-15 would not be implemented under Alternative 2. Forest-wide – Riparian and Aquatic Habitats Guideline G-2 states: “Uneven-aged silvicultural practices should be used within the Riparian Management Zone (RMZ) along all perennial streams, lakes, ponds, and vernal pools. Cuts should be designed to maintain a relatively continuous forest canopy for the protection and maintenance of water quality, dead wood recruitment, hydrologic function, wildlife habitat, and scenic values. Regeneration group cuts should be limited to less than 1 acre in size. Exceptions may apply in areas deemed important for maintaining beaver colonies. In the absence of on-the-ground riparian mapping, width of RMZs should be defined as in the Table 2-01 [of the Forest Plan] (USDA Forest Service 2005a). Vegetation must be cleared to protect infrastructure and ensure safe operation of the lines and some clearing would occur near perennial streams. Shrubs would be planted in the riparian management zone in areas authorized by a SUP to provide shade, bank stability, and some riparian habitat.

Forest-wide – Riparian and Aquatic Habitats Guideline G-15 states: "Trees that directly provide structure to the streambanks and channels of intermittent streams should be retained" (USDA Forest Service 2005a). Trees must be removed to protect infrastructure and some may be along the banks of intermittent streams. Shrubs would be planted in the riparian management zone in areas authorized by a SUP to provide shade, bank stability and some riparian habitat.

4.5.13.9 Alternative 5c

Impacts from Construction

Construction impacts from underground portions of the Project would be similar to those for Alternative 4c (see **Section 4.5.13.6**) because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.13.2**).

Watersheds

Under Alternative 5c, construction disturbance in the WMNF Section would impact multiple watersheds including 3 acres (1 ha) of the Headwaters of the Wild Ammonoosuc River Watershed, which is the watershed with the largest total disturbance area in the WMNF Section under Alternative 5c.

Surface Water

Under Alternative 5c, less than 0.5 mile (0.8 km) of surface waters would be impacted. Of the less than 0.5 mile (0.8 km) of waterbodies disturbed, less than 0.1 mile (0.1 km) are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 5c in the WMNF Section, approximately 1 acre (<0.5 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 5c in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 20 acres (8 ha) of disturbance would occur in SWPAs under Alternative 5c in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance, excavation and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. There would be no disturbance in WHPAs as a result of operational and construction activities under Alternative 5c in the WMNF Section.

Floodplains

Under Alternative 5c in the WMNF Section, approximately 15 acres (6 ha) of disturbance would occur in FEMA Flood Zone X.

Wetlands

Under Alternative 5c, no wetlands would experience direct, long-term impacts from installation of structures such as towers. Temporary, short-term impacts, primarily from transmission cable installation, would affect less than 1 acre (<0.5 ha) of PEM and PSS wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 5c Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 5c would be similar to Alternative 5a (see **Section 4.5.13.7**) as both alternatives would be located aboveground and belowground.

4.5.13.10 Alternative 6a

Impacts from Construction

In the WMNF Section, impacts from construction on water resources along Alternative 6a would be identical to Alternative 4a (see **Section 4.5.13.4).**

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 6a would be identical to Alternative 4a (see **Section 4.5.13.4**).

4.5.13.11 Alternative 6b

Impacts from Construction

In the WMNF Section, impacts from construction on water resources along Alternative 6b would be identical to Alternative 4b (see **Section 4.5.13.5).**

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 6b would be identical to Alternative 4b (see **Section 4.5.13.5**).

4.5.13.12 Alternative 7 – Proposed Action

Impacts from Construction

Watersheds

Under Alternative 7, construction disturbance in the WMNF Section would impact multiple watersheds including up to 6 acres (2 ha) of the Upper Ammonoosuc River, the watershed with the largest total disturbance area in the WMNF Section under Alternative 7.

Surface Water

Under Alternative 7, less than 0.5 mile (0.8 km) of surface waters would be impacted, of which none are impaired waterbodies on the 303(d) list.

Groundwater

Under Alternative 7 in the WMNF Section, approximately 1 acre (<0.5 ha) of disturbance would occur in locations overlying stratified-drift aquifers, glacial aquifers, till, over and/or glacial lake bottom deposits, surface waterbody, thin stratified-drift aquifer, and medium to fine stratified-drift deposits. No disturbance would occur in areas overlying bedrock aquifers.

Water Supply

Under Alternative 7 in the WMNF Section, no PWS wells would be impacted by construction and operational disturbance. Approximately 15 acres (6 ha) of disturbance would occur in SWPAs under Alternative 7 in the WMNF Section. Potential impacts to SWPAs would include temporary clearing, ground disturbance, excavation and cable burial activities, and construction activities which could result in increased erosion and sedimentation via runoff. No disturbance would occur in WHPAs as a result of construction and operational activities under Alternative 7 in the WMNF Section.

Floodplains

Under Alternative 7 in the WMNF Section, approximately 12 acres (5 ha) of disturbance would occur in FEMA Flood Zone X.

Wetlands

Under Alternative 7, no wetlands would experience direct, long-term impacts from installation of structures such as towers. Temporary, short-term impacts, primarily from transmission cable installation, would affect 0.5 acre (<0.5 ha) of PEM wetlands (see **Table 4-200**). No secondary impacts would occur.

Vernal Pools

No vernal pools were identified in the Alternative 7 Project corridor.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts on water resources from operation, maintenance, and emergency repairs from Alternative 7 would be similar to Alternative 5a (see **Section 4.5.13.7**) as both alternatives would be located aboveground and belowground.

4.5.14 GEOLOGY AND SOILS

Refer to **Section 4.1.14** for a discussion of general impacts common to all geographic sections.

Within the WMNF, the Applicant proposes several measures to minimize impacts, including those provided in the existing SUP, as amended in September 2013. Adherence to the *Best Management Practices Manual for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire*, developed by the NHDES, would also help to minimize impacts associated with soil and erosion control concerns, where impacts are unavoidable. Some of the key measures identified in the SUP include:

- Consistency with Forest Plan standards and guidelines
- Use of low-impact tree clearing.
- Use of appropriate erosion and sediment controls, as necessary.
- Maintaining vegetation along stream banks and within wetlands to the extent possible.

4.5.14.1 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

4.5.14.2 Alternative 2

Impacts from Construction

Under Alternative 2, about 96 acres (39 ha) of surface soils would be impacted in the WMNF Section.

Long-term impacts are anticipated on geology and soils from installation of new towers that would require support structures. This may necessitate blasting depending on the depth of bedrock and the depth to which the structures' foundations are installed. Expansion of the transmission route would require the removal of overhead vegetation and soil disturbance, which could expose soils to additional environmental considerations such as exposure to erosion from additional precipitation or wind. Though these impacts are likely to cause some soil erosion, impacts are expected to be short term.

Under Alternative 2, no faults would be crossed by disturbed areas in the WMNF Section. Approximately 22 acres (9 ha) of disturbance area within the WMNF Section has a high landslide incidence (over 15 percent of the area is involved in landsliding). In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through the implementation of erosion and sediment control plans to provide for slope stability. Approximately 74 acres (30 ha) of disturbance areas within the WMNF Section have a low landslide incidence (less than 2 percent of the area is involved).

Alternative 2 would result in the disturbance of about 96 acres (39 ha) in the WMNF Section. Potential impacts are expected be minimized based on the specific clearing and erosion control practices specified in the introduction to this section. Approximately 0.3 acre (0.1 ha) of hydric soils, approximately 85 acres (34 ha) of partially hydric soils, and approximately 10 acres (4 ha) of non-hydric soils would be impacted by disturbance areas under Alternative 2 in the WMNF Section. The WMNF Section does not cross any Prime Farmland under Alternative 2. The WMNF Section crosses less than 0.1 acre (0.04 ha) of Farmland of Statewide Importance, and 0.7 acre (0.3 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 2. Impacts on soils within the WMNF would be similar to those described in Alternative 2 for the Northern and Central Sections but would affect different areas.

APMs (see **Appendix H**) consider the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

Short-term impacts related to maintenance and emergency repair activities would be similar to short-term construction impacts primarily resulting in erosion from maintenance and emergency repairs. These impacts would occur for a shorter duration than construction impacts, but would occur over the life of the Project. Long-term impacts are not anticipated, except where permanent structures are needed. Short-term or long-term impacts are not anticipated on geology and soils from the operation of the Project under Alternative 2.

4.5.14.3 Alternative 3

Impacts from Construction

Alternative 3 would result in the disturbance of about 52 acres (21 ha) of surface soils in the WMNF Section. The main impact would result from the digging of the trench which accounts for 13 acres (5 ha) of the disturbance area, along with the construction activities associated with the installation of the underground line, which account for 38 acres (15 ha). Underground cable installation would require more grading, trenching, and other excavation along with backfilling compared to aboveground installation resulting in more soil disturbance and exposure to erosion during construction (see **Section 4.1.14**). Granite and granodiorite are the most common bedrock types where construction disturbance would occur.

Under Alternative 3, no faults would be crossed by disturbance areas in the WMNF Section. Approximately 10 acres (4 ha) of disturbance area within the WMNF Section has a high landslide incidence (over 15 percent of the area is involved in landsliding). In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through the implementation of erosion and sediment control plans to provide for slope stability. Approximately 42 acres (17 ha) of disturbance areas within the WMNF Section have a low landslide incidence (less than 2 percent of the area is involved).

Alternative 3 would result in the disturbance of about 52 acres (21 ha) of soil in the WMNF Section due to the Project features listed above. The main impact to soils would result from the digging of the trench which accounts for 13 acres (5 ha) of the disturbance area, along with the construction activities associated with the installation of the underground line, which account for 38 acres (15 ha). Approximately 0.2 acre (0.08 ha) of hydric soils, 47 acres (19 ha) of partially hydric soils, and about 5 acres (2 ha) of not hydric soils would be impacted by disturbance areas under Alternative 3 in the WMNF Section. The WMNF Section does not cross any Prime Farmland or Farmland of Statewide Importance under Alternative 3. Approximately 0.6 acre (0.2 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 3 in the WMNF Section. Impacts on soils within the WMNF would be similar to those described in Alternative 3 for the Northern and Central Sections, but would affect different areas.

APMs (see **Appendix H**) consider the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

Alternative 3 would be buried; long-term impacts on soils are not anticipated from the burial of the transmission cable. Maintenance or emergency repairs could require the short-term disturbance of soils in areas where excavation is required; however, burial of the transmission cable traditionally limits the need for maintenance in general.

4.5.14.4 Alternative 4a

Impacts from Construction

Alternative 4a would traverse the WMNF between approximately MP 71 and MP 80 within roadway corridors. Additionally, I-93 touches the WMNF near MP 91 and MP 102. Under Alternative 4a, approximately 3 acres (1 ha) of surface soils would be impacted in the WMNF Section due to the burial of cable along roadways.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; no faults would be crossed within the disturbance areas in the WMNF Section. Approximately 0.6 acre (0.2 ha) of disturbance area within the WMNF Section has a high landslide incidence. In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through the implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the WMNF Section for Alternative 4a (3 acres [1 ha]) are considered to have low incidence of landslides.

Under Alternative 4a, approximately 4 acres (2 ha) of soil would be in the total disturbance area in the WMNF. Approximately 3 acres (1 ha) of partially hydric soils, and about 0.7 acre (0.3 ha) of soil which are not hydric would be affected by disturbance areas under Alternative 4a in the WMNF Section. There are no farmlands that would be impacted by disturbance areas under Alternative 4a in the WMNF Section.

APMs (see **Appendix H**) consider the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4a would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**), as both alternatives would be located underground. However, Alternative 4a would be located in roadway corridors. Therefore, access to the cable for maintenance and emergency repairs would be easier than under Alternative 3 which would result in fewer impacts to soil resources.

4.5.14.5 Alternative 4b

Impacts from Construction

Alternative 4b would traverse the WMNF from approximately MP 71 to MP 79 and MP 90 to MP 106 within roadway corridors. Under Alternative 4b, approximately 8 acres (3 ha) of surface soils would be in the total disturbance area in the WMNF Section due to the burial of cable along roadways.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; two faults would be crossed at two locations within the disturbance areas in the WMNF Section. Approximately 0.6 acre (0.2 ha) of disturbance area within the WMNF Section has a high landslide incidence. In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the WMNF Section for Alternative 4b (8 acres [3 ha]) are considered to have low incidence of landslides.

Under Alternative 4b, approximately 8 acres (3 ha) of soil would be impacted in the WMNF. Approximately 8 acres (3 ha) of partially hydric soils and about 0.4 acre (0.2 ha) of hydric soils would be affected by disturbance areas under Alternative 4b in the WMNF Section. Approximately 0.1 acre (<0.1 ha) of Prime Farmland, about 0.1 acre (<0.1 ha) of Farmland of Statewide Importance, and no acreage of Farmland of Local Importance would be impacted by disturbance areas under Alternative 4b in the WMNF Section. Approximately 1 acre (0.4 ha) are not considered farmland.

APMs (see **Appendix H**) consider the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4b would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**), as both alternatives would be located underground. However, Alternative 4b would be located in roadway corridors. Therefore, access to the cable for maintenance and emergency repairs would be easier than under Alternative 3 which would result in fewer impacts to soil resources.

4.5.14.6 Alternative 4c

Impacts from Construction

Alternative 4c would traverse the WMNF underground from approximately MP 82 to MP 95 within roadway corridors. Construction impacts on geology and soils would be similar to Alternative 4b (see **Section 4.5.14.5**), although the alternatives would follow slightly different alignments. Under Alternative 4c, approximately 6 acres (2 ha) of surface soils would be impacted in the WMNF Section due to the burial of cable along roadways.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; two faults are crossed at two locations within the disturbance areas in the WMNF Section. All areas of the Project in the WMNF Section for Alternative 4c (6 acres [2 ha]) are considered to have low incidence of landslides.

Under Alternative 4c, approximately 6 acres (2 ha) of soil would be in the total disturbance area in the WMNF. Approximately 6 acres (2 ha) of partially hydric soils and about 0.4 acre (0.2 ha) of soil are not hydric would be affected by disturbance areas under Alternative 4c in the WMNF Section. Approximately 0.1 acre (<0.1 ha) of Prime Farmland, about 0.1 acre (<0.1 ha) of Farmland of Statewide Importance, and no acreage of Farmland of Local Importance would be impacted by disturbance areas under Alternative 4c in the WMNF Section. Approximately 1 acre (0.4 ha) is not considered farmland. APMs (see **Appendix H**) consider the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project's operation, maintenance, and emergency repairs under Alternative 4c would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**), as both alternatives would be located underground. However, Alternative 4c would be located in roadway corridors. Therefore, access to the cable for maintenance and emergency repairs would be easier than under Alternative 3 which would result in fewer impacts to soil resources.

4.5.14.7 Alternative 5a

Impacts from Construction

Alternative 5a would traverse the WMNF aboveground from approximately MP 50 to MP 52 in Stark, NH and near MP 109 in Thornton, NH. Additionally, I-93 corridor touches the WMNF near MP 102. Additionally, Alternative 5a would traverse the WMNF underground in the I-93 corridor. Construction impacts from underground portions of the Project would be similar to those for Alternative 4a (see **Section**

4.5.14.4) because both alternatives follow similar alignments. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.14.2**).

Under Alternative 5a, about 12 acres (5 ha) of surface soils in the WMNF would be in the disturbance area mainly due to the burial of cable in existing roadway corridors as well as construction pads, new installation and new/widening of the roadway corridor, and access roads. Disturbance related to the construction of buried cable would impact approximately 3 acres (1 ha), while the remaining disturbances (9 acres [4 ha]) would be caused by aboveground construction.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes and no faults have been documented within the disturbance areas in the WMNF Section. Approximately 4 acres (2 ha) of disturbance area within the WMNF Section has a high landslide incidence. In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the WMNF Section for Alternative 5a (8 acres [3 ha]) are considered to have low incidence of landslides.

Under Alternative 5a, about 12 acres (5 ha) of soil would be in the total disturbance area in the WMNF. Approximately 11 acres (4 ha) of partially hydric soils and about 0.7 acre (0.3 ha) of soil that is not hydric would be affected by disturbance areas under Alternative 5a in the WMNF Section. No farmland would be impacted by disturbance areas under Alternative 5a in the WMNF Section. The Applicant would need to ensure to accommodate the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

For underground portions of the Project, impacts from operations, maintenance, and emergency repairs under Alternative 5a would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**). However, Alternative 5a would be located in roadway corridors. For aboveground portions of the Project, impacts from operations, maintenance, and emergency repairs would be identical to Alternative 2.

4.5.14.8 Alternative 5b

Impacts from Construction

Alternative 5b would traverse the WMNF aboveground from approximately MP 50 to MP 52 in Stark, NH. Additionally, Alternative 5b would traverse the WMNF underground in roadway corridors between MP 92 to MP 110. Construction impacts from underground portions of the Project would be similar to Alternative 4b (see **Section 4.5.14.5**) as both alternatives follow similar alignments through the WMNF Section. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.14.2**).

Under Alternative 5b, about 29 acres (12 ha) of surface soils in the WMNF would be in the disturbance area mainly due to the burial of cable in the corridor and along roadways as well as construction pads, new installation and new/widening of the corridor. Disturbance related to the construction of buried cable would impact approximately 6 acres (2 ha), while the remaining disturbances (23 acres [9 ha]) would be caused by aboveground construction.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; two faults would be crossed at two locations within the disturbance areas in the WMNF Section. Approximately 13 acres (5 ha) of disturbance area within the WMNF Section has a high landslide incidence. In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed. All other areas of the Project in the WMNF Section for Alternative 5b (16 acres [6 ha]) are considered to have low incidence of landslides.

Under Alternative 5b, about 29 acres (12 ha) of soil would be in the total disturbance area in the WMNF. Approximately 0.3 acre (0.1 ha) of hydric soils, approximately 29 acres (12 ha) of partially hydric soils, and about 0.4 acre (0.2 ha) of soil that is not hydric would be affected by disturbance areas under Alternative 5b in the WMNF Section. Approximately 0.1 acre (<0.1 ha) of Prime Farmland, about 0.1 acre (<0.1 ha) of Farmland of Statewide Importance, and 0.2 acre (<0.1 ha) of Farmland of Local Importance would be impacted by disturbance areas under Alternative 5b in the WMNF Section. About 2 acres (0.8 ha) are not considered farmland. The Applicant would need to ensure to accommodate the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

For underground portions of the Project, impacts from operations, maintenance, and emergency repairs under Alternative 5b would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**). However, Alternative 5b would be located in roadway corridors. For aboveground portions of the Project, impacts from operation, maintenance, and emergency repairs would be identical to Alternative 2.

4.5.14.9 Alternative 5c

Impacts from Construction

Alternative 5c would traverse the WMNF aboveground from approximately MP 50 to MP 52 in Stark, NH. Additionally, Alternative 5c would traverse the WMNF underground between MP 93 to MP 110 within roadway corridors. Construction impacts from underground portions of the Project would be similar to Alternative 4c (see **Section 4.5.14.6**) as both alternatives follow similar alignments through the WMNF Section. Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.14.2**).

Under Alternative 5c, about 15 acres (6 ha) of surface soils in the WMNF would be in the disturbance area mainly due to the burial of cable in existing roadway corridors as well as construction pads, new installation and new/widening of the roadway corridor. Disturbance related to the construction of buried cable would impact approximately 6 acres (2 ha), while the remaining disturbances (9 acres [4 ha]) would be caused by aboveground construction.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; two faults would be crossed at two locations within the disturbance areas in the WMNF Section. Approximately 3 acres (1 ha) of disturbance area within the WMNF Section has a high landslide incidence. In those areas where there is high landslide incidence, impacts on surficial geology would occur and mitigation would be needed through implementation of erosion and sediment control plans to provide for slope stability. All other areas of the Project in the WMNF Section for Alternative 5c (12 acres [5 ha]) are considered to have low incidence of landslides.

Under Alternative 5c, about 15 acres (6 ha) of soil would be in the total disturbance area in the WMNF. Approximately 15 acres (6 ha) of partially hydric soils are affected by disturbance areas under Alternative 5c in the WMNF Section. Approximately 0.1 acre (<0.1 ha) of Prime Farmland, 0.1 acre (<0.1 ha) of Farmland of Statewide Importance, and no Farmland of Local Importance are impacted by disturbance areas under Alternative 5c in the WMNF Section.

The Applicant would need to ensure to accommodate the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. If these requirements are implemented then the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

For underground portions of the Project, impacts from operations, maintenance, and emergency repairs under Alternative 5c would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**). However, Alternative 5c would be located in roadway corridors. For aboveground portions of the Project, impacts from operations, maintenance, and emergency repairs would be identical to Alternative 2.

4.5.14.10 Alternative 6a

Impacts from Construction

Construction impacts under Alternative 6a would be identical to those described for the Project under Alternative 4a and discussed under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project’s operation, maintenance, and emergency repairs under Alternative 6a would be identical to those described for the Project under Alternative 4a.

4.5.14.11 Alternative 6b

Impacts from Construction

Construction impacts under Alternative 6b would be identical to those described for the Project under Alternative 4b and discussed under Alternative 3 in the WMNF Section (see **Section 4.5.12.3**).

Impacts from Operations, Maintenance, and Emergency Repairs

Impacts from the Project’s operation, maintenance, and emergency repairs under Alternative 6b would be identical to those described for the Project under Alternative 4b.

4.5.14.12 Alternative 7 – Proposed Action

Impacts from Construction

Alternative 7 would traverse the WMNF aboveground from approximately MP 50 to MP 52 in Stark, NH. Additionally, Alternative 7 would traverse the WMNF underground between MP 94 to MP 109 within roadway corridors. Construction impacts from underground portions of the Project would be similar to Alternative 4c as both alternatives follow similar alignments through the WMNF Section (see **Section 4.5.14.6**). Impacts from overhead portions would be identical to those resulting from Alternative 2 (see **Section 4.5.14.2**).

Under Alternative 7, about 12 acres (6 ha) of surface soils in the WMNF would be in the disturbance area mainly due to the burial of cable in existing roadway corridors as well as construction pads, new installation and new/widening of the transmission corridor, and access roads. Disturbance related to the construction of buried cable would impact approximately 6 acres (2 ha), while the remaining disturbances (6 acres [2 ha]) would be caused by aboveground construction.

Bedrock outcrops or locations where bedrock is near the surface are common where construction disturbance would occur and could require blasting for cable burial. Blasting may be required for installation of the underground cable. This would be limited to the amount of explosives needed for a localized area; as a result, the impacts on surficial geology from construction of the underground cable are not expected to be adverse in most areas. Additional bedrock fracturing could occur. However, bedrock depth data are not available in this area and the extent of potential impact related to blasting is unknown.

No earthquakes have been documented within the disturbance areas; two faults would be crossed at two locations within the disturbance areas in the WMNF Section. All areas of the Project in the WMNF Section for Alternative 7 (12 acres [5 ha]) are considered to have low incidence of landslides.

Under Alternative 7, about 12 acres (5 ha) of soil would be in the total disturbance area in the WMNF. Approximately 11 acres (4 ha) of partially hydric soils are affected by disturbance areas under Alternative 7 in the WMNF Section, the remaining acreage consists of not hydric soils. Approximately 0.1 acre (<0.1 ha) of Prime Farmland, 0.1 acre (<0.1 ha) of Farmland of Statewide Importance, and no Farmland of Local Importance would be impacted by disturbance areas under Alternative 7 in the WMNF Section.

With the implementation of APMs, the Project would be consistent with the Forest Plan soil stabilization goals and objectives to minimize off-site movement of soil. As a result, the impacts on soils would be short-term and localized.

Impacts from Operations, Maintenance, and Emergency Repairs

For underground portions of the Project, impacts from operations, maintenance, and emergency repairs under Alternative 7 would be similar to those described for the Project under Alternative 3 in the WMNF Section (see **Section 4.5.14.3**). However, Alternative 7 would be located in roadway corridors. For aboveground portions of the Project, impacts from operations, maintenance, and emergency repairs would be identical to Alternative 2 (see **Section 4.5.14.2**).

CHAPTER 5
CUMULATIVE AND OTHER IMPACTS

5 CUMULATIVE AND OTHER IMPACTS

Cumulative impacts are the result of the incremental effects of any action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7). Cumulative impacts can result from individually minor but collectively major actions taking place over a period of time (40 CFR § 1508.7).

This chapter is organized as follows:

- **Section 5.1** presents a discussion of cumulative impacts
- **Section 5.2** describes the adverse environmental effects that cannot be avoided
- **Section 5.3** describes the relationship between the short-term uses of the environment and the maintenance and enhancement of long-term productivity
- **Section 5.4** describes the irreversible and irretrievable commitments of resources

As discussed in **Section 5.4**, an irreversible commitment of a resource is a permanent or essentially permanent use or loss of that resource; the commitment cannot be reversed, except in the extreme long-term. An irretrievable commitment is a loss of production or use of resources for a period of time.

About Chapter 5

This chapter presents a summary of the anticipated cumulative impacts. Further detailed information regarding cumulative impacts is provided in the Technical Resource Reports, which were prepared for each resource area evaluated. These reports are available for review on the EIS website (http://www.northernpasseis.us/library/final-eis/technical-reports)

Additionally, this chapter includes an analysis of other types of potential impacts that are required to be considered under NEPA (**Sections 5.2-5.4**).

Refer to **Chapter 1, Section 1.8** for a discussion of the structure of this document, as well as the "Reader's Guide."

5.1 CUMULATIVE IMPACTS

Cumulative impacts result from past, present, and reasonably foreseeable future actions. The impacts of past actions within the immediate study area are incorporated into the affected environment descriptions in **Chapter 3**. Present projects (i.e., those that are under construction thus are not yet part of the affected environment) and reasonably foreseeable future transportation, energy, and other projects that could, with implementation of the Project, have cumulative environmental impacts are listed in **Appendix D**.

The existing PSNH transmission line (and associated cleared transmission route) is a past action and thus is taken into account in the affected environment (see **Sections 3.1**, **3.2**, **3.3**, **3.4**, and **3.5**). However, it would continue to operate into the future and cumulative impacts could result from ongoing operation, maintenance, and emergency repairs associated with the existing PSNH transmission line.

Cumulative impacts analysis must be conducted within the context of the resource areas. The magnitude and context of the effect on a resource area depends on whether the cumulative effects exceed the capacity of a resource to sustain itself and remain productive (CEQ 1997a). The environmental consequences for visual resources, socioeconomics (including tourism), and recreation are addressed first because they were the most frequently expressed areas of concern during public scoping. Following the discussion of those resources, the final EIS addresses the cumulative impacts for the human and built environment followed by the

Transmission Route

As used within this document, "transmission route" specifically refers to the corridor of land upon which a transmission system (including line/cable and associated facilities) may be located. This term is used to refer to the land currently occupied by the existing PSNH transmission line, as well as the potential location of the Project. Land use authority for the construction and operation of the Project is, or may be, granted to the Applicant via a combination of rights which may include: fee simple ownership, long-term lease agreement, rights-of-way (granted by easement), or SUP (authorized by the USFS).

physical and biological environment. **Table 5-1** presents the past, present, and reasonably foreseeable future projects that have been considered for this final EIS.

Table 5-1. Past, Present, and Reasonably Foreseeable Future Projects

Past Projects	Present Projects	Future Projects
Transportation Projects		
NHDOT Transportation Projects	NHDOT Transportation Projects	NHDOT Transportation Projects
Energy Projects		
Granite Reliable Wind Park	Eversource Energy/National Grid AC Plan	Champlain Hudson Power Express
Groton Wind Power		New England Clean Power Link
Jericho Power Wind		National Grid/Anbaric Green Line
		Planned Natural Gas Pipeline Projects
		Massachusetts Clean Energy RFP Transmission Projects
		Future Wind Projects
Regional Projects		
General Regional/County Growth	General Regional/County Growth	General Regional/County Growth
Forest Plan	Forest Plan	Forest Plan
Miscellaneous Projects		
City of Franklin Brownfield Project – Former Guay's Garage		

5.1.1 VISUAL RESOURCES

5.1.1.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for cumulative impacts consist of the Project's viewshed for aboveground portions (i.e., the area from which the Project could be visible). For underground portions, the spatial bounds consist of the areas within and immediately adjacent to the Project corridors.

Temporal Bounds of Analysis

The temporal bounds for cumulative impacts consist of the duration of construction, operation, and maintenance for aboveground portions of the Project. For underground portions of the Project, the temporal bounds include the duration of construction and future maintenance activities.

Past, Present, and Reasonably Foreseeable Future Actions

- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects
- General Regional/County Growth
- Forest Plan

5.1.1.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.1.3 Alternative 2

Cumulative visual impacts result from the combined, incremental effects of human activity on the landscape. In the forests of New England, the changing electricity resource mix is a contributing source of visual change on relatively undisturbed landscapes. The new energy landscape has large energy generation facilities, such as wind energy projects, often located in a forested setting. These projects can be visible from 10 miles (16 km) or more. In addition to generation facilities, transmission lines are needed to move this electricity to market creating visual impacts.

The overall contrast of proposed new energy generation facilities and related infrastructure in a natural-appearing landscape creates the conditions for potentially widespread scenic degradation. Three types of cumulative impacts are analyzed here:[117]

1. *Combined:* where a viewer could see multiple projects from a stationary point, each separated by a minimum distance (i.e., the viewer looks out at an arc of ±45 degrees).
2. *Successive:* where a viewer could see multiple projects from a particular viewpoint, but not within the same viewing arc (i.e., viewers could have to turn their heads and/or bodies a minimum number of degrees to see another wind project).
3. *Sequential:* where more than one project could be seen as the viewer traveled along a linear route (e.g., hiking trail or scenic highway) or planar surface (e.g., a large water body) but not from a particular viewpoint.

For the cumulative impact analysis for the Project, the greatest cumulative impact to visual resources would be due to the existing PSNH transmission line and the Project under Alternative 2, which could result in combined, successive, and sequential cumulative impacts as described above. **Sections 3.1.1**, **3.2.1**, **3.3.1**, **3.4.1**, and **3.5.1** present the affected environment for the visual resource, which includes the existing PSNH transmission line and the existing developed environment within the study area. The KOPs analyzed in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1** demonstrate the visual condition following construction of the Project; because in many locations the Project would be located in the existing PSNH transmission route, many visual simulations depict both the existing PSNH transmission line as well as the Project. Therefore, many of these KOPs demonstrate the cumulative visual impact of the Project and the existing PSNH transmission line.

Wind energy projects could also impose cumulative visual impacts. The cumulative visual impacts from Alternative 2 and wind energy projects would most commonly be of the sequential, and sometimes successive, type.

- The Granite Reliable Wind Park in Millsfield, NH is approximately 4 miles (6 km) from the Project under Alternative 2. There could be viewpoints where the Granite Reliable Wind Park and the Project would be simultaneously visible, resulting in a combined visual impact to the viewer. For instance, Granite Reliable Wind Park's generator lead line is visible in both the existing photograph and simulation for KOP DU-1.

[117] These categories of cumulative impact were adapted from a report prepared for Maine's Office of Energy Independence and Security that analyzed the cumulative visual impact of wind energy projects (State of Maine OEIS 2012a).

- The Jericho Power Wind project is approximately 12 miles (18 km) from the existing PSNH transmission line and the Project under Alternative 2. There could also be viewpoints where the Jericho Power Wind project and the Project would be simultaneously visible, resulting in a combined impact, particularly from high peaks.
- There may be locations in Millsfield, NH between Granite Reliable Wind Park and the Project under Alternative 2 where there would be a successive impact. For example, viewers would see Granite Reliable Wind Park in one direction and the Project in the opposite direction. The distances are great enough between Jericho Power Wind and Alternative 2 that it is less likely there would be a combined or successive cumulative visual impact.
- Groton Wind Power is approximately 7 miles (11 km) from the Project under Alternative 2. There could be viewpoints where the Groton Wind Power project and the Project may be successively visible. Examples would include viewpoints on Newfound Lake, Audubon's Paradise Point Nature Center, and the state-designated Lakes Region tour, River Heritage Tour, and White Mountain Trail Southern Loop. The more noticeable effect would be the incremental scenic degradation of sequential cumulative visual impacts to people along hiking trails and scenic roads, such as the state-designated Woodland Heritage Trail, Presidential Range Tour, and Moose Path Trail.

Beyond specific projects, two general actions that have visual impacts to the landscape include the management direction contained in the Forest Plan and the general population and development growth that is occurring within the counties the Project is located within. Certain portions of the study area are experiencing increases in population growth and associated infrastructural development and/or increases in tourism and associated development (e.g., the Balsams Resort near Dixville Notch, NH). Additionally, a portion of the Project under Alternative 2 is within the Wagner Forest (commercial forest operation) that has, and will continue to, impact the surrounding environment from a cumulative standpoint. The on-going growth and development contributes to the overall developed character of the landscape. On the WMNF, 92 percent of the Forest is natural appearing and the goal of the Forest Plan is to maintain the natural appearing landscape through adherence to the Scenic Integrity Objectives (SIOs) (USDA Forest Service 2005b). Management areas on the WMNF do allow for uses that impact the natural appearing landscape, including: ski areas, wind towers, telecommunication sites, utility corridors and mining. Timber harvests in areas of the WMNF can also create short-term changes in scenic quality. These types of projects have occurred, are currently visible, and will occur in the future on the WMNF.

Because of the trending developed character of the landscape, Alternative 2 could result in a moderate contribution to cumulative impacts on visual resources.

5.1.1.4 Alternative 3

As discussed in **Section 2.3.3**, the Project would be buried under Alternative 3, and long term visual impacts could result from vegetation clearing for the new transmission route. There could be viewpoints where the Granite Reliable Wind Park and the cleared Alternative 3 corridor for the new transmission route would be simultaneously visible. Similarly, there could be viewpoints where the Groton Wind Power project and the cleared Alternative 3 corridor for the new transmission route would be simultaneously visible. However, due to the burial of Alternative 3, the Project would have limited cumulative impacts.

Chapter 3 presents the affected environment for the visual resource, which includes the existing PSNH transmission line. The KOPs analyzed in **Chapter 4** demonstrate the cumulative impact of certain Alternative 3 locations combined with the existing PSNH transmission line. The majority of the future visibility would be that of the existing PSNH transmission line.

As discussed in Alternative 2, general population growth and development will continue to impact the character of the landscape within the study area. Alternative 3 would have a negligible contribution to the overall cumulative impact on visual resources.

5.1.1.5 Alternative 4a

Because the Project would be buried along existing roadways, Alternative 4a would result in a negligible contribution to cumulative impacts on visual resources.

5.1.1.6 Alternative 4b

Because the Project would be buried along existing roadways, Alternative 4b would result in a negligible contribution to cumulative impacts on visual resources.

5.1.1.7 Alternative 4c

Because the Project would be buried along existing roadways, Alternative 4c would result in a negligible contribution to cumulative impacts on visual resources.

5.1.1.8 Alternative 5a

The greatest cumulative impact to visual resources in close proximity to the Project under Alternative 5a would be where the existing PSNH transmission line and the Project under Alternative 5a would be in the same route, which would result in combined, successive, and sequential cumulative impacts. **Sections 3.1.1**, **3.2.1**, **3.3.1**, **3.4.1**, and **3.5.1** present the affected environment for the visual resource, which includes the existing PSNH transmission line and the existing developed environment within the study area. The KOPs analyzed in **Sections 4.2.1**, **4.3.1**, **4.4.1**, and **4.5.1** demonstrate the cumulative impact of the Project combined with the existing PSNH transmission line.

For the aboveground portions of Alternative 5a, the cumulative impacts would be identical to those presented for Alternative 2. For the buried portion of Alternative 5a, the cumulative impacts would be identical to those presented for the Alternative 4a. Overall, Alternative 5a would result in long term moderate contribution to cumulative impacts on visual resources.

5.1.1.9 Alternative 5b

The cumulative visual impacts under Alternative 5b would be similar to those presented for Alternative 5a. The difference between Alternative 5a and Alternative 5b is the location of the buried portion of the Project in the vicinity of the WMNF.

5.1.1.10 Alternative 5c

The cumulative visual impacts under Alternative 5c would be similar to those presented for Alternative 5a. The difference between Alternative 5a and Alternative 5c is the location of the buried portion of the Project in the vicinity of the WMNF.

5.1.1.11 Alternative 6a

The greatest cumulative impact to visual resources under Alternative 6a would be due to the existing PSNH transmission line and the Project under Alternative 6a where the two would be in the same route south of Franklin, which would result in combined, successive, and sequential cumulative impacts. **Sections 3.1.1**, **3.2.1**, **3.3.1**, **3.4.1,** and **3.5.1** present the affected environment for the visual resource, which includes the existing PSNH transmission line and the existing developed environment within the study area. Two KOPs (CO-4d and DE-1d) specific to Alternative 6a analyzed in **Section 4.4.1.10** demonstrate the cumulative impact of the Project combined with the existing PSNH transmission line.

Alternative 6a would result in a negligible contribution to cumulative impacts on visual resources.

5.1.1.12 Alternative 6b

The cumulative visual impacts under Alternative 6b would be similar to those presented for Alternative 6a. The difference between Alternative 6a and Alternative 6b is the location of the buried portion of the Project.

5.1.1.13 Alternative 7 – Proposed Action

The cumulative visual impacts under Alternative 7 would be similar to those presented for Alternative 5c. The difference between Alternative 5c and Alternative 7 is additional burial of the Project in existing roadways in the Central Section, which would result in a smaller contribution to cumulative visual impacts than Alternative 5c.

5.1.2 SOCIOECONOMICS

5.1.2.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds of the cumulative impacts consist of the ISO-NE region and nearby ISO regions (i.e., New York ISO) that exchange electricity with ISO-NE.

Temporal Bounds of Analysis

The temporal bounds for the cumulative impacts analysis extends from construction through year 2030. Although the Project would continue to operate well beyond 2030, the approximately ten-year horizon is the period in which cumulative effects can be identified, quantified, and considered.

Past, Present, and Reasonably Foreseeable Future Actions

- Champlain Hudson Power Express
- New England Clean Power Link
- National Grid/Anbaric Green Line
- Eversource Energy/National Grid AC Plan
- Planned Natural Gas Pipeline Projects
- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects
- General Regional/County Growth
- Massachusetts Clean Energy RFP Transmission Projects

5.1.2.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.2.3 Alternative 2

Alternative 2, if implemented, may result in cumulative impacts to socioeconomic resources—including economic output (beneficial impact), tourism (negative impact), and electricity system infrastructure (beneficial impact). In general, population growth and development affects socioeconomics within the study area. The reader is referred to **Chapter 3** for socioeconomic (see **Sections 3.1.2**, **3.2.2**, **3.3.2**, **3.4.2**, and **3.5.2**) and land use (see **Sections 3.1.6**, **3.2.6**, **3.3.6**, **3.4.6**, and **3.5.6**) metrics that demonstrate growth trends by county. Other projects planned or underway are also expected to provide long-term, cumulative socioeconomic benefits in the area. Wind projects and Alternative 2 could create cumulative impacts to property values and the property taxes paid to the local jurisdiction if a property is located within 1,000 feet of Alternative 2 and within the viewshed of the wind project. Properties were not individually evaluated for this analysis and are not quantified herein. Additionally, of particular note are other proposed, or pending transmission projects. These projects are considered below.

Under Alternative 2, each of the transmission projects listed above could result in cumulative socioeconomic impacts within the ISO-NE region. In particular, these impacts could take the form of changes to property tax revenue, tourism, consumer spending, and economic output across the region and increases in long-term employment.

Two projects—Champlain Hudson Power Express and New England Clean Power Link—have been approved to be buried underground, as could a selection of future transmission projects associated with the Massachusetts Clean Energy RFP. As described in **Chapter 4**, property values and tourism would not be impacted by underground infrastructure. Thus, cumulative impacts to residential property values and tourism from these projects would not occur in the long-term.

However, the Eversource Energy/National Grid AC Plan contains aboveground components within portions of southern New Hampshire, as could Planned Natural Gas Pipeline projects and a selection of future transmission projects associated with the Massachusetts Clean Energy RFP. Therefore, Alternative 2 could result in adverse cumulative impacts to property values and tourism at a statewide scale when combined with other aboveground construction activities in the same area.

The implementation of other projects affecting electricity system infrastructure could also change the impact of Alternative 2 on wholesale electricity prices across New Hampshire and the ISO-NE region. For the analysis of Alternative 2's operation phase, conditions of the ISO-NE market have been projected through 2030. This evaluation specifically includes foreseeable, publicly announced installations and retirements of generating facilities and transmission lines. At present, conditions in electricity markets across New England and the Northeast do not provide sufficient justification to include specific additions to the U.S. transmission network with a specific timetable prior to the end of the modeling period. However, if completed, Massachusetts Clean Energy RFP transmission projects, Planned Natural Gas Pipeline projects, and others could affect the pricing of wholesale electric power in ISO-NE (and therefore the operation of Alternative 2). Because, like Alternative 2, these other transmission lines would deliver electricity into the Northeast U.S., the impact of each line on wholesale electricity prices would tend to be reduced by the presence of one or more of the other lines.[118]

Alternative 2's individual contribution to cumulative impacts on wholesale electricity costs in the presence of other projects would be less than its impact in the absence of these projects (as described in **Section 4.1.2.2**). The individual contribution to cumulative impacts of Alternative 2 on job creation and economic output in New Hampshire in the presence of other electricity system infrastructure would be commensurately lower, although the impacts due to Alternative 2's construction and maintenance costs and property tax payments would be unaffected by the presence of the TDI projects.

5.1.2.4 Alternative 3

Under Alternative 3, cumulative impacts from the past, present, and reasonably foreseeable projects listed above would be similar to those under Alternative 2 relating to property tax revenue, long-term employment, consumer spending, and economic output across the region. However, because Alternative 3

[118] While it is unknown if any or all potential projects would be constructed, a selection could be constructed and become operational.

would be buried underground, no long-term cumulative impacts would occur to property values and tourism.

The implementation of other projects affecting electricity system infrastructure would also affect the impact of Alternative 3 on wholesale electricity prices across New Hampshire and the ISO-NE region. The types of impacts would be similar to Alternative 2; however, since the transmission capacity of Alternative 3 would be 1,090 MW (instead of 1,200 MW as under Alternative 2), cumulative impacts to total wholesale energy payments would be slightly less.

5.1.2.5 Alternative 4a

Cumulative impacts to socioeconomic resources under Alternative 4a would be similar to those under Alternative 3, considering the spatial bounds of the cumulative impacts analysis and the past, present, and reasonably foreseeable future projects. This is because Alternative 4a would be buried under both alternatives, although in different locations.

5.1.2.6 Alternative 4b

Cumulative impacts to socioeconomic resources under Alternative 4b would be similar to those under Alternative 3, considering the spatial bounds of the cumulative impacts analysis and the past, present, and reasonably foreseeable future projects. This is because the Alternative 4b would be buried under both alternatives, although in different locations.

5.1.2.7 Alternative 4c

Cumulative impacts to socioeconomic resources under Alternative 4c would be similar to those under Alternative 3, considering the spatial bounds of the cumulative impacts analysis and the past, present, and reasonably foreseeable future projects. This is because Alternative 4c would be buried under both alternatives, although in different locations.

5.1.2.8 Alternative 5a

Cumulative impacts to socioeconomic resources under Alternative 5a would be similar to those under Alternative 2, with the exception of impacts to wholesale electricity prices. Because the transmission line under Alternative 5a would have a 1,090 MW capacity, impacts to wholesale electricity prices would be similar to those under Alternative 3. Because the transmission line would be buried in some of the WMNF Section, cumulative impacts to property values and tourism would be less than under Alternative 2.

5.1.2.9 Alternative 5b

Cumulative impacts to socioeconomic resources under Alternative 5b would be similar to those under Alternative 2. Because the transmission line would be buried in some of the WMNF Section, cumulative impacts to property values and tourism would be less than under Alternative 2.

5.1.2.10 Alternative 5c

Cumulative impacts to socioeconomic resources under Alternative 5c would be similar to those under Alternative 2, with the exception of impacts to wholesale electricity prices. Because the transmission line under Alternative 5c would have a 1,090 MW capacity, impacts to wholesale electricity prices would be similar to those under Alternative 3. Additionally, because the transmission line would be buried in some of the WMNF Section, cumulative impacts to property values and tourism would be less than under Alternative 2.

5.1.2.11 Alternative 6a

Cumulative impacts to socioeconomic resources under Alternative 6a would be similar to those under Alternative 3. However, because Alternative 6a includes an overhead, co-located line in the Southern Section, cumulative impacts to property values and tourism could occur in that Section when measured at a larger scale. Individual property values would only experience cumulative impacts if two or more projects affect the same property.

5.1.2.12 Alternative 6b

Cumulative impacts to socioeconomic resources under Alternative 6b would be similar to those under Alternative 3. However, because Alternative 6b includes an overhead, co-located line in the Southern Section, cumulative impacts to property values and tourism could occur in that Section. Individual property values would only experience cumulative impacts if two or more projects affect the same property.

5.1.2.13 Alternative 7 – Proposed Action

Cumulative impacts to socioeconomic resources under Alternative 7 would be similar to those under Alternative 5c. Because an additional portion of the transmission line would be buried, cumulative impacts to property values and tourism would be less than under Alternative 5c.

5.1.3 RECREATION

5.1.3.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the recreation cumulative impacts analysis consist of the Project's viewshed for aboveground portions (i.e., the area from which the Project would be visible). For underground portions, the spatial bounds consist of areas within and immediately adjacent to the Project routes.

Temporal Bounds of Analysis

The temporal bounds for the recreation cumulative impacts analysis consist of the duration of construction, operation, and maintenance for aboveground portions of the Project. For underground portions of the Project, the temporal bounds consist of the duration of construction, maintenance, and emergency repairs.

Past, Present, and Reasonably Foreseeable Future Actions

- Forest Plan
- General Regional/County Growth
- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects

5.1.3.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.3.3 Alternative 2

Recreation impacts from Alternative 2 are presented in **Sections 4.1.3, 4.2.3.2, 4.3.3.2, 4.4.3.2,** and **4.5.3.2** and include short-term and long-term impacts to the recreation experience, primarily as a result of visual impacts. Other projects that will lead to cumulative impacts within the study area include wind power development, the Forest Plan, and general population and infrastructure growth.

The Granite Reliable Wind Park and Jericho Power Wind projects are representative of a trend to build grid-scale wind projects on forested ridgelines. The wind projects and the Project under Alternative 2 may be visible simultaneously from certain viewpoints. If these and future projects are simultaneously visible from a particular viewpoint, their large scale and dispersed nature contributes to a general degradation of the scenic value of recreational resources which has the potential to impact the recreation experience.

The Forest Plan provides management direction for recreation uses across the WMNF. The WMNF is considered an "Urban Forest" and is heavily recreated based on being within a day's drive to 70 million people (USDA Forest Service 2005b). The Forest Plan provides direction for a range of recreational experiences with goals to be achieved. On-the-ground projects (e.g., trail improvements) have occurred since the authorization of the Forest Plan in 2005 and will continue into the future. These projects are designed to improve the recreation experience. Other projects authorized on the WMNF may have short-term and/or long-term negative impacts to the recreation experience (e.g., timber harvest). As site-specific projects are implemented across the WMNF, projects that overlap spatially and/or temporally with Alternative 2 (Alternative 2 recreation impacts on the WMNF are presented in **Section 4.5.3.2**) would lead to cumulative effects. Depending on the type of project, the cumulative impact could be positive or negative.

General population growth and development typically impacts the solitude of the recreation experience. For example, hiking trails begin to see more use because of greater populations in closer proximity or increases in tourism to an area. Additionally, residential and commercial development may fragment trails impacting the user experience. Considering these impacts from other past, present, and reasonably foreseeable future actions, Alternative 2 would have a minor contribution to cumulative impacts on recreation.

5.1.3.4 Alternative 3

The recreation impacts of Alternative 3 are presented in **Sections 4.1.3, 4.2.3.3, 4.3.3.3, 4.4.3.3,** and **4.5.3.3** and would be primarily short-term in nature due to construction. Alternative 3 would have limited recreation impacts; therefore, considering other cumulative projects, Alternative 3 would have a negligible contribution to cumulative impacts on recreation.

5.1.3.5 Alternative 4a

Under Alternative 4a, cumulative impacts would be similar to the cumulative impacts of Alternative 3 because they are both buried and would have limited direct and indirect impacts.

5.1.3.6 Alternative 4b

Under Alternative 4b, cumulative impacts would be similar to the cumulative impacts of Alternative 3 because they are both buried and would have limited direct and indirect impacts.

5.1.3.7 Alternative 4c

Under Alternative 4c, cumulative impacts would be similar to the cumulative impacts of Alternative 3 because they are both buried and would have limited direct and indirect impacts.

5.1.3.8 Alternative 5a

Under Alternative 5a, cumulative impacts would be similar to those under Alternative 2.

5.1.3.9 Alternative 5b

Under Alternative 5b, cumulative impacts would be similar to those under Alternative 2.

5.1.3.10 Alternative 5c

Under Alternative 5c, cumulative impacts would be similar to those under Alternative 2.

5.1.3.11 Alternative 6a

Under Alternative 6a, cumulative impacts would be similar to the cumulative impacts of Alternative 3 because the majority of the Project would be buried and would have limited direct and indirect impacts.

5.1.3.12 Alternative 6b

Under Alternative 6b, cumulative impacts would be similar to the cumulative impacts of Alternative 3 because the majority of the Project would be buried and would have limited direct and indirect impacts.

5.1.3.13 Alternative 7 – Proposed Action

Under Alternative 7, cumulative impacts would be similar to those under Alternative 5c. However, an additional portion of buried transmission line would reduce the cumulative impacts to recreation of Alternative 7 as compared to Alternative 5c.

5.1.4 HEALTH AND SAFETY

5.1.4.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the health and safety cumulative impacts consist of the Project corridors.

Temporal Bounds of Analysis

The temporal bounds for the health and safety cumulative impacts consist of the duration of construction and operation.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects[119]
- City of Franklin Brownfield Project – Former Guay's Garage

5.1.4.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.4.3 Alternative 2

Construction of NHDOT Transportation Projects and any hazardous waste cleanup project would require the use of fuels and hazardous materials. They would also use equipment that could act as an ignition source. Improper handling of hazardous materials or wastes, spills, mobilization of contaminants, damage to other utilities, fires from construction crews, and potential risks to workers could all occur at any construction or operation site.

NHDOT Transportation Projects and maintenance or reconfiguring of the existing PSNH transmission line would involve use of equipment, fuels, and land disturbance. Spills could occur, contamination could be unearthed, or unanticipated fires could occur. In addition, construction of the transportation projects could

[119] Individual NHDOT transportation project location and information is available online at: http://gis.dot.nh.gov/projectviewer/.

increase traffic hazards. However, cumulative impacts would only occur if these projects occur in the same location or in close proximity and at the same time. The potential for any of the NHDOT Transportation Projects to contribute to cumulative impacts, such as increased risk of a large fire due to the Project being located nearby and contributing to such a hazard, would depend on the timing of construction, maintenance, or emergency repairs, but the overall potential is expected to be minor.

Impacts to public safety would occur if an incident (e.g., weather extremes such as lightening, heavy snow loads, and icing) along the Project resulted in an incident along the PSNH transmission line that compromised health and safety. However, with compliance with NESC requirements for spacing of transmission lines from each other and the edge of the transmission route, the normal operation of the Project and the PSNH transmission lines would not be expected to impact health and safety.

The magnetic fields generated by HVDC and HVAC lines are at different frequencies, so they are not directly comparable. Both the magnetic and electric fields are below international exposure limits; therefore, cumulative impacts from exposure to these fields would not be anticipated.

Both Alternative 2 and the existing PSNH transmission line in the Southern Section would be AC lines that would generate EMFs. The levels at the centerline of the Project corridor would exceed the electrical level exposure limits for general public but not for occupational exposure, but would not exceed international exposure limits at edge of the Project corridor.

The cumulative impacts under Alternative 2, combined with the other relevant projects discussed above are anticipated to be minor. Construction worker safety incidents, primarily during construction of the Project (hauling routes) could increase as the Project would generate additional traffic through NHDOT construction zones. Additionally, where the Project crosses roadways that are under construction, a higher likelihood of incidents exist. Considering these impacts from other past, present, and reasonably foreseeable future actions, Alternative 2 would have a minor contribution to cumulative impacts on recreation.

5.1.4.4 Alternative 3

Under Alternative 3, cumulative impacts would be similar to those under Alternative 2, with certain exceptions, explained below.

Because Alternative 3 would be located underground, certain health and safety issues associated with overhead transmission lines (i.e., weather extremes) would not be applicable. Although Alternative 3 would parallel the existing PSNH transmission line, the safety issues would be those exclusively associated with the PSNH transmission line; therefore, no cumulative impacts would occur. Magnetic fields would be generated by the underground cable, but no electric fields would be aboveground.

Cumulative impacts from NHDOT Transportation Projects would be similar to those under Alternative 2, except that ground disturbance and construction duration under Alternative 3 would be greater.

No known existing or reasonably foreseeable projects exist in the vicinity of the North Road Converter Station or Deerfield Substation that could result in similar health and safety impacts; therefore, no cumulative impacts would be expected.

Considering these impacts from other past, present, and reasonably foreseeable future actions, Alternative 3 would have a negligible contribution to cumulative impacts on health and safety, primarily due to the burial of the Project within the existing PSNH transmission route.

5.1.4.5 Alternative 4a

Under Alternative 4a, cumulative impacts from the existing PSNH transmission line would occur where the Project crosses the existing PSNH transmission route. Because the Project would be buried in

Alternative 4a, potential impacts would be those related to EMFs. Magnetic fields would be generated by the underground cable, but no electric fields would be aboveground.

Cumulative impacts from NHDOT Transportation Projects would be expected under Alternative 4a, particularly since the cable would be buried in existing roadway corridors for its entire length. Where Project construction coincided in time and space with NHDOT Transportation Projects, cumulative impacts could occur. Construction of any of these projects could increase traffic hazards to workers where this alternative would be constructed in the roadway.

Because Alternative 4a would be installed underground, certain public safety issues associated with overhead transmission lines (i.e., weather extremes) would not be applicable. Considering these impacts from other past, present, and reasonably foreseeable future actions, Alternative 4a would have a negligible contribution to cumulative impacts on health and safety, primarily due to the burial of the Project and through the application of roadway construction APMs.

5.1.4.6 Alternative 4b

Cumulative impacts under Alternative 4b would be similar to those under Alternative 4a, but Alternative 4b would follow a different roadway in the vicinity of the WMNF. Certain NHDOT Transportation Projects with potential to result in cumulative impacts would differ from Alternative 4a in locations where the two alternatives do not spatially coincide.

Alternative 4b would be within as little as 5 feet (2 m) of a historic gas station located at 770 Lost River Road in North Woodstock, NH. Construction of NHDOT projects could increase traffic hazards to workers where this alternative would be constructed in the roadway. Although no contamination is known to be associated with this location, historic gas stations could have had leaking underground storage tanks or pockets of contaminated soil or groundwater. Therefore, construction of any project concurrently with Alternative 4b could expose contamination. Considering these impacts from other past, present, and reasonably foreseeable future actions, Alternative 4b would have a negligible contribution to cumulative impacts on health and safety, primarily due to the burial of the Project and through the application of roadway construction APMs.

5.1.4.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar to those under Alternative 4b. Certain NHDOT Transportation Projects with potential to result in cumulative impacts would differ from Alternative 4b in locations where the two alternatives do not spatially coincide.

5.1.4.8 Alternative 5a

Cumulative impacts for aboveground portions of Alternative 5a would be identical to those under Alternative 2. For underground portions, cumulative impacts would be identical to those under Alternative 4a.

5.1.4.9 Alternative 5b

Cumulative impacts for aboveground portions of Alternative 5b would be identical to those under Alternative 2. For underground portions, cumulative impacts would be identical to those under Alternative 4b.

5.1.4.10 Alternative 5c

Cumulative impacts for aboveground portions of Alternative 5c would be identical to those under Alternative 2. For underground portions, cumulative impacts would be identical to those under Alternative 4c.

5.1.4.11 Alternative 6a

Cumulative impacts for aboveground portions of Alternative 6a (south of the Franklin Converter Station) would be identical to those under Alternative 2. For underground portions, cumulative impacts would be identical to those under Alternative 4a.

The Former Guay's Garage Brownfield in the City of Franklin is a location that currently has or historically could have had soil or groundwater contamination within 250 feet of the disturbance area for Alternative 6a. Therefore, construction of Alternative 6a could potentially expose residual contamination. Considering these impacts from other past, present, and reasonably foreseeable future actions, the disturbance would have a negligible contribution to cumulative impacts on health and safety.

5.1.4.12 Alternative 6b

Cumulative impacts for aboveground portions of Alternative 6b (south of the Franklin Converter Station) would be identical to those under Alternative 2. For underground portions, cumulative impacts would be identical to those under Alternative 4b.

The Former Guay's Garage Brownfield in the City of Franklin is a location that currently has or historically could have had soil or groundwater contamination within 250 feet of the disturbance area for Alternative 6a. Therefore, construction of any project concurrently with Alternative 6b could potentially expose residual contamination. Considering these impacts from other past, present, and reasonably foreseeable future actions, the disturbance would have a negligible contribution to cumulative impacts on health and safety.

5.1.4.13 Alternative 7 – Proposed Action

Cumulative impacts for aboveground portions of Alternative 7 would be similar to those under Alternative 2. For underground portions, cumulative impacts would be similar to those under Alternative 4c. Certain NHDOT Transportation Projects with potential to result in cumulative impacts would differ from Alternative 4c in locations where the two alternatives do not spatially coincide.

5.1.5 TRAFFIC AND TRANSPORTATION

5.1.5.1 Scope of Analysis

Spatial Bounds of Analysis

The road network throughout much of the study area relies on a few main roadways with limited alternatives, and impacts to transportation are generally considered localized. Therefore, the spatial bounds for the transportation cumulative effects analysis consist of areas 1 mile (1.6 km) on either side of the Project centerline.

Temporal Bounds of Analysis

The temporal bounds for the transportation cumulative effects analysis last for the duration of construction, operation, and maintenance for aboveground portions of the Project. For underground portions of the Project, the temporal bounds last for the duration of construction.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects
- General Regional/County Growth

5.1.5.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.5.3 Alternative 2

NHDOT Transportation Projects and general population growth and development are expected to generate additional traffic from construction vehicles, along with short-term road closures or changes in travel patterns. These types of impacts would be expected to be short-term and localized. This may include additional construction vehicles on roadways during peak traffic hours, short-term road closures, and limited available detours around the Project during construction. Additionally, growth in residential and commercial development will generate increases in long-term vehicular traffic. Under Alternative 2 (see **Sections 3.1.5**, **3.2.5**, **3.3.5**, **3.4.5**, and **3.5.5** and **Sections 4.1.5**, **4.2.5.2**, **4.3.5.2**, **4.4.5.2** and **4.5.5.2** for Alternative 2 impacts), the Project could also result in cumulative impacts to transportation resources when considered together with NHDOT Transportation Projects. Construction activities along roadways would result in cumulative impacts to traffic and transportation if there were an increase in construction and maintenance vehicles on these roadways. The increase in construction vehicles from road repaving or reconstruction combined with construction vehicles from the Project could result in traffic delays on roadways. Alternative 2 would result in a negligible contribution to cumulative impacts on traffic and transportation.

5.1.5.4 Alternative 3

Cumulative impacts would be similar to those under Alternative 2. However, fewer construction vehicles would be needed for the burial of cables; therefore, Alternative 3 would result in a negligible contribution to cumulative impacts on traffic and transportation and would be expected to be less than those under Alternative 2.

5.1.5.5 Alternative 4a

Past, present, and reasonably foreseeable future action would have short-term and long-term impacts to roadways, as presented in Alternative 2. Road construction projects coinciding with the Project, located in or near roadway corridors where the Project would be buried, would result in cumulative impacts to traffic and transportation. Under Alternative 4a (and other alternatives burying the cable in roadway corridors), short-term lane closures would be expected. Therefore, due to the length of transmission line to be buried in roadway corridors, Alternative 4a would result in a substantial short-term contribution to cumulative impacts on traffic and transportation along roadways Alternative 4a is proposed within.

5.1.5.6 Alternative 4b

Cumulative impacts under Alternative 4b would be similar for those described under Alternative 4a, but would impact different roadways.

5.1.5.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar for those described under Alternative 4a, but would impact different roadways.

5.1.5.8 Alternative 5a

Cumulative impacts for aboveground portions of Alternative 5a would be similar to those under Alternative 2. For underground portions (in the WMNF Section), cumulative impacts would be similar to those under Alternative 4a, as the cable would be buried creating a substantial short-term contribution to cumulative impacts on traffic and transportation along those roadways.

5.1.5.9 Alternative 5b

Cumulative impacts for aboveground portions of Alternative 5b would be similar to those under Alternative 2. For underground portions (in the WMNF Section), cumulative impacts would be similar to those under Alternative 4b, as the cable would be buried creating a substantial short-term contribution to cumulative impacts on traffic and transportation along those roadways.

5.1.5.10 Alternative 5c

Cumulative impacts for aboveground portions of Alternative 5c would be similar to those under Alternative 2. For underground portions (in the WMNF Section), cumulative impacts would be similar to those under Alternative 4c, as the cable would be buried creating a substantial short-term contribution to cumulative impacts on traffic and transportation along those roadways.

5.1.5.11 Alternative 6a

Cumulative impacts for underground portions of Alternative 6a would be identical to those under Alternative 4a. For aboveground portions (south of the Franklin Converter Station), cumulative impacts would be similar to those under Alternative 2.

5.1.5.12 Alternative 6b

Cumulative impacts under Alternative 6b would be identical to those under Alternative 4b (in the underground sections) and Alternative 2 for the rest of the route, because the transmission cable would follow the same route as these alternatives.

5.1.5.13 Alternative 7 – Proposed Action

Cumulative impacts for aboveground portions of Alternative 7 would be similar to those under Alternative 5c. For underground portions, cumulative impacts would be similar to those under Alternative 4c, as the cable would be buried creating a substantial short-term contribution to cumulative impacts on traffic and transportation along those roadways.

5.1.6 LAND USE

5.1.6.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial extent of the land use cumulative impacts analysis consists of each of the five study area counties (Coös, Grafton, Belknap, Merrimack, and Rockingham).

Temporal Bounds of Analysis

The temporal extent of the cumulative impacts analysis includes the duration of construction, operation, and maintenance.

Past, Present, and Reasonably Foreseeable Future Actions

- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects
- General Regional/County Growth
- Forest Plan

5.1.6.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.6.3 Alternative 2

Alternative 2 would have limited impacts on land use (see **Chapter 4**), and will result in the conversion of land to different uses. Alternative 2 impacts on land use are presented in **Sections 4.1.6, 4.2.6.2**, **4.3.6.2**, **4.4.6.2**, and **4.5.6.2**. Aside from Alternative 2, the majority of land use changes are occurring through on-going residential and commercial growth as lands are being developed (note, Coös County is experiencing less growth compared to other counties in the study area) and due to other infrastructural projects (e.g., wind power projects). Land use trends within the counties the Project is located within are presented in **Sections 3.2.6.1, 3.3.6.1, 3.4.6.1**, and **3.5.6.1**. The Forest Plan allocates management areas for lands within the WMNF. Each management area includes different desired future conditions and standards and guidelines to achieve those desired future conditions (see **Section 3.5.6**). Because the majority of the Project would be constructed in either the existing PSNH transmission route, a roadway corridor (areas which are already developed or where land use would not change as a result of the Project), and currently managed lands (Wagner Forest commercial operation), Alternative 2 would have a negligible contribution to cumulative impacts on land use.

5.1.6.4 Alternative 3

Cumulative impacts to land use under Alternative 3 would be similar to those under Alternative 2.

5.1.6.5 Alternative 4a

Land use impacts from Alternative 4a would be negligible because it would be buried in existing roadways and land use would primarily be impacted from the proposed converter station. Therefore, Alternative 4a would have a negligible contribution to cumulative impacts on land use.

5.1.6.6 Alternative 4b

Cumulative impacts to land use under Alternative 4b would be identical to those under Alternative 4a.

5.1.6.7 Alternative 4c

Cumulative impacts to land use under Alternative 4c would be identical to those under Alternative 4a.

5.1.6.8 Alternative 5a

Cumulative impacts to land use under Alternative 5a would be similar to those under Alternative 2, but impacts from the underground portions would have negligible impacts on land use.

5.1.6.9 Alternative 5b

Cumulative impacts to land use under Alternative 5b would be similar to those under Alternative 2, but impacts from the underground portions would have negligible impacts on land use.

5.1.6.10 Alternative 5c

Cumulative impacts to land use under Alternative 5c would be similar to those under Alternative 2, but impacts from the underground portions would have negligible impacts on land use.

5.1.6.11 Alternative 6a

Because the aboveground portion of the Project would be located within an existing transmission route and the buried portion would be located within existing roadway corridors, Alternative 6a would have a negligible contribution to cumulative impacts on land use.

5.1.6.12 Alternative 6b

Cumulative impacts to land use under Alternative 6b would be similar to those under Alternative 6a.

5.1.6.13 Alternative 7 – Proposed Action

Cumulative impacts to land use under Alternative 7 would be similar to those under Alternative 5c. The additional underground portion would have negligible impacts on land use.

5.1.7 NOISE

5.1.7.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds of the noise cumulative impacts analysis consist of a corridor 0.25 mile (0.4 km) on each side of the Project corridors. This study area was further refined based on the analysis and focused on the area where noise levels could exceed thresholds established by EPA and USDOT.

Temporal Bounds of Analysis

The temporal bounds of the cumulative impacts analysis consist of the duration of construction, operation, and maintenance.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects
- General Regional/County Growth
- Forest Plan

5.1.7.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.7.3 Alternative 2

The addition of Alternative 2 within the existing PSNH transmission route could create additional noise within the transmission route resulting in an impact during construction and from corona noise during operation. The audible corona noise level contribution from the Project's overhead HVDC transmission line would be identical to those described in **Section 4.1.7**. The audible noise due to the corona effect would not exceed the EPA guidance level of Ldn of 55 dBA for outdoor areas beyond the transmission route.

NHDOT Transportation Projects, such as road improvements and repair, could occur near Alternative 2 during construction. If the schedule for these projects coincided with this Project, it would generate more noise than one project alone and could have short-term impacts on the noise environment. These impacts would last only for several days at a time until construction associated with the Project moved along the route.

General residential and commercial development that will continue to occur in the future will create short-term construction related noise impacts and long-term vehicular related noise impacts. The Forest Plan includes direction, primarily related to recreation intensity that indirectly manages the noise levels within areas of the WMNF (e.g., level of solitude).

Considering these activities, Alternative 2 would have a minor contribution to cumulative impacts on noise.

5.1.7.4 Alternative 3

Cumulative noise impacts under Alternative 3 would be identical to those under Alternative 2, except the lack of additional corona noise under Alternative 3.

5.1.7.5 Alternative 4a

Less than 1 mile (1.6 km) of the Project under Alternative 4a would be located within the existing PSNH transmission route. Therefore, cumulative noise impacts from the existing PSNH transmission line could occur, but the extent of those impacts would be limited.

Because the Project would be buried in roadway corridors under Alternative 4a, any NHDOT Transportation Projects occurring at the same time and nearby the Project would result in cumulative noise impacts. This could occur with the rehabilitation of the I-93 bridge over the Winnipesaukee River in the Southern Section. Because the area around this bridge is industrial, noise impacts would likely be limited.

Considering these activities, Alternative 4a would have a minor contribution to cumulative impacts on noise.

5.1.7.6 Alternative 4b

NHDOT Transportation Projects, such as road resurfacing of NH Route 116 in Franconia, NH from Harvard Street to Wells Road or the reconstruction of the intersection of US Route 3 and Industrial Park Drive, could coincide with construction of Alternative 6b. Generally, cumulative impacts to noise under Alternative 4b would be similar to those under Alternative 4a.

5.1.7.7 Alternative 4c

Because the Project would be buried in roadway corridors under Alternative 4c, any NHDOT Transportation Projects occurring at the same time and nearby the Project would result in cumulative noise impacts. This could occur with the road resurfacing of NH Route 116 in Franconia, NH from Harvard Street to Wells Road.

Generally, Cumulative impacts to noise under Alternative 4b would be similar to those under Alternative 4a.

5.1.7.8 Alternative 5a

Cumulative impacts for aboveground portions of Alternative 5a would be identical to those under Alternative 2 from both the existing PSNH transmission line and NHDOT Transportation Projects. For underground portions of Alternative 5a, cumulative impacts would be identical to those under Alternative 4a.

5.1.7.9 Alternative 5b

Cumulative impacts for aboveground portions of Alternative 5b would be identical to those under Alternative 2 from both the existing PSNH transmission line and NHDOT Transportation Projects. For underground portions of Alternative 5b, cumulative impacts would be identical to those under Alternative 4b.

5.1.7.10 Alternative 5c

Cumulative impacts for aboveground portions of Alternative 5c would be identical to those under Alternative 2 from both the existing PSNH transmission line and NHDOT Transportation Projects. For underground portions of Alternative 5c, cumulative impacts would be identical to those under Alternative 4c.

5.1.7.11 Alternative 6a

Cumulative impacts for underground portions of Alternative 6a would be identical to those under Alternative 4a. For aboveground portions of Alternative 6a (south of the Franklin Converter Station), cumulative impacts would be identical to those under Alternative 2.

NHDOT Transportation Projects, such as the reconstruction of the intersection of US Route 3 and Industrial Park Drive could coincide with construction of Alternative 6a. Because the area around the intersection is industrial, it is unlikely that recognizable cumulative noise impacts would occur.

5.1.7.12 Alternative 6b

Cumulative impacts for underground portions of Alternative 6b would be identical to those under Alternative 4b. For aboveground portions of Alternative 6b (south of the Franklin Converter Station), cumulative impacts would be identical to those under Alternative 2.

NHDOT Transportation Projects, such as road resurfacing of NH Route 116 in Franconia, NH from Harvard Street to Wells Road or the reconstruction of the intersection of US Route 3 and Industrial Park Drive, could coincide with construction of Alternative 6b. Because the area around the intersection is industrial, it is unlikely that recognizable cumulative noise impacts would occur.

5.1.7.13 Alternative 7 – Proposed Action

Cumulative impacts for aboveground and underground portions of Alternative 7 would be similar to those under Alternative 5c from both the existing PSNH transmission line and NHDOT Transportation Projects. For underground portions of Alternative 7, cumulative impacts would be similar to those under Alternative 4c.

5.1.8 HISTORIC AND CULTURAL RESOURCES

5.1.8.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the historic and cultural cumulative effects analysis consist of the direct and indirect APE as described in **Section 3.1.8**. Adverse cumulative effects on historic and cultural resources may occur if ground disturbance associated with the Project and other present and reasonably foreseeable projects directly destroy or damage archaeological resources, disturb the context of archaeological resources, or affects an NRHP-eligible architectural resource. Cumulative visual impacts from projects associated with aboveground structures are addressed in the visual analysis. For visual impacts to architectural resources, the spatial bounds of analysis extends to where the Project and a past, present and reasonably foreseeable future action can be simultaneously viewed (combined view). Indirect, long-term, adverse visual effects on architectural resources within the indirect APE are likely to occur wherever the reasonably foreseeable future projects are visibly prominent and appear inconsistent with the existing setting of the architectural resources.

Temporal Bounds of Analysis

The temporal bounds for the historic and cultural cumulative effects analysis consist of the duration of construction and operation.

Past, Present, and Reasonably Foreseeable Future Actions

- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects
- NHDOT Transportation Projects
- General Regional/County Growth
- Forest Plan

5.1.8.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.8.3 Alternative 2

Potential cumulative adverse effects to archeological resources could occur if multiple projects were constructed concurrently in close proximity to one another. If these projects occurred in the direct vicinity of the Project in the same timeframe, they would result in cumulative adverse effects to known archaeological sites in addition to previously unidentified sites in archaeologically sensitive areas located within the Project corridor, if these sites could not be avoided during construction. Specifically, surface and subsurface ground-disturbing activities such as clearing, grubbing, grading, excavating, and blasting could result in long-term, adverse cumulative impacts to archaeological resources. These construction activities have the potential to disturb and/or damage the integrity of archaeological sites.

The ANST is crossed by Alternative 2 in the Central Section. Cumulative adverse effects to the ANST, associated with the visibility of the new transmission line and maintenance activities or new tower construction on the existing PSNH transmission line, would be expected. Additionally, other trail improvements or projects that would further modify the visual setting of the ANST would potentially result in cumulative adverse effects to architectural resources.

Projects such as the Granite Reliable Wind Park, Jericho Power Wind, and Groton Wind Power projects, as well as regional residential and commercial development, would be outside the indirect APE (described in **Section 3.1.8**) for architectural resources; however, because the wind projects and the Project could be visible simultaneously from certain viewpoints, cumulative adverse effects to architectural resources could occur.

Future NHDOT Transportation Projects would result in cumulative adverse effects on both archaeological and architectural resources if they resulted in additional subsurface ground disturbance impacting archeological sites, or new landscape features visible within the direct APE, the disturbance area of Alternative 2, or the ZVI for the indirect APE.

5.1.8.4 Alternative 3

Under Alternative 3, cumulative adverse effects to archaeological resources would be similar to those under Alternative 2, but would occur over a greater spatial extent because the cable would be buried for the entire length of the alternative thus potentially disturbing more archeological resources. Visual effects to architectural resources within the indirect APE would also potentially occur for a longer duration during construction. However, cumulative adverse effects to architectural resources during operation would be expected to be limited since the transmission cable would be buried within the existing PSNH transmission route.

5.1.8.5 Alternative 4a

Alternative 4a would have a higher likelihood of NHDOT Transportation Projects contributing to cumulative adverse effects because the cable would be buried in roadway corridors. Specifically, road work and bridge repair/replacement along I-93, US Route 3, NH Route 110, NH Route 16, US Route 2, and Hazen Road would result in cumulative adverse effects to archeological resources if the subsurface ground disturbance impacted archeological sites.

Adverse effects to architectural resources would be expected during the construction periods of NHDOT Transportation Projects, which includes the ANST crossing. However, long-term cumulative adverse effects to architectural resources would not be expected because the transmission cable would be located underground in existing roadway corridors.

Long-term cumulative adverse effects from wind power projects would not be expected because the cable would be buried underground.

5.1.8.6 Alternative 4b

Under Alternative 4b, cumulative adverse effects would be similar to those under Alternative 4a, except in the WMNF where the Project would be buried in a different road corridor. Cumulative adverse effects to archaeological resources would occur if additional subsurface ground disturbance impacted archeological sites. Adverse effects to architectural resources would occur temporarily during construction if coinciding with NHDOT Transportation Projects, but would not be expected to occur during operation because the cable would be buried.

5.1.8.7 Alternative 4c

Under Alternative 4c, cumulative adverse effects would be similar to those under Alternative 4a, except in the WMNF where the Project would be buried in a different roadway corridor. Cumulative adverse effects to archaeological resources would occur if additional subsurface ground disturbance adversely impacts archeological sites. Adverse effects to architectural resources would occur temporarily during construction if coinciding with NHDOT Transportation Projects, but would not be expected to occur during operation because the cable would be buried.

5.1.8.8 Alternative 5a

For aboveground portions of Alternative 5a, cumulative adverse effects would be identical to those under Alternative 2. For underground portions of Alternative 5a (in the WMNF Section), which includes the ANST crossing in Franconia Notch, cumulative adverse effects would be identical to those under Alternative 4a.

5.1.8.9 Alternative 5b

For aboveground portions of Alternative 5b, cumulative adverse effects would be identical to those under Alternative 2. For underground portions of Alternative 5b (in the WMNF Section), cumulative adverse effects would be identical to those under Alternative 4b.

5.1.8.10 Alternative 5c

For aboveground portions of Alternative 5c, cumulative adverse effects would be identical to those under Alternative 2. For underground portions of Alternative 5c (in the WMNF Section), cumulative adverse effects would be identical to those under Alternative 4c.

5.1.8.11 Alternative 6a

Cumulative adverse effects for underground portions of Alternative 6a would be identical to those under Alternative 4a. For aboveground portions of Alternative 6a (south of the Franklin Converter Station), cumulative adverse effects would be identical to those under Alternative 2.

5.1.8.12 Alternative 6b

Cumulative adverse effects for underground portions of Alternative 6b would be identical to those under Alternative 4b. For aboveground portions of Alternative 6b (south of the Franklin Converter Station), cumulative adverse effects would be identical to those under Alternative 2.

5.1.8.13 Alternative 7 – Proposed Action

For aboveground portions of Alternative 7, cumulative adverse effects would be similar to those under Alternative 2. For the additional underground portion of Alternative 7, cumulative adverse effects would be similar to those under Alternative 4c.

5.1.9 ENVIRONMENTAL JUSTICE

5.1.9.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the environmental justice cumulative impacts analysis consist of populations within 1,000 feet (305 m) of the Project corridors.

Temporal Bounds of Analysis

The temporal bounds for the environmental justice cumulative impacts analysis consist of the duration of construction, operation, and maintenance for the Project.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects
- Granite Reliable Wind Park
- Jericho Power Wind
- Groton Wind Power
- Future Wind Projects
- Champlain Hudson Power Express
- New England Clean Power Link
- National Grid/Anbaric Green Line
- Eversource Energy/National Grid AC Plan
- Planned Natural Gas Pipeline Projects

5.1.9.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.9.3 Alternatives 2, 3, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, and 7

The analysis presented in **Chapter 4** did not identify any disproportionately high or adverse impacts to minority or low-income populations. Therefore, the Project, by definition, would not contribute to any cumulative impacts related to environmental justice.

5.1.10 AIR QUALITY

5.1.10.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for air quality cumulative impacts consist of the localized areas of construction in Coös, Rockingham, Merrimack, Belknap, Grafton counties in the vicinity of the Project, as well as changes to the ISO-NE region including a cumulative evaluation of the potential development of the Champlain Hudson Power Express, and the New England Clean Power Link.

Temporal Bounds of Analysis

The temporal bounds for air quality cumulative impacts consist of construction through year 2025.

Past, Present, and Reasonably Foreseeable Future Actions Considered

- Champlain Hudson Power Express
- New England Clean Power Link
- General Regional/County Growth
- Forest Plan
- NHDOT Transportation Projects
- Massachusetts Clean Energy RFP Transmission Projects
- Planned Natural Gas Pipeline Projects

If the Project overlaps with other construction projects (NHDOT Transportation Projects, General Regional/County Growth and Forest Plan) within the study area at the same time, total construction emissions could result in cumulative impacts to air quality. Typical construction activities that result in emissions include fugitive dust from soil disturbance and the emissions from operation of on-road and off-road construction equipment and vehicles. Because exact schedules for the Project or for other construction projects are not available at this time, it is not possible to quantitatively identify the volume of cumulative air quality impacts or loss of carbon sequestration capacity from removal of forest cover.

Other minor construction projects may be planned to occur at the same time within or near the study area, such as the repaving of roads or general maintenance. If they coincide with the construction of the Project, associated construction would result in cumulative impacts to air quality. General Regional/County Growth would continue into the future and would increase population within the same spatial bounds of this analysis. That population growth will further contribute emissions that could affect air quality within the region.

GHG Emissions and Climate Change

The Intergovernmental Panel on Climate Change's (IPCC's) Fifth Assessment Report indicates that changes in many physical and biological systems, such as increases in global temperatures, more frequent heat waves and droughts, rising sea levels, coastal flooding, new risks for natural and human systems, and other potential environmental impacts are linked to changes in the climate system due to increased levels of atmospheric GHGs resulting from human activities (IPCC 2014).

Because GHG emissions are managed regionally but have global impacts, it is difficult to establish the cumulative bounds of analysis for GHG emissions and climate change.

Data presented in **Section 4.1.2** details that the Project would partially replace electricity from other sources of thermal generation (primarily gas and oil) having the effect of reducing cumulative GHG emissions, thereby helping to address climate change. Additionally, the Project would support state and regional renewable energy and GHG emission reduction goals. By increasing the supply of renewable energy to the ISO-NE Region, the Project would contribute to other programs to produce a cumulative beneficial impact on climate change. Therefore, the ISO-NE region was used for the analysis area.

ISO-NE Region: Electricity Generation

Implementation of the Project could have long-term, beneficial cumulative impacts to air quality within the ISO-NE region by reducing thermal electricity generation within the system and thereby reducing annual criteria pollutants and GHG emissions.

To analyze cumulative impacts, a valuation study (GE Energy Consulting 2017) analyzed the potential economic and environmental impacts associated with the Project from in-service through the year 2030, and changes to other regional electricity generation.) For more information about the analysis, see the **Socioeconomics Technical Report** for the Final Environmental Impact Statement, Appendices 8 and 11. Additionally, this study specifically assessed/quantified the potential future (cumulative) impacts of two well publicized potential future transmission projects—Champlain Hudson Power Express and New England Clean Power Link. **Table 5-2** includes the results of this cumulative analysis.

The results from this analysis indicate that the electricity provided to the region from the Project could result in a decrease in the utilization of existing fossil fuel generated electricity across the ISO-NE region. **Table 5-2** shows the projected baseline and annual reduction in environmental pollutant emissions across the ISO-NE region in 2020, 2025, and 2030 with the addition of the Project when also considering the impact of the other reasonably foreseeable future actions.

Table 5-2. Projected Cumulative Annual ISO-NE Emissions, 2020, 2025, and 2030

Emission	2020	2025	2030
Projected, Alternative 1 – No Action			
NO_X (tons)	6,151	6,059	6,515
SO_2 (tons)	872	655	794
CO_2 (metric tons)	22,700,000	24,000,000	25,600,000
Projected Change in Emissions, Alternative 1 – No Action			
NO_X (tons) (percent change)	-732 (-11%)	-644 (-10%)	-685 (-10%)
SO_2 (tons) (percent change)	-418 (-32%)	-268 (-29%)	-242 (-23%)
CO_2 (metric tons) (percent change)	-2,800,000 (-11%)	-2,690,000 (-10%)	-2,530,000 (-9%)

Table 5-2. Projected Cumulative Annual ISO-NE Emissions, 2020, 2025, and 2030

Emission	2020	2025	2030
Projected Emissions, after Project Implementation of 1,200 MW (Alternatives 2 and 5b)			
NO_X (tons)	5,476	5,573	5,917
SO_2 (tons)	618	576	652
CO_2 (metric tons)	19,500,000	21,000,000	22,600,000
Projected Change in Emissions, after Project Implementation of 1,200 MW (Alternatives 2 and 5b)			
NO_X (tons) (percent change)	-1,407 (-20%)	-1,129 (-17%)	-1,282 (-18%)
SO_2 (tons) (percent change)	-673 (-52%)	-347 (-38%)	-384 (-37%)
CO_2 (metric tons) (percent change)	-6,100,000 (-24%)	-5,690,000 (-21%)	-2,530,000 (-20%)
Projected Emissions, after Project Implementation of 1,090 MW (Alternatives 3, 4, 5a, 5c, 6, and 7)			
NO_X (tons) (percent change)	5,575	5,598	5,970
SO_2 (tons) (percent change)	665	544	657
CO_2 (metric tons) (percent change)	19,800,000	21,290,000	22,900,000
Projected Change in Emissions, after Project Implementation of 1,090 MW (Alternatives 3, 4, 5a, 5c, 6, and 7)			
NO_X (tons) (percent change)	-1,308 (-19%)	-1,104 (-16%)	-1,230 (-17%)
SO_2 (tons) (percent change)	-626 (-49%)	-379 (-41%)	-379 (-37%)
CO_2 (metric tons) (percent change)	-5,720,000 (-22%)	-5,430,000 (-20%)	-5,220,000 (-19%)

Based on consideration of the cumulative impacts of the Project and the New England Power Link, it is assumed that other foreseeable actions would not result in a significant change to the projected benefits attributed to the action. Therefore, the Project could have long-term, beneficial cumulative impacts to air quality, in the form of reduced total emissions of NO_x, SO_2, and CO_2, within the ISO-NE region.

5.1.10.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.10.3 Alternative 2

Under Alternative 2, cumulative impacts would occur from construction of the Project and other construction or project activity in the immediate vicinity occurring at the same time. The cumulative impacts to air quality are depicted in **Table 5-2**.

5.1.10.4 Alternative 3

Under Alternative 3, cumulative impacts would occur from construction of the Project and other construction or project activity in the immediate vicinity occurring at the same time. The cumulative impacts to air quality (depicted in **Table 5-2**) would be slightly less than those detailed for Alternative 2 since Alternative 3 would be implemented with a delivery capacity of 1,090 MW.

5.1.10.5 Alternative 4a

Under Alternative 4a, cumulative impacts to air quality would be similar to those discussed for Alternative 3. Because there would be less clearing, disturbed ground, and equipment usage for the underground cable installation along existing roadways when compared to the installation along the existing PSNH transmission route and new transmission route under Alternative 3, the cumulative air emissions and associated impacts would be lower under Alternative 4a compared to Alternative 3.

5.1.10.6 Alternative 4b

Cumulative impacts under Alternative 4b would be similar to those under Alternative 4a. The difference between Alternative 4b and 4a is the burial in different existing roadway corridors through the Northern and Central Sections. The cumulative air pollutant and GHG emissions and impacts for Alternative 4b would result in slightly higher impacts compared to Alternative 4a because of the additional roadway corridor disturbance; however, the difference between alternatives would be negligible when considered cumulatively with other projects.

5.1.10.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar to those under Alternative 4a and 4b. The difference between the alternatives is the burial in different existing roadway corridors through the Central and Southern Sections. The cumulative air pollutant and GHG emissions and impacts for Alternative 4c would result in slightly higher impacts compared to Alternative 4a because of the additional roadway corridor disturbance; however, the difference between alternatives would be negligible when considered cumulatively with other projects.

5.1.10.8 Alternative 5a

Cumulative impacts from construction under Alternative 5a would be similar to those under Alternative 2 (note, Alternative 5a would be constructed with a 1,090 MW capacity). Because there would be less clearing, disturbed ground, and equipment usage for the underground cable installation along existing roadways when compared to the installation along the existing PSNH transmission route and new transmission route under Alternative 2, the cumulative air pollutant and GHG emissions and associated impacts would be lower under Alternative 5a compared to Alternative 2.

5.1.10.9 Alternative 5b

Cumulative impacts under Alternative 5b would be similar to those under Alternative 2. Because there would be less clearing, disturbed ground, and equipment usage for the underground cable installation along existing roadways when compared to the installation along the existing PSNH transmission route and new transmission route under Alternative 2, the cumulative air pollutant and GHG emissions and associated impacts would be lower under Alternative 5b compared to Alternative 2.

5.1.10.10 Alternative 5c

Cumulative impacts under Alternative 5c would be similar to those under Alternative 5a.

5.1.10.11 Alternative 6a

Cumulative impacts under Alternative 6a would be similar to those under Alternative 4a. The difference between the alternatives is the aboveground portion in the Southern Section in the existing PSNH transmission route. The cumulative air pollutant and GHG emissions and impacts for Alternative 6a would result in slightly higher impacts compared to Alternative 4a because of the additional clearing for the aboveground portion; however, the difference between alternatives would be negligible when considered cumulatively with other projects.

5.1.10.12 Alternative 6b

Cumulative impacts under Alternative 6b would be similar to those under Alternative 4a. The difference between the alternatives is the aboveground portion in the Southern Section in the existing PSNH transmission route. The cumulative air pollutant and GHG emissions and impacts for Alternative 6b would result in slightly higher impacts compared to Alternative 4a because of the additional clearing for the aboveground portion; however, the difference between alternatives would be negligible when considered cumulatively with other projects.

5.1.10.13 Alternative 7 – Proposed Action

Cumulative impacts under Alternative 7 would be similar to those under Alternative 5c. Because there would be less clearing, disturbed ground, and equipment usage for the additional portion of underground cable installation along existing roadways when compared to the installation along the existing PSNH transmission route and new transmission route under Alternative 5c, the cumulative air pollutant and GHG emissions and associated impacts would be lower under Alternative 7 compared to Alternative 5c.

5.1.11 WILDLIFE

5.1.11.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for cumulative impacts to wildlife other than to federally-listed wildlife species consist of areas within 0.25 mile (0.4 km) of the centerline of Project corridors. This distance was selected because a number of wildlife species that would utilize the study area would also be expected to be present within 0.25 mile (0.4 km) of the Project corridors given the distribution of similar habitat mainly in the form of forest cover. For federally-listed wildlife species, the analysis includes areas within 1 mile (1.6 km) of the centerline of the Project corridor. A greater distance was chosen for the federally-listed species because they can be more susceptible to adverse effects associated with disturbance. For bat and bird species, a larger spatial bound was established at a county-level scale because the operation of a wind power project could have long-term effects on resident or migratory birds and bats.

Temporal Bounds of Analysis

The temporal bounds for wildlife cumulative impacts varies for construction and operation. Potential cumulative impacts to wildlife from construction, for the most part, would be during the periods of construction. Potential operational cumulative effects to wildlife would mainly occur during repair or maintenance activities, but could also occur at any time during the operation of the Project.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects
- Granite Reliable Wind Park
- Jericho Power Wind
- Future Wind Projects
- General Regional/County Growth
- Forest Plan
- Groton Wind Power

5.1.11.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.11.3 Alternative 2

Impacts to wildlife resources would differ between construction and operation of the Project. During construction, wildlife would be affected by actual vegetation clearing or ground disturbance within the Project corridor, as well as through the alteration of habitats following construction, as the Project overlaps spatially and temporally with other past, present and reasonably foreseeable future actions. Cumulative impacts to wildlife resources would occur primarily through a combination of the following:

- Sensory disturbance
- Mortality/injury
- Increased depredation
- Habitat loss and modification, including potential habitat fragmentation and effects on biodiversity

Impacts to wildlife from Alternative 2 are presented in **Sections 4.1.11, 4.2.11.2**, **4.3.11.2**, **4.4.11.2** and **4.5.11.2**. Other projects potentially affecting wildlife would involve vegetation removal, tree clearing, grading and excavation, and overall general disturbance to wildlife habitats. Because these activities would be localized, the potential for any of them to contribute to cumulative impacts would depend on their proximity to the Project and the timing of construction or operation. The Forest Plan includes standards and guidelines to protect wildlife species and habitat across the WMNF. Individual projects may have short and long-term impacts to wildlife species, but are typically within the range of potential impacts the Forest Plan has considered.

Potential cumulative impacts during construction would occur if multiple projects were conducted concurrently in close proximity. Specifically, the clearing of vegetation and disturbance of wildlife habitats could physically harm or displace wildlife species. In addition, effects such as disturbance related to construction noise could occur. Non-listed wildlife species do not suffer from population-level declines. However, if federally- or state-listed species were to be affected by cumulative effects associated with construction or operation of the Project, those effects would be adverse. With respect to listed federal species, cumulative impacts causing disturbance and displacement would potentially occur to the northern long-eared bat and Indiana bat where additional tree clearing was involved, along with potential mortality from existing and relocated overhead structures on the existing PSNH transmission line. Cumulative effects would also potentially occur to the Karner blue butterfly and Canada lynx if past, present, and reasonably foreseeable future projects resulted in disturbance and loss of habitat, which would adversely affect Karner blue butterfly and Canada lynx should other projects also affect species habitat.

During operation, increased mortality of bird and bat species from operation of existing or proposed projects within the study area could result in cumulative population declines. The operational cumulative impacts to federally-listed species with existing imperiled population numbers (e.g., Indiana bat, northern long-eared bat) would depend upon the extent, timing, and type of tree clearing and the occurrence of mortality during operation.

Existing or proposed wind power projects have avoided, or would avoid, disturbing large perennial streams and wetlands during construction. These projects would also be expected to minimize and mitigate appropriately as specified in any issued CWA Section 401/404 permit. Therefore, construction and operational cumulative impacts to non-listed and listed aquatic species from wind power projects in combination with the Project are not expected. Cumulative impacts to forest fragmentation/modification from tree clearing activities during construction of a wind power project and the Project would be expected.

As the State of New Hampshire has long-range renewable energy goals, including the 25 X '25 Renewable Energy Initiative, future development of renewable energy projects, including wind farms is expected (NHOEP 2017). The Project would result in the loss of high-elevation spruce-fir forests, including the clearing of younger stands, which would result in the future loss of succession to future mature forest stands. One example is the potential loss of future high-elevation mature woodlands on Sugar Hill; this area, along with other areas that occur on narrower ridgelines and steeper terrain at higher elevations, contain unique biological communities. In addition, these areas are typically less likely to be affected by human-related disturbances, including commercial forestry operations, because of their inaccessibility. These areas typically occur above an elevation of approximately 3,000 feet and display characteristics of unharvested high-elevation spruce-fir forests. This impact would be long-term and adverse; however, there is a large amount of similar habitat in the region. According to the New Hampshire Wildlife Action Plan (NHWAP) data, Coös County has approximately 214,000 acres of high-elevation spruce-fir forests. The action alternatives analyzed in the EIS would remove between 0 to 76 acres of high-elevation spruce-fir forests, which represents less than 0.05 percent of the existing community within the county. While most of this disturbance area is not located within these high elevation spruce-fir forest communities on top of ridgelines, future wind projects would likely be sited in these areas, which could lead to cumulative adverse impacts to these unique habitats.

NHDOT Transportation Projects may also occur near the Project, including re-surfacing/re-pavement, road drainage, and new guardrails. The specific locations of these projects have not yet been identified, but cumulative impacts to wildlife resources would only be expected during the construction phase and would be short-term and localized.

Considering these activities, Alternative 2 would have a minor contribution to cumulative impacts on wildlife. Furthermore, cumulatively, the projects would not affect species at the population-level. The exception could be to Indiana and northern long-eared bat. However, APMs in **Appendix H** address impacts to bats to minimize the effects from the Project, which would minimize the potential for cumulative impacts.

5.1.11.4 Alternative 3

Under Alternative 3, cumulative impacts would be similar to those under Alternative 2. Because the transmission cable would be buried, no cumulative operational wildlife impacts would occur directly under Alternative 3. However, short-term cumulative impacts would occur over a longer period of time because burial of the transmission cable would potentially require a longer construction period. Mortality or injuries would potentially occur to less-mobile species due to the presence of construction equipment or crew foot traffic. These cumulative impacts would occur along the entire Project corridor.

NHDOT Transportation Projects for Alternative 3 would have similar cumulative impacts as Alternative 2, with the difference being the duration for construction of the Project between Alternative 2 and Alternative 3.

With respect to federally-listed species, vegetation management, potential mortality from existing overhead structures, and potential mortality from burial of the Project in the existing PSNH transmission route could cause disturbance and displacement, potentially resulting in cumulative impacts to the northern long-eared bat and Indiana bat. Cumulative effects would also potentially occur to the Karner blue butterfly and Canada lynx if past, present, and reasonably foreseeable future projects resulted in disturbance and loss of habitat, which would adversely affect Karner blue butterfly and Canada lynx should other projects also affect species habitat.

Considering these activities, Alternative 3 would have a minor contribution to cumulative impacts on wildlife.

5.1.11.5 Alternative 4a

Under Alternative 4a, cumulative impacts to wildlife resources from the Project would occur, but would be limited to locations where the Project corridor coincided with other past, present, and reasonably foreseeable future projects and would be limited to the duration of construction. Wildlife resources would be impacted temporarily in the vicinity of the Project for the duration of construction due to the presence of construction equipment. Mortality or injuries would potentially occur to less-mobile species due to the presence of construction equipment or crew foot traffic. Because the transmission cable would be buried primarily in roadway corridors, no cumulative operational wildlife impacts would occur under Alternative 4a. However, short-term cumulative impacts would occur over a longer period of time because burial of the transmission cable would potentially require a longer construction period. These cumulative impacts would occur along the entire Project corridor.

Cumulative effects from NHDOT Transportation Projects for Alternative 4a would be more substantial than those discussed for Alternative 3 because of the closer proximity of construction work along the roadway corridors. General road improvement projects may also occur near the Project including re-surfacing/re-pavement, road drainage, and new guardrails. The specific locations of these projects have not yet been identified, but cumulative impacts to wildlife resources would only be expected during the construction phase, and would be short-term and localized.

Considering these activities, Alternative 4a would have a negligible contribution to cumulative impacts on wildlife.

5.1.11.6 Alternative 4b

Cumulative impacts under Alternative 4b would be similar to those under Alternative 4a. The difference between these alternatives is the alignment of the underground portion through the Central and WMNF Sections. Considering these activities, Alternative 4b would have a negligible contribution to cumulative impacts on wildlife.

5.1.11.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar to those under Alternative 4b. The difference between these alternatives is the alignment of the underground portion through the Central and WMNF Sections.

5.1.11.8 Alternative 5a

Cumulative impacts under Alternative 5a would be similar to those under Alternative 2 where the Project is aboveground, and similar to those under Alternative 4a where the Project is buried. Overall, Alternative 5a would have a minor contribution to cumulative impacts on wildlife.

5.1.11.9 Alternative 5b

Cumulative impacts under Alternative 5b would be similar to those under Alternative 2 where the Project is aboveground, and similar to those under Alternative 4b where the Project is buried. Overall, Alternative 5b would have a minor contribution to cumulative impacts on wildlife.

5.1.11.10 Alternative 5c

Cumulative impacts under Alternative 5c would be similar to those under Alternative 2 where the Project is aboveground, and similar to those under Alternative 4c where the Project is buried. Overall, Alternative 5c would have a minor contribution to cumulative impacts on wildlife.

5.1.11.11 Alternative 6a

Cumulative impacts under Alternative 6a would be similar to those under Alternative 4a, except cumulative effects would also potentially occur to the Karner blue butterfly if projects result in disturbance and loss of additional wild lupine communities, which would adversely affect this species. The reason why these cumulative impacts are of concern for Alternative 6a, but not for Alternative 4a, is that 6a includes an aboveground portion through the Southern Section and the Karner blue butterfly is present in that area.

5.1.11.12 Alternative 6b

Cumulative impacts under Alternative 6b would be similar to those under Alternative 4a and 4b, except cumulative effects would also potentially occur to the Karner blue butterfly if projects result in disturbance and loss of additional wild lupine communities, which would adversely affect this species. The difference between alternatives is the aboveground portion through the Southern Section.

5.1.11.13 Alternative 7 – Proposed Action

Cumulative impacts under Alternative 7 would be similar to those under Alternative 5c. Overall, Alternative 7 would have a minor contribution to cumulative impacts on wildlife.

5.1.12 VEGETATION

5.1.12.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for vegetation cumulative impacts consist of areas within 0.25 mile (0.4 km) from the centerline of the Project corridors. This distance was selected as the typical microhabitat requirements of many flora, which would dictate their presence. For federally-listed vegetation species, however, the spatial bounds consists of areas within 1 mile (1.6 km) from the centerline of the Project corridors; a greater distance was chosen for the federally-listed species because they are more susceptible to adverse effects associated with disturbance.

Temporal Bounds of Analysis

The temporal bounds for vegetation cumulative impacts associated with construction and operation varies by alternative, as well as geographic section. Cumulative impacts to vegetation from construction, for the most part, would occur at the actual time of construction. Operational cumulative impacts to vegetation would mainly occur during repair or maintenance activities, but could also occur at any time during the operation of the transmission line or cable.

Past, Present, and Reasonably Foreseeable Future Actions

- NHDOT Transportation Projects
- General Regional/County Growth
- Forest Plan

5.1.12.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.12.3 Alternative 2

Cumulative impacts for vegetation resources would generally be the same during construction and during maintenance activities during operation of the transmission line, although maintenance activities would occur at a much-reduced scale. The Forest Plan provides direction that timber harvest across the WMNF be used for, among other things, wildlife habitat management and improvement and the management of scenic integrity (USDA Forest Service 2005b). Should the construction and operation of Alternative 2 overlap spatially and temporally with a site-specific project allowed for in the Forest Plan short- and long-term impacts to general vegetation resources could occur. The Forest Plan does include standards and guidelines for the protection of species (USDA Forest Service 2005a). Implementation of the Forest Plan could result in long-term impacts to vegetative communities, which could contribute to the modification of forestlands, similar to the widening of the transmission route in forest communities. Activities during this project could include clear cutting of multiple patches of forests, prescribed burns, and other types of harvest. These disturbance activities may have cumulative effects in the Project corridor when considering the removal of forestlands/trees, removal of scrub-shrub communities due to burns, and the impacts due to the presence of construction equipment. Aside from completely clear-cut patches, these silvicultural treatments are meant to improve the quality of vegetative communities through creation of a regeneration age class, and development of uneven-aged structure in forest habitats. Prescribed burns are also necessary for the success of oak/pine communities.

Cumulative effects could also be associated with changes to biodiversity. Fine level (local) species richness would increase, but coarse, landscape level richness/diversity would not. Increases in local species richness of early-successional species would correspond with a reduction in the forest-dependent species and communities that occurred there originally. With the application of appropriate APMs (see **Appendix H**), cumulative impacts related to the spread of noxious weeds or invasive plants would be minimized.

With respect to listed plant species, one federally-listed plant species, the small whorled pogonia, has the potential to occur along the Project corridor, although this plant was not found during DOE field surveys. Cumulative impacts to the small whorled pogonia could occur if this species is later found in the Project corridors and within project areas of other projects.

Potential cumulative impacts on vegetation resources during construction, operation and maintenance could occur if multiple projects were conducted concurrently in close proximity. Specifically, the clearing of any federally- or state-listed vegetation species could result in adverse effects to those vegetation resources with low population-levels or for species which a large portion of the existing population is affected, even if the species is relatively (for a listed species) more abundant. Population-level effects would depend on the proportion of the population affected as well as the population size. Non-listed vegetation species that could be impacted would not suffer from population-level declines.

Cumulative impacts resulting from Alternative 2 and NHDOT Transportation Projects would only be expected during the construction phase and would be short-term and localized. General road improvements projects may also occur near the Project that may include re-surfacing/re-pavement, road drainage, and new guardrails. The specific locations of these projects have not yet been identified, but cumulative impacts to vegetative resources could be expected.

Overall, the development and on-going operation of past, present and reasonably foreseeable future projects, in particular, the general residential and commercial growth that will occur over time, that overlap spatially and temporally with the Project have the potential to cumulatively impact vegetation and listed and non-listed species habitat. The projects would not have cumulative impacts on species, other than the small whorled pogonia, at the population-level. However, APMs in **Appendix H** address impacts to small whorled pogonia to minimize the effects from the Project, which would minimize the potential for cumulative impacts. The spread of noxious weeds would be minimized through the application of APMs described in **Appendix H**. However, the risk of noxious weeds is present, and combined with other projects, the risk would cumulatively increase within the spatial bounds of the analysis.

5.1.12.4 Alternative 3

Short-term cumulative impacts could occur over a longer period of time because burial of the transmission cable could potentially require a longer construction period, as well as a complete removal of vegetation, roots, and potential seedbanks within the soil along with the potential for invasive plants to become established.

Cumulative impacts as a result of the Project under Alternative 3 and from other past, present, and reasonably foreseeable future projects would be similar to those discussed for Alternative 2, but Alternative 3 would have less overstory vegetation removal. Alternative 3 would have more trenching compared to Alternative 2, which could result in greater herbaceous and shrub vegetation impacts.

5.1.12.5 Alternative 4a

Cumulative impacts from the Project under Alternative 4a, combined with past, present, and reasonably foreseeable future projects, would be minor. Alternative 4a would have limited vegetation clearing and would be buried along a roadway corridor; therefore, cumulative impacts would be relatively minor. The greatest impact at a landscape scale is past, present and future residential and commercial development that requires greater amounts of vegetation removal. Construction-related cumulative impacts would include additional forest removal and habitat loss. There are some noxious weeds and invasive plant species that could potentially spread through construction efforts and/or movement of construction vehicles or workers. The application of appropriate APMs would be expected to minimize the spread of noxious weeds.

5.1.12.6 Alternative 4b

Cumulative impacts under Alternative 4b would be similar to those under Alternative 4a. The roadway corridor would be different for Alternative 4b compared to Alternative 4a; however, impacts would be expected to be similar because the distances are similar.

5.1.12.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar to those under Alternative 4a. The roadway corridor south of Whitefield, NH would be different for Alternative 4c compared to Alternative 4a; however, impacts would be expected to be similar because the distances are similar.

5.1.12.8 Alternative 5a

Cumulative impacts under Alternative 5a would be similar to those under Alternative 2. The difference between these alternatives is the underground portion through the Central and WMNF Sections which would have fewer impacts to vegetation.

5.1.12.9 Alternative 5b

Cumulative impacts under Alternative 5b would be similar to those under Alternative 2. The difference between these alternatives is the underground portion through the Central and WMNF Sections which would have fewer impacts to vegetation.

5.1.12.10 Alternative 5c

Cumulative impacts under Alternative 5c would be similar to those under Alternative 2. The difference between these alternatives is the underground portion through the Central and WMNF Sections which would have fewer impacts to vegetation.

5.1.12.11 Alternative 6a

Cumulative impacts under Alternative 6a would be similar to those under Alternative 4a. The difference between these alternatives is the aboveground portion through the Southern Section, which would have similar impacts as Alternative 2.

5.1.12.12 Alternative 6b

Cumulative impacts under Alternative 6b would be similar to those under Alternative 4a. The difference between alternatives is the aboveground portion through the Southern Section, which would have similar impacts as Alternative 2.

5.1.12.13 Alternative 7 – Proposed Action

Cumulative impacts under Alternative 7 would be similar to those under Alternative 5c. The difference between these alternatives is an additional underground portion in the Central Section which would have fewer cumulative impacts to vegetation.

5.1.13 WATER RESOURCES

5.1.13.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the water resources cumulative impacts analysis consist of the watersheds, and the surface water, wetlands and groundwater resources that are contained within those watersheds that occur within or near the Project.

Temporal Bounds of Analysis

The temporal bounds for the water resources cumulative impacts analysis consists of the duration of construction and operation of the Project.

Past, Present, and Reasonably Foreseeable Future Actions

- General Regional/County Growth
- Forest Plan
- NHDOT Transportation Projects
- City of Franklin Brownfield Project – Former Guay's Garage

5.1.13.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.13.3 Alternative 2

In general, cumulative impacts for water resources are distinguished by the nature of the disturbance and relative exposure of a water resource to the impact source. Impacts to surface water resources are measured by the spatial reduction of a resource or through the loss/reduction of the quality of that resource. Surface water resources such as streams, ponds, wetlands, and vernal pools could be affected through impact from a project's footprint or by secondary effects resulting from the construction and operation of a project. Groundwater resources could be affected by elimination/reduction of soil attributes that are critical to groundwater recharge or through the loss of quality as a result of contaminant transmission into aquifers. The effects from all activities identified within the Project's spatial and temporal scope are then assessed in unison with similar effects resulting from other projects and activities, in order to determine the magnitude of those activities that could act in concert to adversely affect a water resource.

Construction of the projects listed above would involve vegetation removal, tree clearing, digging, and grading. Potential cumulative impacts on water resources could occur if multiple projects were conducted concurrently and in close proximity.

Under Alternative 2, the Project could result in cumulative impacts to water resources when considered together with various NHDOT Transportation Projects and projects on the WMNF based on USFS management direction. The Forest Plan has long-term goals for watershed health and improvement; however, it is anticipated that site-specific projects that may occur across the WMNF could have short-term impacts to watersheds and stream health (USDA Forest Service 2005b). The Project would be located within the same transmission route as the existing PSNH transmission line under Alternative 2, which would add to the level of long-term development in the corridor. This could affect water resources in the vicinity of the Project. Although these cumulative impacts would occur primarily during construction, long-term habitat changes within the transmission route could affect hydrologic flow and infiltration potentials.

NHDOT's database indicates that numerous past, present, or reasonably foreseeable future projects are relevant for assessing cumulative impacts of the Project. The majority of the NHDOT Transportation Projects are related to road improvement, including re-surfacing and/or repairs to existing roads, but three bridge replacement/rehabilitation projects are proposed within the Alternative 2 study area. Generally, the greatest potential for impacts to water resources exists during new road construction activities and at bridge construction sites. Road improvement activities may result in limited beneficial surface water or groundwater flow modification, or localized degradation of water quality near the road improvement site as a result of soil erosion. Because there would likely be limited modification to drainage patterns associated with each project identified, off-site and down-gradient impacts are expected to be minimal. NHDOT, in conjunction with NHDES, has developed a manual of BMPs for providing management of routine roadway maintenance activities (NHDOT 2003a).

General landscape development that occurs over time due to population increases changes land cover types (e.g., forested to developed). These changes can impact watersheds, water supplies and groundwater.

If actions described above coincided with the construction of the Project, cumulative impacts to water resources could result. Both the Project and other past, present and reasonably foreseeable future actions could cause short-term, but limited, impacts to water quality in the immediate vicinity of the Project. With the application of APMs, Alternative 2 would result in a minor long-term contribution to cumulative impacts on water resources.

5.1.13.4 Alternative 3

Under Alternative 3, the Project could result in cumulative impacts to water resources when considered together with the existing PSNH transmission line, NHDOT Transportation Projects, projects on the WMNF, and most noteworthy, general residential and commercial development on the landscape. These impacts would be similar to those discussed in Alternative 2. Because the Project would be buried mostly within a new or existing transmission route under Alternative 3, cumulative impacts to water resources could occur for the duration of construction. Operation and maintenance of the Project under Alternative 3 would not result in impacts to water resources. Cumulative impacts from the Project and other projects would be similar to those discussed for Alternative 2. With the application of APMs, Alternative 3 would result in a minor long-term contribution to cumulative impacts on water resources.

5.1.13.5 Alternative 4a

Cumulative impacts from NHDOT Transportation Projects (including one bridge project) relevant to the spatial bounds of Alternative 4a would be similar, but spatially less, compared to either Alternative 2 or Alternative 3. With implementation of APMs during construction, it is expected that cumulative impacts to water resources could occur but would be minimized. With the application of APMs, Alternative 4a would result in a minor long-term contribution to cumulative impacts on water resources.

5.1.13.6 Alternative 4b

Cumulative impacts under Alternative 4b, combined with other past, present, and reasonably foreseeable future actions, would be similar to those under Alternative 4a, except for the consideration of only two bridge rehabilitation projects.

5.1.13.7 Alternative 4c

Cumulative impacts under Alternative 4c, combined with other past, present, and reasonably foreseeable future actions, would be similar to those under Alternative 4a.

5.1.13.8 Alternative 5a

Cumulative impacts under Alternative 5a where it is aboveground would be similar to those under Alternative 2. Outside of the WMNF portion of the Central Section, the Project would be located within the existing PSNH transmission route, which would add to the level of development in the transmission route and further impact water resources that occur within the vicinity of the Project. These activities are expected to be short-term in duration with limited ground disturbance. With the application of APMs, Alternative 5a would result in a minor long-term contribution to cumulative impacts on water resources.

5.1.13.9 Alternative 5b

Cumulative impacts under Alternative 5b would be similar to those under Alternative 2. Outside of the WMNF portion of the Central Section, the Project would be located within the existing PSNH transmission route, which would add to the level of development in the transmission route and further impact water resources that occur within the vicinity of the Project.

5.1.13.10 Alternative 5c

Cumulative impacts under Alternative 5c would be similar to those under Alternative 2.

5.1.13.11 Alternative 6a

Cumulative impacts under Alternative 6a would be similar to those under Alternative 4a. The difference between these alternatives is the overhead portion through the Southern Section.

Additionally, cumulative impacts to water resources could result when considered together with the Former Guay's Garage Brownfield in the City of Franklin, a location that currently has or historically could have had soil or groundwater contamination within 250 feet of the disturbance area for Alternative 6a. Construction of Alternative 6a could potentially expose residual contamination.

5.1.13.12 Alternative 6b

Cumulative impacts under Alternative 6b would be identical to those under Alternative 4a. The difference between these alternatives is the overhead portion through the Southern Section.

Additionally, cumulative impacts to water resources could result when considered together with the Former Guay's Garage Brownfield in the City of Franklin, a location that currently has or historically could have had soil or groundwater contamination within 250 feet of the disturbance area for Alternative 6b. Construction of Alternative 6b could potentially expose residual contamination.

5.1.13.13 Alternative 7 – Proposed Action

Cumulative impacts under Alternative 7 would be similar to those under Alternative 5c. The difference between these alternatives is an additional underground portion through the Central Section.

5.1.14 GEOLOGY AND SOILS

5.1.14.1 Scope of Analysis

Spatial Bounds of Analysis

The spatial bounds for the geology and soils cumulative impacts analysis consist of areas within the width of the cleared corridor for overhead sections and 100 feet (30 m) from the centerline for underground sections. This distance was selected based on the area of potential soil disturbance from the Project.

Temporal Bounds of Analysis

The temporal bounds for geology and soils cumulative impacts analysis consist of the construction phase. Potential cumulative effects to geology and soils from construction, for the most part, would occur at the actual time of construction such as soil compaction for the creation of access roads and vegetation removal that could increase soil erosion.

Past, Present, and Reasonably Foreseeable Future Actions

- General Regional/County Growth
- NHDOT Transportation Projects

5.1.14.2 Alternative 1 – No Action

Under the No Action Alternative, DOE assumes for analytical purposes that the Project would not proceed and none of the potential environmental impacts associated with the Project would occur.

5.1.14.3 Alternative 2

This analysis considers other projects potentially affecting geology and soil resources also affected within the Project corridor. If construction of the identified past, present, and foreseeable future projects and the Project were to overlap, these projects would be expected to have incremental, additive impacts greater than those discussed in **Sections 4.1.14**, **4.2.14**, **4.3.14**, **4.4.14**, and **4.5.14**, except for the existing PSNH transmission route which was incorporated into the baseline analysis (see **Sections 3.1.14**, **3.2.14**, **3.3.14**, **3.4.14**, and **3.5.14**).

Under Alternative 2, the Project could result in cumulative impacts to geology and soils when considered together with the existing PSNH transmission line and various NHDOT Transportation Projects. For the majority of its length, the Project would be located within the existing PSNH transmission route under Alternative 2, which would add to the level of long-term development in the corridor. This could affect geology and soil in the vicinity of the Project. Although these cumulative impacts would occur primarily during construction, long-term changes within the transmission route to geology and soils could affect erosion and soil compaction in what is already a disturbed corridor. In particular, the addition of access roads and vegetation clearing could result in impacts to geology and soils.

NHDOT's database indicates that numerous past, present, or reasonably foreseeable future projects are relevant for assessing cumulative impacts of the Project; however, only a small portion of these projects are within the study area. These projects include general improvements to state and local roads including resurfacing/repaving, drainage, and new guardrails. Generally, the greatest potential for impacts to geology and soils exists during new road construction activities. Road improvement activities may result increased erosion and soil compaction. Both the Project and NHDOT Transportation Projects could cause short-term, but limited, impacts to geology and soils in the immediate vicinity of the Project.

From a cumulative standpoint, the greatest combined impact would result from general growth along the Project corridor. Residential and commercial development will continue to impact soils and geology through ground disturbing activities.

Alternative 2 would result in approximately 1,200 acres of soil disturbance due to vegetation removal, tower construction, etc. Combined with the other actions discussed above, Alternative 2 would result in a moderate contribution to cumulative impacts on geology and soils.

5.1.14.4 Alternative 3

Cumulative impacts under Alternative 3 would be similar to those under Alternative 2 because the overall soil disturbance acreage is generally similar at the scale of the Project. The difference between alternatives is Alternative 3 would be located underground. This would result in increased trenching, which is considered a short-term disturbance. However, less vegetation would need to be removed and the area above the buried cable would be revegetated.

5.1.14.5 Alternative 4a

Combined with the other actions discussed above, Alternative 4a would result in a negligible contribution to cumulative impacts on geology and soils because the Project would be buried in existing roadway corridors.

5.1.14.6 Alternative 4b

Cumulative impacts under Alternative 4b would be slightly greater when combined with other past, present, and reasonably foreseeable future actions than those under Alternative 4a, because of the utilization of different existing roadway corridors and a greater overall area of soil disturbance.

5.1.14.7 Alternative 4c

Cumulative impacts under Alternative 4c would be similar to those under Alternative 4b because these alternatives follow very similar alignments and the area of overall soil disturbance are nearly the same.

5.1.14.8 Alternative 5a

Cumulative impacts under Alternative 5a, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 2. Although Alternative 5a would be partially buried in roadways, the area of overall soil disturbance is similar to that of Alternative 2.

5.1.14.9 Alternative 5b

Cumulative impacts under Alternative 5b, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 2. Although Alternative 5a would be partially buried in roadways, the area of overall soil disturbance is similar to that of Alternative 2.

5.1.14.10 Alternative 5c

Cumulative impacts under Alternative 5b, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 2. Although Alternative 5a would be partially buried in roadways, the area of overall soil disturbance is similar to that of Alternative 2.

5.1.14.11 Alternative 6a

Cumulative impacts under Alternative 6a, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 4a because the area of overall soil disturbance is similar. The difference between these alternatives is the aboveground portion through the Southern Section.

5.1.14.12 Alternative 6b

Cumulative impacts under Alternative 6b, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 4b because the area of overall soil disturbance is similar. The difference between alternatives is the aboveground portion through the Southern Section.

5.1.14.13 Alternative 7 – Proposed Action

Cumulative impacts under Alternative 7, when combined with other past, present, and reasonable foreseeable future actions, would be similar to those under Alternative 2. Although Alternative 7 would be partially buried in roadways, the area of overall soil disturbance is similar to that of Alternative 2.

5.2 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Unavoidable adverse impacts would result from implementation of the Project. Unavoidable adverse impacts occurring during construction would vary by alternative, but would include impacts to visual resources, property values, and recreation; increased risk of health and safety hazards; increased traffic, air emissions, and noise; impacts to cultural and historic resources; wildlife and plant habitat loss and degradation; localized impacts to water resources; and impacts to soil resources.

Maintenance activities and emergency repairs along the Project route, once the Project is operational, could generate unavoidable adverse impacts similar to those occurring during construction. Unavoidable long-term impacts from operations include impacts to visual resources, property values, and recreation; increased risk of health and safety hazards; wildlife and plant habitat loss and degradation; conversion of forested wetlands to scrub-shrub wetlands; and impacts to soil due to compaction and localized bedrock blasting from construction. Portions of the Project located underground would avoid impacts to visual resources and subsequent impacts to recreation, historic and cultural resources, property values, and other resources.

Adverse impacts would be minimized with implementation of the APMs that are applicable to all action alternatives (see **Appendix H**). Additional detail on these impacts is provided in **Chapter 4**.

5.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses of the biophysical components of the human environment include impacts, usually related to construction activities, which occur over a period of less than five years. Long-term uses of the human environment include those impacts that occur over a period of more than five years, including permanent resource loss.

Chapter 4 identifies potential short-term, adverse impacts on the built and natural environment as a result of construction activities. These adverse impacts include impacts to visual resources, property values, and recreation; increased risk of health and safety hazards; increased traffic, air emissions, and noise; impacts to cultural and historic resources; wildlife and plant habitat loss and degradation; localized impacts to water resources; and impacts to soil resources. These kinds of short-term impacts would occur during construction activities in localized areas, occasional maintenance activities (e.g., vegetation management), or emergency repair activities. Generally, disturbed areas would recover once ground-disturbing activities were complete and construction equipment left the area. Adverse impacts would be minimized through the inclusion of APMs (see **Appendix H**).

Long-term impacts of the Project include impacts to visual resources, property values, and recreation; increased risk of health and safety hazards; impacts to cultural and historic resources; wildlife and plant habitat loss and degradation; conversion of forested wetlands to scrub-shrub wetlands; and impacts to soil due to compaction and localized bedrock blasting.

The Project would be expected to have long-term productivity by importing energy into New Hampshire and the ISO-NE region without increasing transmission congestion, applying downward pressure on electricity prices, and replacing fossil-fueled sources of energy.

5.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources refer to impacts on or losses of resources that cannot be reversed or recovered, even after an activity has ended. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. Irretrievable commitment applies to the loss of production, harvest, or natural resources. This section discusses irreversible and irretrievable commitments of resources as result of implementing the Project. Implementation of the Project would result in irreversible and irretrievable commitments of resources; these impacts are permanent.

5.4.1 PROTECTED SPECIES

Construction, maintenance, and emergency repair of the Project could result in mortality to species individuals. Mobile species would be expected to avoid areas within the Project corridor during these ground-disturbing activities. While the loss of an individual of a protected species would be considered an adverse impact, because species would not be impacted at the population-level, it would not be expected to have irreversible or irretrievable impacts on the species as a whole.

A Biological Assessment will be prepared for the Project, in compliance with Section 7 of the ESA. Consultation between DOE and USFWS as required under the ESA is ongoing and is included in **Appendix G**.

5.4.2 HISTORIC AND CULTURAL RESOURCES

Construction, maintenance, and emergency repair of the Project could result in the disturbance of cultural resources. The application of APMs (see **Appendix H**) would minimize the risk of disturbing any belowground cultural resources, but construction activities could have localized impacts on cultural resources. This impact would be irreversible.

5.4.3 AIR EMISSIONS

Construction, maintenance, and emergency repair of the Project could result in air emissions from construction vehicles and other activities. These emissions could have a short-term, localized impact on air quality. This could be considered an irreversible and irretrievable impact. However, in the long-term, the Project could have a beneficial impact on air quality.

5.4.4 WETLANDS HABITAT

Several areas of palustrine forested (PFO) wetlands would be permanently converted to palustrine scrub-shrub (PSS) and/or palustrine emergent (PEM) wetlands during the construction of the Project and would be maintained as PSS and/or PEM wetlands throughout the Project's lifetime. PSS and PEM wetlands are generally considered to be of lower value than PFO wetlands. This would be considered an irreversible and irretrievable impact.

5.4.5 MATERIALS

Material resources irretrievably used for the Project would include copper, lead, steel, concrete, bitumen, and other materials. Because these materials are generally considered to be available, and are not in short supply such that implementation of the Project would limit other unrelated construction activities, the irretrievable use of material resources would not be considered significant.

5.4.6 ENERGY

The Project would result in the irretrievable loss of energy resources due to the use of gasoline and diesel fuel for the operation of vehicles, equipment, trains, and other modes of transport, as well as from the manufacturing of the materials. Long-term operation of transition and converter stations would consume electricity, and maintenance and emergency repairs would also require fuel. Because overall Project-related consumption of energy would not place a significant demand on the regional availability of energy resources, limited impacts would be expected.

5.4.7 HUMAN RESOURCES

The use of human resources for construction, maintenance, and emergency repairs is considered irretrievable because it would not allow such personnel to engage in other work activities. However, because the use of human resources represents employment opportunities, it is considered a beneficial commitment of resources.

5.4.8 GEOLOGY

Bedrock blasting, which could be required along the Project route to install underground portions of the Project, would affect local geology through modification of the surface layer of the bedrock. This would be considered an irreversible and irretrievable commitment of geologic resources. Impacts would be expected to be isolated only to those areas requiring blasting.

CHAPTER 6
LIST OF PREPARERS

6 LIST OF PREPARERS

This section lists the individuals who filled primary roles in the preparation of this final EIS. Brian Mills of the DOE Office of Electricity Delivery and Energy Reliability directed the preparation of the EIS. The EIS Preparation Team, led by Kent Sharp of the EIS contractor SE Group, provided primary support and assistance to DOE. Other members of the team included a range of resource specialists, NEPA specialists, and technical writers.

DOE provided direction to SE Group, which was responsible for developing analytical methodology and assessing the potential impacts of the alternatives, coordinating the work tasks, performing the impact analyses, and producing the document. DOE was responsible for the scope, content, and organization of the EIS data quality, and issue resolution and direction.

DOE independently evaluated all supporting information and documentation prepared by SE Group. Further, DOE retained the responsibility for determining the appropriateness and adequacy of incorporating any data, analyses, and results of other work performed by SE Group in this final EIS. SE Group was responsible for integrating such work into this final EIS.

As required by Federal Regulations (40 CFR § 1506.5(c)) SE Group signed a NEPA Disclosure Statement in relation to the work they performed on this EIS. This statement is provided on the project website (http://northernpasseis.us/media/documents/DOE_NP_SE_MOU_8_12_2011.pdf).

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CHAPTER 7
REFERENCES

7 REFERENCES

In-text Citation	Reference
ACHP 2013	Advisory Council on Historic Preservation. 2013. NEPA and NHPA A Handbook for Integrating NEPA and Section 106.
Armstrong 2012a	Armstrong, Drew. 2012. Irene's Trail of Damage: Deaths, Flooding, Losses of Power State-by-State. *Bloomburg News* August 8, 2012. http://www.bloomberg.com/news/2011-08-29/hurricane-irene-damage-deaths-flooding-losses-of-power-state-by-state.html. Accessed October 17, 2013.
Audubon 2017	Audubon. 2017. Conservation – Important Bird Areas. http://www.audubon.org/important-bird-areas. Accessed May 24, 2017.
BAPE 2009	Bureau d'audiences publiques sur l'environnmente (BAPE). 2009. *Romaine River Hydroelectric Complex Development Project – Investigation and Public Hearing Report* (Québec City, Canada: February 27, 2009).
Belin 2013	Belin, D. 2013. Personal Communication with Daniel Lee, Plymouth State University, regarding taxable sales paid by travelers by county, FY 2004 to 2014. November 1, 2013.
Belknap County 2009a	Belknap County. 2009. Belknap County Profile. Laconia, NH.
Black & Veatch Corporation 2013a	Black & Veatch Corporation. 2013. Natural Gas Infrastructure and Electric Generation: Proposed Solutions for New England. Prepared for The New England States Committee on Electricity.
BLM 1986a	Bureau of Land Management. 1986. Visual Resource Contrast Rating. BLM Manual 8431-1.
BLM 2011a	Bureau of Land Management. 2011a. North Steens 230-kV Transmission Line Project Final Environmental Impact Statement. Hines, OR.
BLM 2013a	Bureau of Land Management. 2013a. Final Environmental Impact Statement for the Gateway West Transmission Line Project. Cheyenne, WY.
BLM 2013b	Bureau of Land Management. 2013b. Final Environmental Impact Statement and Proposed Resource Management Plan Amendments for the SunZia Southwest Transmission Project. Santa Fe, NM.
Blondin et al. 1996	Blondin, Jean-Pierre et al. 1996. Human perception of electric fields and ion currents associated with high-voltage DC transmission lines. *Bioelectromagnetics* 17.3: 230-241.
BLS 2015a	Bureau of Labor Statistics. 2015a. Table A-1. Fatal occupational injuries by industry and even or exposure, all United States, 2015. U.S. Department of Labor, Washington, D.C. https://www.bls.gov/iag/tgs/iag23.htm#fatalities_injuries _and_illnesses. Accessed February 14, 2017.
BLS 2015b	Bureau of Labor Statistics. 2015b. Table 1. Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2015. U.S. Department of Labor, Washington, D.C. https://www.bls.gov/iag/tgs/iag23.htm#fatalities_injuries_and_illnesses. Accessed February 14, 2017.
BLS 2015c	Bureau of Labor Statistics. 2015c. Table 2. Numbers of nonfatal occupational injuries and illnesses by industry and case types, 2015. U.S. Department of Labor, Washington, D.C. https://www.bls.gov/iag/tgs/iag23.htm#fatalities_injuries_and_illnesses. Accessed February 14, 2017. https://www.bls.gov/iag/tgs/iag23.htm#fatalities_injuries_and_illnesses. Accessed February 14, 2017.

In-text Citation	Reference
BLS 2016a	Bureau of Labor Statistics. 2016a. Databases, Tables & Calculators by Subject – New Hampshire. U.S. Department of Labor, Washington, D.C. https://data.bls.gov/timeseries/LASST330000000000005. Accessed December 2016.
BLS 2016b	Bureau of Labor Statistics. 2016b. Local Area Unemployment Statistics – New Hampshire. U.S. Department of Labor, Washington, D.C. https://www.bls.gov/lau/. Accessed December 2016.
BLS 2017a	Bureau of Labor Statistics. 2017a. The Employment Situation – April 2017. News Release. May 5, 2017. U.S. Department of Labor, Washington, D.C.
Boisvert 2003a	Boisvert, Richard. 2003a. Wintertime Archaeological Fieldwork. January. Concord, NH.
Boisvert 2013a	Boisvert, Richard A., Ph.D. 2013a. Letter dated March 28, 2013, from Richard A. Boisvert, Ph.D., State Archaeologist and Deputy State Historic Preservation Officer, New Hampshire Division of Historical Resources, State of New Hampshire, Department of Cultural Resources, Concord, New Hampshire, to Brian Mills, National Electricity Delivery Division, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C. Re: *Northern Pass Transmission, LLC Presidential Permit Application, Area of Potential Effects*.
Boisvert 2015a	Boisvert, Richard A., Ph.D. 2015a. Letter dated April, 2015, from Richard A. Boisvert, Ph.D., State Archaeologist and Deputy State Historic Preservation Officer, New Hampshire Division of Historical Resources, State of New Hampshire, Department of Cultural Resources, Concord, New Hampshire, to Brian Mills, National Electricity Delivery Division, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C. Re: *APE Determinations for Alternative, Northern Pass Transmission, LLC Presidential Permit Application, RPR-4680*.
Bottemiller and Wolverton 2013a	Bottemiller, S.C. and M.L Wolverton. 2013a. The Price Effects of HVTLs on Abutting Homes. *The Appraisal Journal*. Winter: 45-62.
Boudette 1994a	Boudette, E.L. 1994a. Earthquakes in New Hampshire. Environmental Fact Sheet GEO-3. New Hampshire Department of Environmental Services, Concord, NH.
BPA 2007a	Bonneville Power Authority. 2007a. Living and Working Safely Around High-Voltage Power Lines. Portland, OR, DOE/BP-3804. http://www.bpa.gov/news/pubs/GeneralPublications/lusi-Living-and-working-safely-around-high-voltage-power-lines.pdf. Accessed August 19, 2014.
Brown 1976a	Brown, Dean J.A. 1976a. The effect of power line structures and easements on farm land values. *Right of Way.* December 1975-January 1976: 33-38.
BAPE n.d.	Bureau d' audiences publiques sur l'environment. n.d. http://www.bape.gouv.qc.ca/sections/participer/eng_participate-ind.htm
Callanan and Hargreaves 1995a	Callanan, Judith and R.V. Hargreaves. 1995a. The effect of transmission lines on property values. *New Zealand Valuers' Journal.* June 1995: 35-38.
CEQ 1981a	Council on Environmental Quality. 1981a. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. March.
CEQ 1997a	Council on Environmental Quality. 1997a. Considering Cumulative Effects Under the National Environmental Policy Act. Washington, D.C. January.

In-text Citation	Reference
CEQ 1997b	Council on Environmental Quality. 1997b. Environmental Justice: Guidance Under the National Environmental Policy Act. Washington, D.C. December.
CEQ 2014a	Council on Environmental Quality. 2014. Draft Guidance on GHG and Climate Change for NEPA for Federal Agencies. Washington, D.C. December 18, 2014. http://www.whitehouse.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance.pdf. Accessed December 22, 2014.
CENELEC Standard EN 50527 2010	European Committee for Electrotechnical Standardization – Standard EN 50527-1. 2010. Procedure for the assessment of the exposure to electromagnetic fields of workers bearing active implantable medical devices – Part 1: General. Belgium.
Chalmers and Voorvaart 2009a	Chalmers, James A. and Frank A. Voorvaart. 2009. *The Appraisal Journal.* Summer 2009: 227-245.
Chalmers 2012a	Chalmers, James A. 2012. High-voltage transmission lines and rural, western real estate values. *The Appraisal Journal.* Winter 2012: 30-45.
Claesson et al. 2014a	Claesson, Stefan, Ph.D., Jacob Freedman, MA, and Christopher Clement, Ph.D. 2014a. Final Phase IA Archaeological Investigations for the Proposed Northern Pass Transmission Project, Coos, Grafton, Belknap, Merrimack, and Rockingham Counties, New Hampshire, NHDHR Project Review Number RPR-4680. Prepared by Stefan Claesson, Ph.D., Senior Principal Investigator, Jacob Freedman, MA, and Christopher Clement, Ph.D., SEARCH, Newberry, Florida. Prepared for United State Department of Energy, Office of Electricity Delivery and Energy Reliability, Washington, D.C. September.
Claesson et al. 2014b	Claesson, Stefan, Jacob Freedman, and Jenna Higgins. 2014b. Executive Summary: Northern Pass Transmission Project, New Hampshire. Prepared by Stefan Claesson, Senior Principal Investigator, Jacob Freedman, Principal Investigator (Archaeology), and Jenna Higgins, Principal Investigator (Architectural History), SEARCH, Newberry, Florida. Prepared for SE Group. November 7.
Claesson et al. 2015a	Claesson, Stefan, Ph.D., Jacob Freedman, MA, and Jessica Fish, MSt. 2015a. Final Desktop Analysis of the Londonderry-Deerfield AC Support System Project for the Proposed Northern Pass Transmission Project, Rockingham County, New Hampshire. Prepared by Stefan Claesson, Ph.D., Jacob Freedman, MA, and Jessica Fish, MSt, SEARCH, Newberry, Florida. Prepared for United State Department of Energy, Office of Electricity Delivery and Energy Reliability, Washington, D.C. April.
Claesson et al. 2015b	Claesson, Stefan, Ph.D., Tricia Peone, PhD, and Jacob Freedman, MA. 2015b. Addendum A: Phase IA Archaeological Investigations for the Proposed Northern Pass Transmission Project, Coos, Grafton, Belknap, Merrimack, and Rockingham Counties, New Hampshire, NHDHR Project Review Number RPR-4680. Prepared by Stefan Claesson, Senior Principal Investigator, Tricia Peone, and Jacob Freedman, SEARCH, Newberry, Florida. Prepared for United States Department of Energy, Office of Electricity Delivery and Energy Reliability, Washington, D.C. July.
Claesson and Peone 2016a	Claesson, Stefan, Ph.D., and Tricia Peone, Ph.D. 2016. Supplemental Phase IA Archaeological Investigations for the Proposed Northern Pass Transmission Project 2015 Amended Route, Grafton County, New Hampshire, NHDHR Project Review Number RPR-4680. Prepared by Stefan Claesson, Ph.D., and Tricia Peone, Ph.D. Prepared for United States Department of Energy, Washington, D.C. September.

In-text Citation	Reference
Colwell 1990a	Colwell, Peter F. 1990a. Power lines and land value. *The Journal of Real Estate Research* 5 (1): 117-127.
The Conference Board 2017	The Conference Board. 2017. Consumer Confidence Survey. New York, NY. https://www.conference-board.org/data/consumerconfidence.cfm. Accessed March 2017.
Coös County 2006a	Coös County. 2006a. Master Plan for the Unincorporated Places in Coös County. Coös County Planning Board. West Stewartstown, NH.
Cowan 1994a	Cowan, James P. 1994a. *Handbook of Environmental Acoustics*. John Wiley & Sons, Inc.
Cowardin et al. 1979a	Cowardin et al. 1979a. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31, U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C.
Cowger, Bottemiller, and Cahill 1996a	Cowger, J.R., Bottemiller, Steven C. and James M. Cahill. 1996a. Transmission line impact on residential property values. *Right of Way.* September/October 1996: 13-17.
Des Rosiers 2002a	Des Rosiers, Francois. 2002a. Power lines, visual encumberance and house values: a microspatial approach to impact measurement. *Journal of Real Estate Research* 23(3): 274-301.
Dig Safe 2014a	Dig Safe. 2014. How It Works. http://www.digsafe.com/how_it_works.php. Accessed August 19, 2014.
DOE 2016a	U.S. Department of Energy. 2016a. Hydropower Vision. https://energy.gov/sites/prod/files/2016/10/f33/Hydropower-Vision-10262016_0.pdf. Accessed April 10, 2017.
Driscoll et al. 1976a	Driscoll, Jr., Edward C., Brian A. Gray, William G. E. Blair, and John F. Ady. 1976. Measuring the visibility of high voltage transmission facilities in the Pacific Northwest. Jones & Jones: Seattle, WA.
Dunham et al. 2017	Dunham, Jenna, Tricia Peone, and Jacob Freedman. 2017. *Technical Memorandum: Survey of Architectural Resources in Canaan, Essex County, Vermont*. Prepared by Jenna Dunham, Tricia Peone, and Jacob Freedman, SEARCH. Prepared for SE Group, Frisco, Colorado. February.
Earth Systems Research Center 2013	Earth Systems Research Center. 2013. New Hampshire Conservation/Public Lands at 1:24,000 Scale. University of New Hampshire. Durham, NH. GIS data.
eBird 2014a	eBird. 2014a. Bird Observations for Coös County, NH. http://ebird.org/ebird/GuideMe?step=saveChoices&getLocations=counties&parentState=US-NH&bMonth=01&bYear=1900&eMonth=12&eYear=2014&reportType=location&counties=US-NH-007&continue.x=49&continue.y=9&continue=Continue. Accessed August 1, 2014.
eBird 2014b	eBird. 2014b. Bird Observations for Belknap and Grafton Counties, NH. http://ebird.org/ebird/GuideMe?src=changeDate&getLocations=counties&counties=US-NH-001%2CUS-NH-009&parentState=US-NH&reportType=location&monthRadio=on&bMonth=01&eMonth=12&bYear=1900&eYear=2014&continue.x=57&continue.y=12&continue=Continue. Accessed August 1, 2014.

In-text Citation	Reference
eBird 2014c	eBird. 2014c. Bird Observations for Merrimack and Rockingham Counties, NH. http://ebird.org/ebird/GuideMe?step=saveChoices&getLocations =counties&parentState=US-NH&bMonth=01&bYear=1900&eMonth=12&eYear =2014&reportType=location&counties=US-NH-013&counties=US-NH-015&continue.x=30&continue.y=6&continue=Continue. Accessed August 1, 2014.
EIA 2017a	Energy Information Administration. 2017a. *Electricity Data Browser, Net Generation for All Sectors*. U.S. Department of Energy, Washington, D.C. https://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=pd8&geo=o01&sec=g&linechart=ELEC.GEN.ALL-US-99.A&columnchart=ELEC.GEN.ALL-US-99.A&map=ELEC.GEN.ALL-US-99.A&freq=A&start=2001&end=2015&ctype=linechart&ltype=pin&rtype=s&maptype=0&rse=0&pin=. Accessed May 23, 2017.
Electricity Advisory Committee 2016	Electricity Advisory Committee. 2016. *2016 Storage Plan Assessment Recommendations for the U.S. Department of Energy*. https://energy.gov/sites/prod/files/2016/10/f33/2016%20EAC%20Storage%20Plan%20Assessment%20Recommendations%20for%20the%20U%20S%20Department%20of%20Energy%20%28September%202016%29.pdf. Accessed July 11, 2017.
Environmental Laboratory 1987a	Environmental Laboratory. 1987a. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
EPA 1974a	United States Environmental Protection Agency. 1974a. Information on Levels of Environmental Noise Requisite to Protect Public Health And Welfare With an Adequate Margin of Safety. Office of Noise Abatement and Control. Washington, D.C.
EPA 2007a	United States Environmental Protection Agency. 2007a. Preliminary Risk Assessment for Creosote. http://www.epa.gov/pesticides/factsheets/chemicals/creosote_prelim_risk_assess.htm. Accessed May 27, 2015.
EPA 2014a	United States Environmental Protection Agency. 2014a. Guay's Garage Site, Franklin, NH. http://www.epa.gov/region1/removal-sites/GuaysGarageSite.html. Accessed October 28, 2014.
EPA 2014b	United States Environmental Protection Agency. 2014b. 2010 Sulfur Dioxide Standards — Region 1 Initial Nonattainment Designations http://www.epa.gov/airquality/sulfurdioxide/designations/region1i.html. Accessed July 16, 2014.
EPA 2014c	United States Environmental Protection Agency. 2014c. Status of Nonattainment Area and Ozone Transport Region SIP Requirements http://www.epa.gov/air/urbanair/sipstatus/nonattainment.html. Accessed July 16, 2014.
EPA 2014d	United States Environmental Protection Agency. 2014d. Climate change indicators in the United States, 2014. Third edition. EPA 430-R-14-004. www.epa.gov/climatechange/indicators. Accessed July 15, 2014.
EPA 2014e	United States Environmental Protection Agency. 2014e. EPA Carbon Pollution Standards: Clean Air Plan. http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule. Accessed September 25, 2014.

In-text Citation	Reference
EPA 2014f	United States Environmental Protection Agency. 2014f. Air Data, Air Quality Index Report. http://www.epa.gov/airdata/ad_rep_aqi.html. Accessed September 25, 2014.
EPA 2014g	United States Environmental Protection Agency. 2014g. Air and Radiation, National Ambient Air Quality Standards. http://www.epa.gov/air/criteria.html. Accessed July 16, 2014.
EPA 2014h	United States Environmental Protection Agency. 2014h. Climate Change: Basic Information. http://www.epa.gov/climatechange/basics. Accessed March 5, 2015.
EPA 2015a	United States Environmental Protection Agency. 2015a. Environmental Justice. http://www.epa.gov/environmentaljustice. Accessed February 23, 2015.
EPA 2015b	United States Environmental Protection Agency. 2015b. Ground Level Ozone Regulatory Actions: Ozone Implementation: Implementing the 2008 8-hour Ozone NAAQS. http://www.epa.gov/air/ozonepollution/actions.html#impl. Accessed June 10, 2015.
EPA 2015c	United States Environmental Protection Agency. 2015c. Implementation of the 2008 NAAQS for Ozone: State Implementation Plan Requirements Final Rule 40 CRF 12264, March 6, 2015. http://www.gpo.gov/fdsys/pkg/FR-2015-03-06/pdf/2015-04012.pdf. Accessed June 10, 2015.
EPA 2015d	United States Environmental Protection Agency. 2015d. New Hampshire Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants as of January 30, 2015. http://www.epa.gov/oar/oaqps/. greenbk/anayo_nh.html. Accessed June 10, 2015.
EPA 2016	United States Environmental Protection Agency. 2016. Criteria Air Pollutants, National Ambient Air Quality Standards Table. Updated December 20, 2016. https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed January 25, 2017.
EPRI 2003a	Electric Power Research Institute. 2003. Charging and Transport of Aerosols near AC Transmission Lines: A Literature Review.
EPRI 2013a	Electric Power Research Institute. 2013. Quantifying the Value of Hydropower in the Electric Grid. Final. Knoxville, TN. Prepared for the U.S. Department of Energy.
Exponent, Inc. 2014a	Exponent, Inc. 2014. Response to Department of Energy Data Request EI-4. Prepared for Northern Pass Transmission, LLC.
FAA 2013a	Federal Aviation Administration. 2013a. New Hampshire, Airport Facilities Data. http://www.faa.gov/airports/airport_safety/airportdata_5010/menu/ index.cfm. Accessed November 7, 2013.
FAA 2013b	Federal Aviation Administration. 2013b. New Hampshire, Airport Runways Data. http://www.faa.gov/airports/airport_safety/airportdata_5010/menu /index.cfm. Accessed November 7, 2013.
FERC 2011a	Federal Energy Regulation Committee. 2011. 134 FERC 61,095 at P15, Dkt. No. ER11-2377-000.
Feighner 2012a	Feighner, Edna. 2012a. File Reviews Required for Project Review. November. Concord, NH.

In-text Citation	Reference
Feighner 2012b	Feighner, Edna. 2012b. Electronic Filing of Project Reports, Request for Project Review Forms using Compact Disks (CD) or Email. November, 2012. Concord, NH.
Feighner 2013a	Feighner, Edna. 2013. Archaeological Report Submittals. June. Concord, NH.
FHWA 2006a	Federal Highway Administration. 2006. *FHWA Highway Construction Noise Handbook*. U.S. Department of Transportation. FHWA-HEP-06-015, DOT-VNTSC-FHWA-06-02, NTIS No. PB2006-109102.
Freedman et al. 2015	Freedman, Jacob, MA, Claesson, Stefan, Ph.D., and Jessica Fish, MSt. 2015. Final Phase IA Archaeological Investigations for Proposed Northern Pass Transmission Project, Alternatives 3, 4, 5, and 6. Coos, Grafton, Belknap, Merrimack, and Rockingham Counties, New Hampshire, NHDHR Project Review Number RPR-4680. Prepared by Jacob Freedman, MA, Stefan Claesson, Ph.D., and Jessica Fish, MSt. Prepared for United State Department of Energy, Office of Electricity Delivery and Energy Reliability, Washington, D.C. May.
FRED 2016a	Federal Reserve Economic Data. 2016. Unemployment Rate in New Hampshire. Federal Reserve Bank of St. Louis, St. Louis, MO. https://fred.stlouisfed.org/series/NHURN. Accessed December 2016.
FTA 2006a	Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment. U.S. Department of Transportation, Washington, D.C. May.
GE Energy Consulting 2015a	GE Energy Consulting. 2015a. Draft Report: Energy Market Evaluation of the Northern Pass Transmission Project. Schenectady, NY.
GE Energy Consulting 2017a	GE Energy Consulting. 2017a. Revised Energy Market Model Results for the Northern Pass Transmission Project. Schenectady, NY.
Genesee &Wyoming Inc. 2013a	Genesee & Wyoming Inc. 2013. General Specifications for Sub-grade and Above Grade Utility Crossings of Railroad’s Right-of-Way. Office of Assistant Vice President – Engineering Design. Revised March 7, 2013. http://www.gwrr.com/real_estate/utility_occupancies. Accessed January 15, 2015.
Gesch, Oimoen, and Evans 2014a	Gesch, D.B., Oimoen, M.J. and G.A. Evans. 2014. Accuracy Assessment of the U.S. Geological Survey National Elevation Dataset, and Comparison with Other Large-Area Elevation Datasets—SRTM and ASTER. United States Geological Survey Open-File Report 2014-1008.
Grafton County Economic Development Council 2014a	Grafton County Economic Development Council. 2014. About Grafton County, New Hampshire. http://www.graftoncountyedc.org/about-grafton-county.html. Accessed December 19.
Great River Energy n.d.	Great River Energy. n.d. Safety Around Power Lines: Frequently asked questions about power lines on or near your property. Maple Grove, MN. http://www.greatriverenergy.com/deliveringelectricity/safety/safetyaroundpowerlines.pdf. Accessed August 19, 2014.
Griffith et al. 2009a	Griffith, G.E., Omernik, J.M., Bryce, S.A., Royte, J., Hoar, W.D., Homer, J.W., Keirstead, D., Metzler, K.J., and Hellyer, G. 2009. Ecoregions of New England. http://www.epa.gov/region1/neaeb2010/pdfs/PosterHellyerGreg.pdf. Accessed November 26, 2014.
Haider and Haroun 2000a	Haider, Murtaza and Antoine Haroun. 2000. Impact of power lines on freehold residential property values in the greater Toronto area. University of Toronto.

In-text Citation	Reference
Hamilton and Schwann 1995a	Hamilton, Stanley W. and Gregory M. Schwann. 1995. Do high voltage electric transmission lines affect property value? *Land Economics* 71 (4): 436-444.
Higgins et al. 2015	Higgins, Jenna, Jacob Freedman, Tricia Peone, Stefan Claesson. 2015. Draft Architectural History and Above-ground Investigations for Proposed Northern Pass Transmission Project, Alternatives 3, 4, 5, and 6. Coos, Grafton, Belknap, Merrimack, and Rockingham Counties, New Hampshire, NHDHR Project Review Number RPR-4680. Prepared by Jenna Higgins, MS, Jacob Freedman, MA, Tricia Peone, MA, and Stefan Claesson, Ph.D. Prepared for United State Department of Energy, Office of Electricity Delivery and Energy Reliability, Washington, D.C. May 2015.
Higgins et al. 2016a	Higgins, Jenna, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant. 2016a. *Northern Pass – Great North Woods Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant, SEARCH, Inc. March 2016.
Higgins et al. 2016b	Higgins, Jenna, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant. 2016b. *Northern Pass – White Mountains Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant, SEARCH, Inc. March.
Higgins et al. 2016c	Higgins, Jenna, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant. 2016c. *Northern Pass – Lakes Region Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant, SEARCH, Inc. February.
Higgins et al. 2016d	Higgins, Jenna, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant. 2016d. *Northern Pass – Merrimack Valley Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, Tricia Peone, Jacob Freedman, Jessica Fish, and Edward Gonzales-Temnant, SEARCH, Inc. January.
Higgins et al. 2016e	Higgins, Jenna, Stefan Claesson, and Tricia Peone. 2016e. *Northern Pass – White Mountains (Supplement) Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, and Tricia Peone, SEARCH, Inc. July.
Higgins et al. 2016f	Higgins, Jenna, Stefan Claesson, and Tricia Peone. 2016f. *Northern Pass – Lakes Region (Supplement) Project Area Form*. Prepared by Jenna Higgins, Stefan Claesson, and Tricia Peone, SEARCH, Inc. July.
Hydro-Québec n.d.[a]	Hydro-Québec. n.d.[a]. The History of Hydro-Quebec. Available at: http://www.hydroquebec.com/about/who-are-we/history-hydro-quebec.html
Hydro-Québec n.d.[b]	Hydro-Québec. n.d.[b]. About Hydro-Quebec. Available at: http://www.hydroquebec.com/about/our-energy/hydropower/clean-renewable.html.
Hydro-Québec n.d.[c]	Hydro-Québec. n.d.[c]. Construction Projects. Available at: http://www.hydroquebec.com/about/construction-projects/
Hydro-Québec n.d.[d]	Hydro-Québec. n.d.[d]. Romaine Complex. Available at: http://www.hydroquebec.com/projects/romaine.html.

In-text Citation	Reference
Hydro-Québec n.d.[e]	Hydro-Québec. n.d.[e]. Hydro- Québec at a Glance. Available at: http://www.hydroquebec.com/about/who-are-we/hydro-quebec-glance.html.
Hydro-Québec 2016	Hydro- Québec. 2016. Sustainability Report 2016. Available at: http://www.hydroquebec.com/data/developpement-durable/pdf/sustainability-report-2016.pdf?v=20170529.
Hydro-Québec Production 2008	Hydro-Québec Production. 2008. *Romaine Complex – Environmental Impact Statement Summary* (Québec, Canada: August 2008); English translation. Available at: http://www.hydroquebec.com/romaine/pdf/romaine-complex-environmental-impact-2008e064-a.pdf.
Hydro-Québec TransÉnergie 2016	Hydro-Québec TransÉnergie. 2016. Quebec-New Hampshire Interconnection: Permit Application Filed with the National Energy Board (Montréal, Canada: December 23, 2016); English Translation.
IARC 2002a	International Agency for Research on Cancer. 2002. IARC Monographs on the Evaluations of Carcinogenic Risks to Humans: Non-Ionizing Radiation, Part 1: Static and Extremely Low-frequency Electric and Magnetic Fields. Lyon, France. (80): 1-395.
INHS 2015	Institute for New Hampshire Studies. 2015. New Hampshire Visitor Barometers (various years). Plymouth State University, Plymouth, NH. http://www.plymouth.edu/institute-for-new-hampshire-studies/nh-tourism-data/travel-barometers/. Accessed January 2015.
INHS 2017	Institute for New Hampshire Studies. 2017. New Hampshire Visitor Barometers (various years). Plymouth State University, Plymouth, NH. http://www.plymouth.edu/institute-for-new-hampshire-studies/nh-tourism-data/travel-barometers/. Accessed March 2017.
Intermap Technologies 2010a	Intermap Technologies. 2010. Product Handbook & Quick Start Guide. Englewood, CO.
IPCC 2014a	Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
Irle et al. 2011a	Irle, Alexandre, Jean Isoard, and Pauline Bonneviot. 2011. Environmental Impact of Underground Links Across Fields. B.2.4 8th International Conference on Insulated Power Cables. Versailles, France.
ISO-NE 2012a	ISO New England Inc. 2012. 2012 Regional System Plan. Holyoke, MA.
ISO-NE 2013a	ISO New England Inc. 2013. 2013 Regional System Plan. Holyoke, MA.
ISO-NE 2014a	ISO New England Inc. 2014a. 2014 Regional System Plan. Holyoke, MA.
ISO-NE 2014b	ISO New England Inc. 2014b. 2014 Regional Energy Outlook. Holyoke, MA.
ISO-NE 2014c	ISO New England Inc. 2014c. 2013 Annual Markets Report. Holyoke, MA.
ISO-NE 2014d	ISO New England Inc. 2014d. 2012 ISO New England Electric Generator Air Emissions Report, System Planning Department, ISO New England Inc. http://www.iso-ne.com/genrtion_resrcs/reports/emission/2012_emissions_report_final_v2.pdf. Accessed July 14, 2014.

In-text Citation	Reference
ISO-NE 2014e	ISO New England Inc. 2014e. 2013 ISO New England Electric Generator Air Emissions Report, System Planning Department, ISO New England Inc. http://www.iso-ne.com/static-assets/documents/2014/12/2013_emissions_report_final.pdf. Accessed May 27, 2015.
ISO-NE 2014f	ISO New England Inc. 2014f. Correspondence to Northeast Utilities Service Company, Section I.3.9 ISO Tariff review response. January 9.
ISO-NE 2015a	ISO New England Inc. 2015. 2015 Regional System Plan. Holyoke, MA.
ISO-NE 2016a	ISO New England Inc. 2016a. Correspondence to Northeast Utilities Service Company, Section I.3.9 ISO Tariff review response. January 9.
ISO-NE 2016b	ISO New England Inc. 2016b. 2014 ISO-NE Electric Generator Air Emissions Report. January 2106. http://www.iso-ne.com/static-assets/documents/2016/01/2014_emissions_report.pdf. Accessed May 2, 2016.
ISO-NE 2017a	ISO New England Inc. 2017a. 2017 Regional Electricity Outlook. Holyoke, MA.
ISO-NE 2017b	ISO New England Inc. 2017b. ISO New England Overview and Regional Update – Presentation to Vermont House Committee on Energy and Technology and Vermont Senate Committee on Natural Resources and Energy, January 27, 2017. Montpelier, VT.
Jackson and Pitts 2010a	Jackson, Thomas O. and Jennifer Pitts. 2010. The effects of electric transmission lines on property values: a literature review. *Journal of Real Estate Literature* 18 (2): 239-259.
Keikko, Isokorpi, and Korpinen 1999a	Keikko, T., J. Isokorpi, and L. Korpinen. 1999. Practical problems in calculating electric fields of transmission lines. Eleventh International Symposium on High Voltage Engineering. Conf. Publ. No. 467 (Vol. 2). The Institution of Engineering and Technology.
Kolb 2002a	Kolb, Christof, Sebastian Schmieder, and Claus Schmitt. 2002. Inappropriate shock delivery due to interference between a washing machine and an implantable cardioverter defibrillator. *Journal of interventional cardiac electrophysiology* 7(3): 255-256.
Koneru 2011a	Koneru, Jayanthi N. et al. 2011. Minimizing Inappropriate or Unnecessary Implantable Cardioverter-Defibrillator Shocks Appropriate Programming. *Circulation: Arrhythmia and Electrophysiology* 4(5):778-790.
Kunz et al. 2007a	Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Frontiers in Ecology and the Environment* (5):315-324.
Labbe 2016a	Labbe, Stephanie. 2016a. Letter dated December 13, 2016, from Stephanie Labbe, Project Manager, PAR Electrical Contracros, Inc., Chicopee, MA to Melody Esterberg, Chief of Design Services, New Hampshire Department of Transportation, Concord, NH. Subject: *Proposed Underground Electric Utility for the Northern Pass Transmission Project; DOT ROT3 & NRTH Permit Packages; Request for Exception to the NHDOT Utility Accommodation Manual*.

In-text Citation	Reference
Labbe 2016b	Labbe, Stephanie. 2016b. Letter dated December 21, 2016, from Stephanie Labbe, Project Manager, PAR Electrical Contracros, Inc., Chicopee, MA to Melody Esterberg, Chief of Design Services, New Hampshire Department of Transportation, Concord, NH. Subject: *Proposed Underground Electric Utility for the Northern Pass Transmission Project; DOT WBR3 Permit Package; Request for Exception to the NHDOT Utility Accommodation Manual*.
Labbe 2016c	Labbe, Stephanie. 2016c. Letter dated December 23, 2016, from Stephanie Labbe, Project Manager, PAR Electrical Contracros, Inc., Chicopee, MA to Melody Esterberg, Chief of Design Services, New Hampshire Department of Transportation, Concord, NH. Subject: *Proposed Underground Electric Utility for the Northern Pass Transmission Project; DOT WMNF/SHEB/ROCK Permit Packages; Request for Exception to the NHDOT Utility Accommodation Manual*.
Linton 1968a	Linton, David L. 1968. The assessment of scenery as a natural resource. *Scottish Geographical Magazine* (84):219-238.
Marshall 2014a	Marshall, Chase. 2014. Fire Management Officer, White Mountain National Forest, personal communication with L. Flynn Ecology and Environment, Inc. concerning WMNF fire-fighting capabilities. October 1.
Maruvada et al. 1982	Maruvada, P.S. et al. 1982. "Environmental Effects of the Nelson River HVDC Transmission Lines-RI, AN, Electric Field, Induced Voltage and Ion Current Distribution Tests." IEEE Transactions on Power Apparatus and Systems PAS-101(4): 951-959.
Mass. Acts 188 2016	An Act to Promote Energy Diversity. 2016 Massachusetts Acts Chapter 188. https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter188
MA DOER 2017a	Massachusetts Department of Energy Resources. 2017a. Request for Proposals for Long-term Contracts for Clean Energy Projects. https://macleanenergy.files.wordpress.com/2017/03/83d-rfp-and-appendices-final.pdf.
MA Governor's Press Office 2016	MA Governor's Press Office. 2016. Governor Baker Signs Comprehensive Energy Diversity Legislation. http://www.mass.gov/governor/press-office/press-releases/fy2017/governor-baker-signs-comprehensive-energy-diversity-law.html. Accessed April 2017.
Commonwealth of MA et al. 2015	Commonwealth of Massachusetts and states of Connecticut and Rhode Island. 2015. Notice of Request for Proposals from Private Developers for Clean Energy and Transmission.
Mills 2013a	Mills, Brian. 2013a. Letter dated March 21, 2013, from Brian Mills, National Electricity Delivery Division, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C., to Elizabeth H. Muzzey, Director, New Hampshire Division of Historical Resources and State Historic Preservation Officer, Concord, New Hampshire. Subject: *Northern Pass Transmission, LLC Presidential Permit Application*.
Mills 2013b	Mills, Brian. 2013b. Letter dated September 3, 2013, from Brian Mills, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C., to Richard A. Boisvert, State Archaeologist, New Hampshire Division of Historical Resources, Deputy State Historic Preservation Officer, Concord, New Hampshire. *Subject: Northern Pass Transmission, LLC Presidential Permit Application, Area of Potential Effects*.

In-text Citation	Reference
Mills 2015a	Mills, Brian. 2015a. Letter dated March 19, 2015, from Brian Mills, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C., to Richard A. Boisvert, State Archaeologist, New Hampshire Division of Historical Resources, Deputy State Historic Preservation Officer, Concord, New Hampshire. Subject: *APE Determinations for Alternatives, Northern Pass Transmission, LLC Presidential Permit Application, RPR-4680*.
Mills 2016a	Mills, Brian. 2016a. Letter dated August 30, 2016, from Brian Mills, Senior Planning Advisor, Northern Pass EIS NEPA Document Manager, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Washington, D.C., to Laura Trieschmann, State Historic Preservation Officer, Vermont Division of Historic Preservation, Montpelier, Vermont. Subject: *Section 106 Consultation on the Area of Potential Effects and Level of Effort for Section 106 Identification Work in Vermont for the Proposed Northern Pass Transmission Project*
MDDELCC n.d.	Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. n.d. http://www.mddelcc.gouv.qc.ca/evaluations/procedure-en.htm.
Minnesota Department of Commerce et al. 2010	Minnesota Department of Commerce, Office of Energy Security, and USDA Rural Development Rural Utilities Service. 2010. Bemidji-Grand Rapids 230 kV Transmission Line Project Final Environmental Impact Statement. St. Paul, MN.
Mouritsen et al. 2005a	Mouritsen, Henrik, and Thorsten Ritz. 2005a. Magnetoreception and its use in bird navigation. *Current opinion in neurobiology* 15(4): 406-414.
MRLC 2013	Multi-Resolution Land Characteristics Consortium. 2013. A comprehensive change detection method for updating the National Land Cover Database to circa 2011. Remote Sensing of Environment, 132: 159–175.
Muzzey 2007a	Muzzey, Elizabeth H. 2007a. Access to Archaeological and Historic Inventory Files. Prepared for the Professional Archaeological and Architectural Historian Consultants. November. Concord, NH.
Napp 2014a	Napp, Andreas et al. 2014a. Electromagnetic Interference with Implantable Cardioverter-Defibrillators at Power Frequency: An In Vivo Study. *Circulation* 129(4): 441-450.
NEB n.d.	National Energy Board. n.d. Responsibilities. Available at: https://www.neb-one.gc.ca/bts/whwr/rspnsblt/index-eng.html.
National Grid 2015a	National Grid. 2015. Electric and magnetic fields and health. http://www.emfs.info/sources/levels/exposure/. Accessed January 26, 2014.
New Hampshire Bird Records 2009a	New Hampshire Bird Records. 2009. New Hampshire's Important Bird Area Program. http://www.nhbirdrecords.org/bird-conservation/IBA.htm#about. Accessed July 1, 2014.
NHB 2014	New Hampshire Natural Heritage Bureau. 2014. GIS data.
NHES 2017a	New Hampshire Employment Security. 2017a. New Hampshire Local Area Unemployment Statistics (not seasonally adjusted). Concord, NH. www.nhes.nh.gov/elmi. Accessed May 25, 2017.
NERC 2013a	North American Electrical Reliability Corporation. 2013. State of Reliability. http://www.nerc.com/pa/rapa/pa/performance%20analysis%20dl/2013_sor_may%2015.pdf. Accessed August 20, 2014.

In-text Citation	Reference
NESCOE 2013a	New England States Committee on Electricity. 2013. Incremental Hydropower Imports Whitepaper. Westborough, MA.
NESCOE 2015a	New England States Committee on Electricity. 2015. New England Governors' Statement: Regional Cooperation on Energy Infrastructure. April 23, 2015. www.nescoe.com/uploads/6_State_Joint_Statement_FINAL_4-22-15_12-3.36pm_w-sealsf.pdf
NH Department of Safety 2014a	New Hampshire Department of Safety. 2014. Division of Homeland Security and Emergency Management. Natural Hazards. http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html. Accessed November 12, 2014.
NHDES 2009	New Hampshire Department of Environmental Services. 2009. New Hampshire Climate Action Plan. Concord, NH.
NHDES 2011a	New Hampshire Department of Environmental Services. 2011. New Hampshire Regional Haze State Implementation Plan. Revised August 26, 2011. http://des.nh.gov/organization/divisions/air/do/asab/rhp/index.htm. Accessed October 14, 2013.
NHDES 2012a	New Hampshire Department of Environmental Services. 2012. Letter Health Consultation: Evaluation of Indoor Air and Soil Gas Data – Former Circle Tri Cleaners. Plymouth, New Hampshire.
NHDES 2013a	New Hampshire Department of Environmental Services. 2013. Regional Greenhouse Gas Initiative. http://des.nh.gov/organization/divisions/air/tsb/tps/climate/rggi/index.htm. Accessed October 14, 2013.
NHDES 2014a	New Hampshire Department of Environmental Services. 2014. The New Hampshire Rivers Management and Protection Program. Concord, NH
NHDES 2017a	New Hampshire Department of Environmental Services. 2017. Letter from Rene Pelletier (DES Water Division) to Pamela Monroe (SEC Administrator).
NHDFL 2014a	New Hampshire Division of Forests and Lands. 2014. NH County Checklist – March 2014.
NHDFL 2015a	New Hampshire Division of Forests and Lands. 2015. Website – Introduction to Natural Communities. http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/about-us/naturalcommunities.aspx. Last accessed June 29, 2015.
NHDHR 2004a	New Hampshire Division of Historical Resources. 2004. Archaeological Standards and Guidelines. Concord, NH.
NHDHR 2007a	New Hampshire Division of Historical Resources. 2007a. Project Review & Compliance, DHR Policies. http://www.nh.gov/nhdhr/review/policies.htm. Accessed November 26, 2014.
NHDHR 2007b	New Hampshire Division of Historical Resources. 2007b. Archaeology Forms and Manuals. http://www.nh.gov/nhdhr/archaeology_forms_manuals.htm. Accessed November 26, 2014.
NHDHR 2007c	New Hampshire Division of Historical Resources. 2007c. Survey and Inventory. http://www.nh.gov/nhdhr/programs/survey.htm. Accessed December 1, 2014.
NHDHR 2013a	New Hampshire Division of Historical Resources. 2013a. Architectural Survey in New Hampshire. Concord, NH.

In-text Citation	Reference
NHDHR 2013b	New Hampshire Division of Historical Resources. 2013b. Architectural Survey Policy. Concord, NH.
NHDHR 2013c	New Hampshire Division of Historical Resources. 2013c. Area Form Survey Manual. Concord, NH.
NHDHR 2016	New Hampshire Division of Historical Resources. 2016. Scope of Work for Cultural Landscape Studies for the Northern Pass Transmission Project. Concord, NH.
NHDOT 2003a	New Hampshire Department of Transportation. 2003. Best Management Practices for Routine Roadway Maintenance Activities in New Hampshire. Concord, NH.
NHDOT 2007a	New Hampshire Department of Transportation. 2007. Regulations and Instructions Governing Oversize and Overweight Vehicle Permits. https://www.nh.gov/dot/org/operations/highwaymaintenance/overhaul/documents/oversizevehiclemanual.pdf. Accessed September 18, 2014.
NHDOT 2010a	New Hampshire Department of Transportation. 2010. Utility Accommodation Manual. Concord, NH.
NHDOT 2014a	New Hampshire Department of Transportation. 2014a. Traffic Volume Reports: US 2 and NH 135. http://www.nh.gov/dot/org/operations/traffic/tvr/routes/index.htm. Accessed March 25, 2015.
NHDOT 2014b	New Hampshire Department of Transportation. 2014b. Traffic Volume Reports: I-93. http://www.nh.gov/dot/org/operations/traffic/tvr/routes/index.htm. Accessed March 25, 2015.
NHDOT 2014c	New Hampshire Department of Transportation. 2014c. Traffic Volume Reports: US 3 and NH 141. http://www.nh.gov/dot/org/operations/traffic/tvr/routes/index.htm. Accessed March 25, 2015.
NHDOT 2014d	New Hampshire Department of Transportation. 2014d. Traffic Volume Reports: NH 28. http://www.nh.gov/dot/org/operations/traffic/tvr/routes/index.htm. Accessed March 25, 2015.
NHDOT 2015	New Hampshire Department of Transportation. 2015. Traffic Volume Reports, 2015. Concord, NH. https://www.nh.gov/dot/org/operations/traffic/tvr/locations/index.htm. Accessed March 2017.
NHDOT 2017a	New Hampshire Department of Transportation. 2017. Traffic Volume Reports (various years). Concord, NH. https://www.nh.gov/dot/org/operations/traffic/tvr/locations/index.htm. Accessed March 2017.
NHDRA 2016a	New Hampshire Department of Revenue Administration. 2016. Property Tax Tables by County: Valuations, Taxes and Tax Rates. Concord, NH.
NHDRA 2016b	New Hampshire Department of Revenue Administration. 2016b. 2016 Annual Report. www.revenue.nh.gov/publications/reports/documents/dra2016annualreport.pdf.
NHDRED 2010a	New Hampshire Department of Resources and Economic Development. 2010. *Best Management Practices for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire*. http://www.nhdfl.org/library/pdf/Publications/DESUtilityBMPrev3.pdf. Accessed June 25, 2015.

In-text Citation	Reference
NHDRED 2014a	New Hampshire Department of Resources and Economic Development. 2014. New Hampshire Climate. http://www.visitnh.gov/welcome-to-nh/climate.aspx. Accessed October 24, 2014.
NHFG 2005a	New Hampshire Fish and Game Department. 2005. New Hampshire Wildlife Action Plan. Concord, NH.
NHFG et al. 2008a	New Hampshire Fish and Game Department, University of New Hampshire Cooperative Extension, and Sustainable Forestry Initiative. 2008. Vernal Pools, Habitat Stewardship Series, New Hampshire Wildlife Action Plan. https://extension.unh.edu/resources/files/Resource000417_Rep957.pdf. Accessed July 1, 2014.
NHFG 2009a	New Hampshire Fish and Game Department. 2009. New Hampshire Freshwater Fishing Guide. Concord, NH.
NHFG 2014a	New Hampshire Fish and Game Department. 2014a. Critical Habitats and Associated Species in New Hampshire. http://www.wildlife.state.nh.us/habitat/critical.html. Accessed July 1, 2014.
NHFG 2014b	New Hampshire Fish and Game Department. 2014b. Hunting and Trapping in New Hampshire. http://www.wildlife.state.nh.us/Hunting/hunting.htm. Accessed July 1, 2014.
NHFG 2015a	New Hampshire Fish and Game Department. 2015. New Hampshire Wildlife Action Plan. http://www.wildlife.state.nh.us/wildlife/wap.html. Accessed April 20, 2017. http://www.wildlife.state.nh.us/wildlife/wap.html. Accessed April 20, 2017.
NHOEP 2014a	New Hampshire Office of Energy and Planning. 2014a. New Hampshire 10-year State Energy Strategy.
NHOEP 2017	New Hampshire Office of Energy and Planning. 2017. Key Initiatives. https://www.nh.gov/oep/energy/programs/initiatives.htm. Accessed May 24, 2017.
NHPUC 2013a	New Hampshire Public Utilities Commission. 2013. 2013 RGGI Annual Report of the DES and the PUC. http://des.nh.gov/organization/divisions/air/tsb/tps/climate/rggi/documents/2013-rggi-annual-report.pdf. Accessed June 30, 2015.
NHPUC 2016	New Hampshire Public Utilities Commission. 2016. Dockets DE 11-250 and DE 14-238. Investigation of Scrubber Costs and Cost Recovery And Determination Regarding Eversource's Generation Assets, Order Approving Settlement Agreements, Order 25,920. http://www.puc.state.nh.us/Regulatory/Orders/2016orders/25920e.pdf. Accessed July 2017.
NOAA 2009a	National Oceanic and Atmospheric Administration. 2009. Climate Data – Past Weather and Normals. Concord Climate Data: Annual Records: All-time Records. National Weather Service Forecast Office, Gray/Portland. http://www.erh.noaa.gov/er/gyx/climate_f6.shtml. Accessed February 11, 2015.
NOAA 2014a	National Oceanic and Atmospheric Administration. 2014. National Weather Service Climate Data, Climatological Report (Annual), Concord Climate Data for the Year 2013. http://www.nws.noaa.gov/climate/. Accessed September 10, 2014.

In-text Citation	Reference
Normandeau Associates 2011a	Normandeau Associates. 2011. Summary of Winter Tracking with Details on Canada Lynx Tracks. Confidential Memorandum from Sarah Barnum to Jeff Simmons, September 1, 2011.
Northeast Utilities 2004a	Northeast Utilities. 2004. Northeast Utilities Specification for Rights-of-Way Vegetation Management Section III Technical Requirements.
Northeast Utilities 2008a	Northeast Utilities. 2008. Northeast Utilities Vegetation Clearing Procedures and Practices for Transmission Line Sections.
Northern Pass 2010a	Northern Pass Transmission LLC. 2010. United States of America Before the Department of Energy Office of Electricity Delivery and Energy Reliability Application of Northern Pass Transmission LLC.
Northern Pass 2013a	Northern Pass Transmission, LLC. 2013. Amended Application to the Department of Energy for a Presidential Permit. July 1, 2013.
Northern Pass 2015	Northern Pass Transmission LLC. 2015. Further Amendment to Presidential Permit Application. August 31, 2015.
NPR 2011a	National Public Radio. 2011. Vacation Homes in New Hampshire: The Who, The What and The Where. http://stateimpact.npr.org/new-hampshire/maps/new-hampshire%E2%80%99s-vacation-homes-who-owns-them-where-are-they-and-how-many-are-there/. Accessed March 4, 2015.
NPR 2012a	National Public Radio. 2012. The Tempermental Economics of Tourism. http://stateimpact.npr.org/new-hampshire/tag/tourism. Accessed February 23, 2015.
NPS 1997a	National Park Service. 1997. How to Apply the National Register Criteria for Evaluation. National Register Bulletin, No. 15. Ed. Rebecca Shrimpton, U.S. Department of the Interior, National Park Service, Cultural Resources.
NPS 2012a	National Park Service. 2012. Susquehanna to Roseland 500 kV Transmission Line Right-of-Way and Special Use Permit Final Environmental Impact Statement. Bushkill, PA.
NSAA 2017	National Ski Areas Association. 2017. Kottke National End of Season Survey, 1996-97 through 2014-15. Lakewood, CO. http://www.nsaa.org/press/industry-stats/industry-stats-pages/nsaa-research-publications/. Accessed March 2017.
Olimpio and Mullaney 1997a	Olimpio, J.R. and J.R. Mullaney. 1997. Geohydrology and Water Quality of Stratified-Drift Aquifers in the Upper Connecticut and Androscoggin River Basins, Northern New Hampshire. USGS Water-Resources Investigations Report 96-4318. Pembroke, New Hampshire.
PSC Wisconsin n.d.	Public Service Commission of Wisconsin. n.d. Underground Electric Transmission Lines. Madison, WI.
Pub. L. 113-23	Hydropower Regulatory Efficiency Act of 2013. Pub. L. 113-23. 127 Stat. 493. 9 August 2013. https://www.gpo.gov/fdsys/pkg/PLAW-113publ23/html/PLAW-113publ23.htm
Reason Foundation 2014a	Reason Foundation. 2014. 21st Annual Report on the Performance of State Highway Systems (1984-2012). http://reason.org/areas/topic/annual-highway-report. Accessed October 3, 2014.
RGGI 2013a	Regional Greenhouse Gas Initiative, Inc. 2013. RGGI States Propose Lowering Regional CO2 Emissions Cap 45%, Implementing a More Flexible Cost-Control Mechanism. New York, NY.

In-text Citation	Reference
RGL 90-7 1990a	Regulatory Guidance Letter. 1990. Clarification of the Phrase “Normal Circumstances” as it pertains to Cropped Wetlands. RGL 90-7.
Rigdon 1991a	Rigdon, Glenn J. 1991. 138Kv transmission lines and the value of recreational land. *International Right of Way Association.* December 1991: 8-20.
Scholten and Silny 2001a	Scholten, J. and A Silny. 2001. The interference threshold of unipolar cardiac pacemakers in extremely low frequency magnetic fields. *Journal of Medical Engineering & Technology* 25 (5): 185-194.
SE Group 2017	SE Group. 2017. Final Biological Assessment for the Northern Pass Transmission Line Project Environmental Impact Statement. Prepared for U. S. Department of Energy, Office of Electricity Delivery and Energy Reliability. Washington, D.C. April 14, 2017.
Sheppard and Newman 1979a	Sheppard, Stephan and Sarah Newman. 1979. Prototype Visual Impact Assessment Manual. Prepared for the USDA Forest Service Pacific Southwest Forest and Range Experiment Station. December 1979.
Smarden et al. 1988a	Smardon, R.C., J.F. Palmer, A. Knopf, K. Grinde, J.E. Henderson and L.D. Peyman–Dove. 1988. Visual Resources Assessment Procedure for US Army Corps of Engineers. Instruction Report EL–88–1. US Army Engineer Waterways Experiment Station. Vicksburg, MS.
State of Maine OEIS 2012a	State of Maine Office of Energy Independence and Security. 2012. Report of OEIS Assessment of Cumulative Visual Impacts from Wind Energy Development. March.
Sullivan 2014a	Sullivan, Robert G., Jennifer M. Abplanalp, Sherry Lahti, Kevin J. Beckman, Brian L. Cantwell, and Pamela Richmond. 2014. Electric transmission visibility and visual contrast threshold distances in western landscapes. In Changing Tides and Sifting Sands. Conference Proceedings of the 39th Annual NAEP Conference. April 7-10, 2014, St. Petersburg, FL.
TDI New England 2015a	TDI New England. 2015. New England Clean Power Link: Project Development Portal. http://necplink.com/. Accessed January 15, 2015.
Transmission Developers 2015a	Transmission Developers. 2015. Champlain Hudson Power Express: Project Development Portal. http://www.chpexpress.com/about.php. Accessed January 15, 2015.
Trieshmann 2016	Trieschmann, Laura. 2016. Vermont Division for Historic Preservation Concurrence dated September 8, 2016, e-signed by Laura Trieschmann, State Historic Preservation Office, Vermont Division for Historic Preservation.
U.S. Government Printing Office 2013a	U.S. Government Printing Office. 2013. Safe, Efficient Use, and Preservation of the Navigable Airspace (14 CFR Part 77). http://www.ecfr.gov/cgi-bin/text-idx?SID=851caf7aa437239fa40a5ac8a8b9c813&node=14:2.0.1.2.9.2.1.3&rgn=div8. Accessed November 4, 2013.
usgovernmentspending.com 2017	usgovernmentspending.com. 2017. http://www.usgovernmentspending.com/compare_state_spending. Accessed March 2017.
USNRC 2015a	U.S. Nuclear Regulatory Commission. 2015. NRC Accepting Public Comments on Decommissioning Plan for Vermont Yankee Nuclear Power Plant. NRC News, Office of Public Affairs, Region I. No: I-15-001. January 7, 2015.

In-text Citation	Reference
USACE 2012a	U.S. Army Corps of Engineers. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. ERDC/EL TR-12-1. U.S. Army Engineer Research and Development Center, Wetlands Regulatory Assistance Program, Vicksburg, MS.
U.S. Census Bureau 2010a	U.S. Census Bureau. 2010. 2010 Census Summary File 1. [machine-readable data files]. U.S. Department of Commerce, Washington, D.C.
U.S. Census Bureau 2015a	U.S. Census Bureau. 2015a. 2008-2010 American Community Survey 3-Year Estimate*s*. Table B02001. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_3YR_B02001&prodType=table, Accessed January 6, 2015.
U.S. Census Bureau 2015b	U.S. Census Bureau. 2015b. 2010 Quickfacts. U.S. Department of Commerce, Washington, D.C. http://www.census.gov/quickfacts/table/LND110210/33015,33013,33009,33001,33007,33. Accessed January 6, 2015.
U.S. Census Bureau 2016a	U.S. Census Bureau. 2016a. 2010-2014 American Community Survey 5-Year Estimates. Table B17010. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B17010&prodType=table. Accessed July 14, 2016.
U.S. Census Bureau 2016b	U.S. Census Bureau. 2016b. 2010-2014 American Community Survey 5-Year Estimates. Table B19013. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19013&prodType=table. Accessed July 12, 2016.
U.S. Census Bureau 2016c	U.S. Census Bureau. 2016c. 2011-2013 American Community Survey 3-Year Estimates. Table C03002. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_3YR_C03002&prodType=table. Accessed July 12, 2016.
U.S. Census Bureau 2016d	U.S. Census Bureau. 2016d. 2011-2015 American Community Survey 5-Year Estimates, Table S2405. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. Accessed July 12, 2016.
U.S. Census Bureau 2016e	U.S. Census Bureau. 2016e. 2010-2014 American Community Survey 5-Year Estimates. Table B19001. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. Accessed July 12, 2016.
U.S. Census Bureau 2017a	U.S. Census Bureau. 2017a. 2011-2015 American Community Survey 5-Year Estimates. Table B02001. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B02001&prodType=table. Accessed February 8, 2017
U.S. Census Bureau 2017b	U.S. Census Bureau 2017b. 2011-2015 American Community Survey 5-Year Estimates, Table S2405. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. Accessed May 24, 2017.
U.S. Census Bureau 2017c	U.S. Census Bureau. 2017c. QuickFacts – New Hampshire. U.S. Department of Commerce, Washington, D.C. https://www.census.gov/quickfacts/table/PST045215/33007,33,00#headnote-js-a. Accessed May 25, 2017.

In-text Citation	Reference
U.S. Census Bureau 2017d	U.S. Census Bureau. 2017d. 2011-2015 American Community Survey 5-Year Estimates, Table S1702. U.S. Department of Commerce, Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_S1702&prodType=table. Accessed May 25, 2017.
USDA Forest Service 1995a	USDA Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management. USDA Forest Service.
USDA Forest Service 2004a	USDA Forest Service. 2004. Forest Service Manual. FSM 2734.2 Special Uses Management. Road and Trail Rights-of-Way Grants. Washington, D.C.
USDA Forest Service 2005a	USDA Forest Service. 2005a. White Mountain National Forest Land and Resource Management Plan. Campton, NH. September.
USDA Forest Service 2005b	USDA Forest Service. 2005b. White Mountain National Forest Proposed Land and Resource Management Plan Final Environmental Impact Statement. Campton, NH. September.
USDA Forest Service 2012a	USDA Forest Service. 2012a. Monitoring and Evaluation Report, White Mountain National Forest, FY 2012. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5447935.pdf. Accessed July 1, 2014.
USDA Forest Service 2012b	USDA Forest Service. 2012b. Regional Forester Sensitive Species List. White Mountain National Forest. Campton, NH.
USDA Forest Service 2015a	USDA Forest Service. 2015. Lynx Habitat Data. White Mountain National Forest. Campton, NH. GIS Data.
USDA NRCS 2015a	USDA Natural Resources Conservation Service. 2015. PLANTS Database http://plants.usda.gov/java/. Accessed March 30, 2015.
USFWS 2012a	U.S. Fish and Wildlife Service. 2012. Migratory Bird Flyways. http://www.fws.gov/migratorybirds/flyways.html. Accessed July 1, 2014.
USFWS 2014a	U.S. Fish and Wildlife Service. 2014a. Endangered Species - Section 7 Consultation. Last Revised: June 30, 2014. http://www.fws.gov/Midwest/endangered/section7/section7.html. Accessed January 6, 2015.
USFWS 2014b	U.S. Fish and Wildlife Service. 2014b. National Wild and Scenic Rivers System – A National System. http://www.rivers.gov/national-system.php. Accessed March 6, 2015.
USGS 2000a	U.S. Geological Survey. 2000. Aquifer Data. Produced for Complex Systems Research Center, University of New Hampshire. http://www.granit.unh.edu/data/datacat/pages/aqu.pdf. Accessed November 26, 2014.
USGS 2005a	U.S. Geological Survey. 2005. National Atlas of the United States, Reston, VA. Significant United States Earthquakes, 1568-2004. GIS data.
USGS 2014a	U.S. Geological Survey. 2014. Earthquake Hazards Program. http://earthquake.usgs.gov/. Accessed September 2014.
Vermont Agency of Transportation 2015	Vermont Agency of Transportation. 2015. 2015 (Route Log) AADTs State Highways. http://vtrans.vermont.gov/operations/technical services/traffic. Accessed September 23, 2016.
Visit NH 2017	Visit New Hampshire. 2017. *Economic Highlights*. https://www.visitnh.gov/press-and-media/travel-and-tourism-information/economic-highlights. Accessed May 23, 2017.

In-text Citation	Reference
Wiltschko et al. 2012a	Wiltschko, Wolfgang, and Roswitha Wiltschko. 2012. Global navigation in migratory birds: tracks, strategies, and interactions between mechanisms. *Current Opinion in Neurobiology* 22 (2): 328-335.
Wolverton and Bottemiller 2003a	Wolverton, Marvin L. and Steven C. Bottemiller. 2003. Further analysis of transmission line impact on residential property values. *The Appraisal Journal* 71 (3): 244-252.
World Health Organization 2007a	World Health Organization. 2007. Environmental Health Criteria No. 238. Extremely Low Frequency Fields. Geneva, Switzerland.
World Media Group LLC 2015a	World Media Group, LLC. 2015. New Hampshire State Natural Disasters and Weather Extremes. http://www.usa.com/new-hampshire-state-natural-disasters-extremes.htm. Accessed August 4, 2014.

CHAPTER 8
GLOSSARY

8 GLOSSARY

A-weighted decibel (dBA) – A unit of sound pressure level, adjusted in accordance with the A-weighting scale, which takes into account the increased sensitivity of the human ear at some frequencies.

Alternating current (AC) – Current that varies, or cycles, over time in both magnitude and polarity.

Applicant-Proposed Impact Avoidance and Minimization Measures (APMs) – A plan developed by the Applicant that documents environmental and construction management procedures and plans to be implemented during Project construction activities to avoid or minimize impacts to the environment. This is a preliminary set of measures, which could change if the EIS identifies potential impacts that are different in kind or degree from the potential impacts Northern Pass has identified to date. The measures could also change or be added to if the New Hampshire Site Evaluation Committee requests or directs that additional or different measures be adopted. Finally, when the detailed design phase of the Project is completed, Northern Pass may conclude that additional or different (but no less protective) measures are required. See **Appendix H**.

Aquifer – An underground body of porous materials, such as sand, gravel, or fractured rock, filled with water and capable of yielding useful quantities of water to a well or spring.

Area of potential effects (APE) – The area of potential effects is a further delineation of the study area for historic and cultural resources. DOE consulted with the NHDHR and additional consulting parties to the NHPA Section 106 compliance process to define the direct or archaeological APE and an indirect or architectural APE. The purpose of defining the APE was to allow the DOE to gather sufficient information to make a preliminary assessment of the potential direct and indirect impacts of the Project on cultural resources under NEPA, and a preliminary determination of the potential direct and indirect effects of the Project on historic properties under Section 106 of the NHPA.

Bedrock – Solid rock beneath the soil and superficial rock.

Benthic – Pertaining to, or occurring at the bottom of a body of water, such as a riverbed or a lakebed.

Best Management Practices (BMPs) – Industry-standard practices that are implemented to reduce the potential for adverse impacts to occur on a resource.

Buried duct bank – Duct banks are groups of conduits designed to protect and consolidate cabling. Duct banks are buried, allowing cables to be centralized within an underground path.

Carbon monoxide (CO) – An odorless and colorless gas formed from one atom of carbon and one atom of oxygen.

Conductor – A wire or group of wires suitable for carrying an electrical current.

Contrast-Dominance – The contrast-dominance of the existing and simulated transmission line seen in each KOP was evaluated. Six landscape architects who were involved in the field inventory rated the degree of color, form, line, texture and scale contrasts, as well as the spatial and scale dominance of the transmission line with the surrounding landscape. Values in the range of 36 to 45 are "Severe," 27 to 35 are "Strong," 18 to 26 are "Moderate," 9 to 17 are "Weak," and 0 to 8 are "Negligible." For more information refer to **Section 3.1.1.4.**

Converter station – A special type of substation that converts electrical power from direct current to alternating current.

Corona – An electrical discharge from a conductor caused by the ionization of surrounding gas.

Corona Effect – The ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. The corona discharge occurs at the conductor surface, representing a small dissipation of heat and energy in the form of local pressure changes that may result in audible noise. The corona discharge generates audible noise during operation of transmission lines and substation equipment and this noise is generally characterized as a crackling or hissing sound that may be accompanied by a 120 Hz hum.

Criteria pollutants – A group of six common air pollutants that are regulated by the National Ambient Air Quality Standards (standards established to protect public health or the environment). The six criteria pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, two size classes of particulate matter (less than 10 micrometers [0.0004 inch] in diameter, and less than 2.5 micrometers [0.0001 inch] in diameter), and sulfur dioxide.

Cumulative impact – Impact on the environment that results when the incremental impact of a proposed action is added to the impacts from other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Current (Electric) (see also Alternating current and Direct current) – The amount of electrical charge (i.e., electrons) flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge).

dBA – See A-weighted decibel.

de minimis – Conditions that generally do not present a threat to human health or the environment, and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

Decibel (dB) – A unit for expressing the relative intensity of sounds on a logarithmic scale that quantifies sound intensity.

Direct burial – refers to burial conventionally trenched from the surface and subsequently backfilled.

Direct current (DC) – Current that is steady and does not change sinusoidally (periodically) with time.

Easement – A document granting certain rights to the use of a parcel of land (which then physically becomes a “right-of-way.”) This may include the right to enter the right-of-way to build, maintain, and repair specific facilities as is expressly granted by the easement.

Economic Output – Economic Output is the value of the goods and services produced in an economy and is also commonly referred to as “gross domestic product.”

Electromagnetic field (EMF) – An extremely low frequency magnetic and electric field, ranging from 3 to 3,000 Hertz (Hz).

Endangered (species) – Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424).

Endangered Species Act (ESA) – A 1973 federal law, amended in 1978 and 1982, to protect troubled species from extinction. The U.S. Fish and Wildlife Service and National Marine Fisheries Service decide whether to list species as Threatened or Endangered. Under the ESA, federal agencies must avoid jeopardy to and aid the recovery of listed species.

Environmental Impact Statement (EIS) – A detailed, written statement, as required by the NEPA, which analyzes the potential environmental impacts of a proposed major federal action that could significantly affect the quality of the human environment.

Federally-listed – Species listed as Threatened or Endangered under the ESA.

Floodplain – That portion of a river valley adjacent to the stream channel which is covered with water when the stream overflows its banks during flood stage.

Fugitive dust – Particulate matter or dust that is released into the air from disturbance of granular material (soil) by mechanical equipment or vehicles.

Full-time equivalent (FTE) – An employment position may be a year-round or seasonal job and either full-time or part-time, whereas one FTE provides sufficient work to keep one person employed full-time for one year. In seasonal industries one FTE may represent several employment positions.

Gauss (G) – A unit of measure that is commonly used to express the strength or intensity of magnetic fields.

Geographic Information System (GIS) – A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.

Greenhouse gas (GHG) – Those gases, such as water vapor, carbon dioxide, nitrous oxide, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride, that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth’s atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet’s surface.

Groundwater – Water below the ground surface in a zone of saturation.

Hertz (Hz) – Frequency/oscillatory rate of an alternating electric current, measured in number of cycles per second (1 Hz is equal to one cycle per second).

Hibernaculum (also hibernacula) – A location chosen by an animal for hibernation.

High-voltage – With respect to electric power transmission, high-voltage is usually considered any voltage greater than approximately 35,000 volts. This classification is also based on the design of apparatus and insulation.

Horizontal directional drilling (HDD) – A steerable trenchless method of installing underground pipes, conduits, and cables in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. This method allows pipes and conduits to be installed under water bodies, parks, roadways, and other features with minimal impact on the resource or surrounding area.

Hydric Soils – Soils that are sufficiently wet in the upper part to develop anaerobic conditions during the growing season.

Hydrology – The science dealing with the properties, distribution, and circulation of water.

Insulator – A material that is a very poor conductor of electricity. The insulating material is usually a ceramic or fiberglass when used in the transmission line and is designed to support a conductor physically and to separate it electrically from other conductors and supporting material.

Interconnection – Two or more electric systems having a common transmission line that permits a flow of energy between them. The physical connection of the electric power transmission facilities allows for the sale or exchange of energy.

Intrinsic Visual Quality – This is an index of the landscape’s inherent potential for attractiveness, stemming from both landform and land cover classification. Areas with greater topographic relief and more natural land cover are rated higher. The values range from 1 for “Very Low” (e.g., industrial development on flat land) to 5 for “Very High” (e.g., a mountain lake or forested mountains). For more information refer to **Section 3.1.1.2.**

Invasive species – A non-indigenous plant or animal species that can harm the environment, human health, or the economy.

Invertebrate – Any animal without a backbone or spinal cord; any animal other than a fish, amphibian, reptile, bird, or mammal.

Jack & bore – A method of trenchless cable installation that involves digging a pit at each end of an underground segment and using a bore machine to dig a tunnel between the pits. The pipe or cable is then pulled through this tunnel.

Key observation point (KOP) – In order to provide a representation of how the Project would likely appear several years after construction, a viewpoint assessment was conducted using visual simulations. Several thousand photographs were taken from selected viewpoints along the Project corridor. Of the 63 visual simulation locations (multiple visual simulations were produced for some locations, resulting in 65 total visual simulations), 15 were identified as KOPs that represent the range of viewpoint characteristics and potential visual impacts that would occur if the Project is constructed. For more information see Viewpoint Assessment or refer to **Section 3.1.1.**

Landscape assessment – The landscape assessment considers the viewshed, intrinsic visual quality, and visual magnitude to evaluate visual resources in the study area. For more information refer to **Section 3.1.1.2.**

Lentic System – A system of non-flowing or standing water, such as a lake or pond.

Long-term construction impacts – Impacts that would occur during construction and continue for the life of the Project. Construction activities resulting in long-term impacts include: overstory vegetation removal; installation of aboveground structures and facilities; permanent roads, laydown areas, and helipad; and rock blasting or drilling.

Long-term operation, maintenance, and emergency repairs impacts – Impacts that would occur during the normal operation of the Project and continue for the life of the Project. Operational, maintenance, and emergency repair activities resulting in long-term impacts include: the transmission of electric power and ongoing vegetation management in the transmission route.

Lotic System – A system of flowing water, such as a river or stream.

Milepost (MP) – A method of indicating the distance of the Project route in miles from its northern to southern endpoints.

Milligauss (mG) – A unit of measure used to express the strength or intensity of magnetic fields; a thousandth of a gauss.

Mitigation – Action taken to reduce the potential for unavoidable adverse impacts caused by the Project to resources.

National Environmental Policy Act (NEPA) – The basic national charter for protection of the environment. For major federal actions significantly affecting the quality of the human environment, NEPA requires federal agencies to prepare a detailed environmental impact statement that includes the environmental impacts of the Proposed Action and other specified information.

Nonattainment area – An area that the U.S. Environmental Protection Agency has designated as not meeting (i.e., not being in attainment of) one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others.

Notice of Intent (NOI) – A public notice that an environmental impact statement will be prepared and considered in the decision making for a proposed action.

Ozone (O_3) – A molecule made up of three atoms of oxygen. Occurs naturally in the stratosphere and provides a protective layer shielding the Earth from harmful ultraviolet radiation. In the troposphere, it is a chemical oxidant, a greenhouse gas, and a major component of photochemical smog.

Perennial waterbodies – Waterbodies with year-round water flow.

Physiographic – Pertaining to the features and phenomena of nature.

Post-Contact period – Time periods since significant contact between Native Americans and Europeans.

Pre-Contact period – Time periods before Native American societies had substantial contact with Europeans.

Prime Farmland – Federally-designated land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses.

Project corridor(s) – Area where the Project would be built, including all areas of potential disturbance (e.g., laydown areas, access roads, etc.).

Reliability (electric system) – The ability of a power system to continue operation and provide uninterrupted service, even while that system is under stress.

Revegetate – Re-establishing vegetation on a disturbed site.

Right-of-way (ROW) – A corridor of lands upon which specific rights of use or access are granted (as documented in an "easement") by the underlying property owner or land management agency. ROWs are typically created for the placement of infrastructure such as a highways, railways, electric transmission lines, or pipelines.

Riparian habitat – The zone of vegetation that extends from the water's edge landward to the edge of the vegetative canopy. Associated with watercourses such as streams, rivers, springs, ponds, lakes, or tidewater.

Scenic Impact – This index accounts for visual impact (an intrinsic measure) and the scenic sensitivity of the viewpoint. Scenic sensitivity considers "social concerns," including the level of designation of a scenic resource, the importance of scenery to the dominant user activity, and the potential for visual exposure to area residents. The value ranges from 0, indicating "Potential Visibility," but no scenic impact; to 1 for "Very Low" indicating a scenic impact that may not be adverse; to 5 for "Very High," indicating a very high adverse and likely intrusive scenic impact. For example, a location with a low visual impact index and a low level of potential visual exposure will have a scenic impact index of 0 or 1. In contrast, a location with a high visual impact index and a high level of visual exposure will have a scenic impact index of 4 or 5. Scenic impact accounts for both context and intensity, and thus is a good indicator of the overall level of impacts to visual resources. The scenic provided this analysis is the mean value for locations with visibility within each geographic section (i.e., the viewshed). For more information refer to **Section 3.1.1.2.**

Scoping – An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying the significant issues related to a proposed action.

Sedimentation – The deposition or accumulation of sediment.

Seismicity – The frequency or magnitude of earthquake activity in a given area.

Short-term construction impacts – Impacts that would occur during construction but would stop when construction was complete (assumed duration of three years). Construction activities resulting in short-term impacts include: operation of construction equipment and ground disturbance related to installation of Project elements (structures, buried cable, roads, laydown areas, etc.).

Short-term operation, maintenance, and emergency repairs impacts – Impacts that would occur during the operation of the Project related to ongoing maintenance and repair, but would stop once the maintenance or repair activity was complete. Operational, maintenance, and emergency repair activities resulting in short-term impacts include: operation of equipment as necessary for repairs and line inspection via aircraft, vehicle, or on foot.

Spawn – To produce or deposit eggs.

Special use permit (SUP) – A special use permit allows for the occupancy and/or use of National Forest System land for a specific purpose or purposes as may be authorized and for a specific period of time.

Species – A group of interbreeding individuals not interbreeding with another such group; similar, and related species are grouped into a genus.

Stream Order – Stream order is used to define the size of streams and rivers. A small headwater stream would be considered first order, while the Mississippi River is a tenth order river.

Study area – Study areas are defined individually for each resource, and represent the total spatial area considered in this analysis. Study areas vary in two ways: 1) by the nature of the resource, and 2) by the location of the alternative.

Submerged aquatic vegetation (SAV) – Generally includes rooted vascular plants that grow up to the water surface but not above. The definition of SAV usually excludes algae, floating plants, and plants that grow above the water surface.

Substation – A non-generating electrical power station that transforms voltages to higher or lower levels. Facility equipment that switches, changes, or regulates electric voltage.

Surface water – Water collecting on the ground or in a stream, river, lake, sea or ocean.

Switches – Devices used to mechanically disconnect or isolate equipment; found on both sides of circuit breakers.

Threatened (species) – Plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR Part 424).

Transformer – A device that operates on magnetic principles to increase (step up) or decrease (step down) voltage.

Transmission cable – An insulated conductor used for underground electric transmission applications. Also see Transmission line.

Transmission route – As used within this document, "transmission route" specifically refers to the corridor of land upon which a transmission system (including line/cable and associated facilities) may be located. This term is used to refer to the land currently occupied by the existing PSNH transmission line, as well as the potential location of the Project. Land use authority for the construction and operation of the Project is, or may be, granted to the Applicant via a combination of rights which may include: fee simple ownership, long-term lease agreement, rights-of-way (granted by easement), or SUP (authorized by the USFS).

Transmission line – A set of conductors, insulators, supporting structures, and associated equipment used to move large quantities of power overhead at high voltage, usually over long distances between a generating or receiving point and major substations or delivery points.

Trenchless technology – is a general reference to various types of horizontal/directional boring or drilling for installation of underground cables not requiring surface trenching.

Turbidity – The state or condition of opaqueness or reduced clarity of a fluid, due to the presence of suspended matter.

Vehicle Exposure on Scenic Roads – The estimated number of hours that vehicles will travel through areas on state- or nationally-designated scenic roads with visibility of transmission structures. This is derived from the distance along which the Project is visible, a nominal speed limit based on the road's functional classification, and the AADT. For more information refer to **Section 3.1.1.3.**

Vernal Pool – Seasonal depressional wetlands covered by shallow water for variable periods (often during winter or spring) that may be completely dry during summer and fall.

Viewpoint Assessment – In order to provide a representation of how the Project would likely appear several years after construction, a Viewpoint Assessment was conducted using visual simulations. Several thousand photographs were taken from selected viewpoints along the Project corridor. Of the 63 visual simulation locations (multiple visual simulations were produced for some locations, resulting in 65 total visual simulations), 15 were identified as KOPs that represent the range of viewpoint characteristics and potential visual impacts that would occur if the Project is constructed. For more information see *Key observation point* or refer to **Section 3.1.1.4.**

Viewshed – The area from which the Project would be visible. The viewshed was determined through the visibility analysis.

Visual Impact – This index is determined from the interaction of intrinsic visual quality and visual magnitude. Therefore, this index represents landform and the prominence of visible structures, but does not consider the sensitivity of the people or sites affected. This index is an intermediate metric used to determine scenic impact. For more information refer to **Section 3.1.1.2.**

Visual Magnitude – This is an index of visibility weighted to account for the greater visual presence of an object (including transmission structures, transition stations, and other aboveground facilities) when it is closer in the visual field. For this analysis, the number of structures visible and the distance from which they are visible was used to assess visual magnitude. The value ranges from 0, indicating "Potential Visibility," but unlikely to be noticed; to 1 for "Very Low," indicating just noticeable; to 5 for "Very High," indicating a very dominant visual presence. For example, a location from which a few structures are visible over 5 miles (8 km) away will have a visual magnitude index of 0. In contrast, a location from which a few structures are visible within 300 feet (91 m) will have a visual magnitude index of 5. The visual magnitude provided this analysis is the mean value for locations with visibility within each geographic section (i.e., the viewshed). For more information refer to **Section 3.1.1.**

Volt – The unit of electromotive force or electric pressure which, if steadily applied to a circuit having a resistance of one ohm, would produce a current of one ampere.

Voltage – The electrical force, or "pressure," that causes current to flow in a circuit, measured in Volts.

Watershed – The area that drains to a common waterway.

Wetlands – An area that is inundated or saturated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas (e.g., sloughs, potholes, wet meadows, river overflow areas, mudflats, natural ponds).

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