DOE/EIS-0236-S4

NNSA
National Nuclear Security Administration

Final Complex Transformation Supplemental Programmatic Environmental Impact Statement

Volume II

Chapters 5 - 15 and Appendices A - G

COMPLEXtransformation

National Nuclear Security Administration
U.S. Department of Energy

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COVER SHEET

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ABSTRACT: The National Nuclear Security Administration (NNSA), an agency within the Department of Energy, has the responsibility to maintain the safety, security, and reliability of the United States' nuclear weapons stockpile. This Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) analyzes the potential environmental impacts of reasonable alternatives to continue transformation of the nuclear weapons complex to be smaller, and more responsive, efficient, and secure in order to meet national security requirements. The current Complex consists of sites located in seven states (California, Missouri, Nevada, New Mexico, South Carolina, Tennessee, and Texas). This SPEIS evaluates alternatives that would restructure special nuclear materials manufacturing and research and development facilities; consolidate special nuclear materials throughout the Complex; consolidate, relocate, or eliminate duplicative facilities and programs and improve operating efficiencies; and identify one or more sites for conducting NNSA flight test operations.

COOPERATING AGENCIES: The Department of the Air Force and the U.S. Army Garrison White Sands are cooperating agencies in the preparation of this Complex Transformation SPEIS.

PUBLIC COMMENTS: The Draft Complex Transformation SPEIS was issued for public review and comment on January 11, 2008. Comments on the Draft SPEIS were requested during a period of 90 days following publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability in the *Federal Register.* Twenty public hearings to solicit comments on the Draft SPEIS were held during the public comment period. Prior to the end of this comment period, NNSA extended the public comment period by 20 additional days, until April 30, 2008. All comments received during the comment period were considered during preparation of the Final SPEIS. Late comments were also considered, to the extent practicable.

The Final SPEIS contains revisions and new information based in part on comments received on the Draft SPEIS. Vertical change bars in the margins indicate the locations of these revisions and new information. Volume 3 contains the comments received during the public comment period on the Draft SPEIS and NNSA's responses to the comments. NNSA will use the analysis presented in this Final SPEIS, as well as other information, in preparing the Record(s) of Decision (RODs) regarding Complex Transformation. NNSA will issue one or more RODs no sooner than 30 days after the EPA publishes a Notice of Availability of this Final SPEIS in the *Federal Register*. This document and related information are available on the Internet at www.ComplexTransformationSPEIS.com.

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Prepared by:

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ACRONYMS AND ABBREVIATIONS

A/D	Assembly/Disassembly
A/D/HE	Assembly/Disassembly/High Explosives
AC and MC	Analytical Chemistry and Materials Characterization
ACE	Altamont Commuter Express
ACHP	Advisory Council on Historic Preservation
ACRR	Annular Core Research Reactor
AEC	Atomic Energy Commission
AFB	Air Force Base
AF&F	Arming, Fuzing, and Firing
ALARA	as low as reasonably achievable
ALCM	Air-Launch Cruise Missile
ALOHA	Aerial Location of Hazardous Atmospheres
AQCR	Air Quality Control Region
ARF	airborne release fraction
ASER	annual site environmental report
ATEC	U.S. Army Test Evaluation Command
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
BACMs	Best Available Control Measures
BEA	Bureau of Economic Analysis
BEEF	Big Explosives Experimental Facility
BEIR	Biological Effects of Ionizing Radiation
Bison-m	Biota Information System of New Mexico
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMAP	Biological Monitoring and Abatement Program
BMPs	Best Management Practices
BNM	Bandelier National Monument
CA	Composite Analysis
CAA	*Clean Air Act*
CAIRS	Computerized Accident/Incident Reporting System
CAMU	corrective action management unit
CASSC	California Species of Special Concern
CAUs	Corrective Action Units
CD-0	critical decision on mission need
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFF	Contained Firing Facility
CFR	Code of Federal Regulations
CGTO	Consolidated Group of Tribes and Organizations
CHS	Center for Homeland Security
CIF	Consolidated Incineration Facility
CMR	Chemistry and Metallurgy Research

CMRR	Chemistry and Metallurgy Research Building Replacement Project
CNC	Consolidated Nuclear Center
CNPC	Consolidated Nuclear Production Center
CNPS	California Native Plant Society
Complex	nuclear weapons complex
Complex Transformation SPEIS	Complex Transformation Supplemental Programmatic Environmental Impact Statement
COPCs	contaminants of potential concern
CPC	Consolidated Plutonium Center
CRT	Cargo Restraint Transporter
CSAs	Canned Subassemblies
CUC	Consolidated Uranium Center
CWA	*Clean Water Act*
CWL	chemical waste landfill
CY	calendar year
D&D	Decontamination and Decommissioning
DA	design agency
DAF	Device Assembly Facility
DARHT	Dual Axis Radiographic Hydrodynamic Test
dB	decibel
dBA	A-weighted decibels
DAF	Device Assembly Facility
DCE	Distributed Centers of Excellence
DCGs	Derived Concentration Guidelines
DHHS	U.S. Department of Health and Human Services
DHS	U.S. Department of Homeland Security
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOT	U.S. Department of Transportation
DP	Defense Programs
DPE	data processing equipment
DR	damage ratio
DTC	Developmental Test Command
DTRA	Defense Threat Reduction Agency
DTSC	Department of Toxic Substances Control
DU	Depleted Uranium
DWPF	Defense Waste Processing Facility
DWTF	Decontamination and Waste Treatment Facility
DX	Dynamic Experimentation
EA	Environmental Assessment
ECF	Entry Control Facility
EDE	effective dose equivalent
EE	Energy Efficiency and Renewable Energy
EFPC	East Fork Poplar Creek
EH	Office of Environment, Safety and Health

EIS	Environmental Impact Statement
EM	Environmental Management
EMAC	Ecological Monitoring and Compliance Program
EOA	expanded operations alternative
EODU	Explosive Ordinance Disposal Unit
EOL	End-of-Life
EOS	Equation of state
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERPG	Emergency Response Planning Guideline
ESL	Effects Screening Level
ETB	Engineering Test Bay
ETF	Environmental Test Facility
ETTP	East Tennessee Technology Park
EU	enriched uranium
EWTF	Explosives Waste Treatment Facility
FBI	Federal Bureau of Investigation
FE	facilities engineering
FGZ	fine-grain zone
FLAME	Fire Laboratory for Accreditation of Models and Experiments
FM	Farm-to-Market Road
FMD	Fissile Materials Disposition
FONSI	Finding of No Significant Impact
FPPA	*Farmland Protection Policy Act*
FTE	Full Time Employee
FWHM	Full Width at Half Maximum
FXR	Flash X-Ray
GCD	Greater Confinement Disposal
GIF	Gamma Irradiation Facility
GPD	gallons per day
GPS	Global Positioning System
GSA	General Services Area
GTS	Gas Transfer System
GWPP	groundwater protection program
HAN	hydroxylamine nitrate
HANDSS-55	“handling and segregation system for 55-gallon drums”
HANMF	H-Area New Manufacturing Facility
HAPs	Hazardous Air Pollutant
HE	High Explosives
HEAF	High Explosives Application Facility
HEPA	high-efficiency particulate air
HETB	Hardened Engineering Test Building
HEU	Highly Enriched Uranium
HEUMF	Highly Enriched Uranium Materials Facility
HEWTF	High Explosives Wastewater Treatment Facility
HI	Hazard Index

HLW	high level radioactive waste
HPS	Hantavirus Pulmonary Syndrome
HQ	Hazard Quotient
HR	Human Resources
HSC	Hazardous Materials Spill Center
HTM	High-Tech Mobile
HVAC	heating, ventilating, and air conditioning
HWDU	Hazardous waste disposal units
HWMF	hazardous waste management facility
HWSU	Hazardous Waste Storage Unit
HWTPF	Hazardous Waste Treatment and Processing Facility
HYDEC	hydride/dehydride casting
I	Interstate Highway
ICD-9-CM	International Classification of Disease, 9th Revision, Clinical Modification
ICRP	International Commission on Radiological Protection
IFF	Identification, Friend or Foe
IH	Industrial Hygiene
INEEL	Idaho National Engineering and Environmental Laboratory
INRAD	intrinsic radiation
IOM	Institution of Medicine
IPT	Integrated Project Team
ISCORS	Interagency Steering Committee on Radiation Standards
ISCST	Industrial Source Complex Short Term
ISD	Independent School District
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ITRD	Innovative Treatment Remediation Demonstration
IWQPs	Inland Water Quality Parameters
JTA	Joint Test Assemblies
KAFB	Kirtland Air Force Base
KCP	Kansas City Plant
KCRIMS	Kansas City Responsive Infrastructure Manufacturing and Sourcing
KTF	Kauai Test Facility
LAC	Los Alamos County
LANL	Los Alamos National Laboratory
LANL SWEIS	Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LB/TS	Large Blast Thermal Simulator
LCF	latent cancer fatality
LDRGIF	Low Dose Rate Gamma Irradiation Facility
LLNL	Lawrence Livermore National Laboratory
LLW	low level waste
LOS	Level of Service

LPF	leak path factor
M&O	Management and Operations
MACCS	MELCOR Accident Consequence Code System
MACCS2	MELCOR Accident Consequence Code System Version 2
MACs	maximum allowable concentrations
MAR	material at risk
MBTA	*Migratory Bird Treaty Act*
MC&A	Material Control and Accountability
MCL	maximum contaminant level
MDC	maximum detectable concentration
MDL	maximum detection limit
MEI	maximally exposed individual
MEK	methyl ethyl ketone
MLLW	mixed low level waste
MOX	Mixed Oxide
MPF	Modern Pit Facility
MPF EIS	Modern Pit Facility Environmental Impact Statement
mrem	millirem
MRTFB	Major Range and Test Facility Base
MSGP	Multi-Sector General Permit
MVAs	motor vehicle accidents
MVM	million vehicle miles
MWDU	Mixed Waste Disposal Unit
NAAQS	National Ambient Air Quality Standards
NAFB	Nellis Air Force Base
NC	numerically controlled
NCRP	National Council on Radiation Protection Measurements
NDA	nondestructive assay
NDEP	Nevada Division of Environmental Protection
NE	Office of Nuclear Energy
NECI	Northeast Center Impact Area
NEP	Nuclear Explosive Package
NEPA	*National Environmental Policy Act*
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEST	Nuclear Emergency Search Team
NGPF	Neutron Generator Production
NHP	National Hydrotesting Program
NHPA	*National Historic Preservation Act*
NMAAQS	New Mexico Ambient Air Quality Standards
NMAQCR	New Mexico Air Quality Control Regulations
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NN	Nonproliferation and National Security
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPR	Nuclear Posture Review
NPS	National Park Service
NPT	Nuclear Nonproliferation Treaty
NPTEC	Nonproliferation Test and Evaluation Complex
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	Nevada Site Office
NSTec	National Security Technologies
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NWS	National Weather Service
NWSM	Nuclear Weapons Stockpile Memorandum
NWSP	Nuclear Weapons Stockpile Plan
OB/OD	Open Burn/Open Detonation
OEPG	Office of Environmental Policy and Guidance
ORNL	Oak Ridge National Laboratory
ORPS	Occurrence Reporting and Processing System
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
OST	Office of Secure Transportation
OUs	operable units
PA	Performance Assessment
PAAA	*Price-Anderson Amendments Act*
Pantex	Pantex Plant
PCBs	polychlorinated biphenyls
pCi/L	picocuries per liter
PDCF	Pit Disassembly and Conversion Facility
PF-4	Plutonium Facility, Building 4
PHERMEX	Pulsed High Energy Radiation Machine Emitting X-Rays
PHETS	Permanent High Explosive Test Site
PIDAS	Perimeter Intrusion Detection and Assessment System
PIXY	Pulse Intense X-Ray
PMDA	Plutonium Management and Disposition Agreement
POLs	petroleum, oils, lubricants
PPE	personal protective equipment
ppy	pits per year
PQL	practical quantitation limit
PSD	Prevention of Significant Deterioration
PSRs	Potential release sites
Pu	Plutonium
PUREX	Plutonium-Uranium Extraction Process
QASPR	Qualification Alternatives to Sandia Pulsed Reactor
R&D	Research and Development
RANT	Radioassay and Nondestructive Testing

RCRA	*Resource Conservation and Recovery Act*
rem	roentgen equivalent man
REOP	Real Estate Operating Permit
RF	respirable fraction
RFI	RCRA facility investigation
RIMSII	Regional Input-Output Modeling System
RLWTF	Radioactive Liquid Waste Treatment Facility
RMWMF	Radioactive and Mixed Waste Management Facilities
ROD	Record of Decision
ROGs/POCs	reactive organic gases/precursor organic compounds
ROI	Region of Influence
RRF	respirable release fraction
RRW	Reliable Replacement Warhead
RWMC	Radioactive Waste Management Complex
RWMS	Radioactive Waste Management Site
S.C.	South Carolina State Highway
SAAQS	State Ambient Air Quality Standards
SASN	Silver acetylide-silver nitrate
SCDHEC	South Carolina Department of Health and Environmental Control
SEAB	Secretary of Energy Advisory Board
SEIS	Supplemental Environmental Impact Statement
SFNF	Santa Fe National Forest
SGT	Safeguards Transporters
SHIST	Seismic Hardrock in Site Test
SHPO	State Historic Preservation Office
SJVUAPCD	San Joaquin Valley Unified Air Pollution Control District
SMR	standardized mortality rate
SNF	Spent nuclear fuel
SNL	Sandia National Laboratories
SNL/NM	Sandia National Laboratories/New Mexico
SNL/CA	Sandia National Laboratories/California
SNM	Special nuclear material
SPEIS	Supplemental Programmatic Environmental Impact Statement
SRARP	Savannah River Archaeological Research Program
SREL	Savannah River Ecology Laboratory
SRS	Savannah River Site
SS&C	sand, slag and crucible
SSM	Stockpile Stewardship and Management
SSM PEIS	Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management
SSO	Sandia Site Office
SSP	Stockpile Stewardship Program
SST	Safe Secure Trailers
STP	Site Treatment Plan
STS	Stock-to-Target Sequence
SVOC	Semi-volatile organic compound

SWEIS	Site-Wide Environmental Impact Statement
SWSC	Sanitary Wastewater Systems Consolidation
SWTF	Solid Waste Transfer Facility
T&E	Threatened and Endangered
TA	Technical Area
TA-55	Technical Area 55
TBF	Terminal Ballistics Facility
TBP	tributyl phosphate
TCEQ	Texas Commission on Environmental Quality
TCP	Traditional Cultural Property
TECC	Transportation and Emergency Control Center
TEDE	Total Effective Dose Equivalent
TEF	Tritium Extraction Facility
TLD	Thermoluminescent dosimeter
TNRCC	Texas Natural Resource Conservation Commission
TPCB	Transurance Pad Cover Building
TPDES	Texas Pollutant Discharge Elimination System
TRAGIS	Transportation Routing Analysis Geographic Information System
Trinity NHL	Trinity Site National Historic Landmark
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter
TSCA	Toxic Substance Control Act
TSD	Transportation Safequards Division
TSP	total suspended particulates
TSPI	Time Space Positioning Information
TTR	Tonopah Test Range
TVA	Tennessee Valley Authority
UC	University of California
UPF	Uranium Processing Facility
US	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
USPHS	United States Public Health Service
UXO	unexploded ordnance
VOC	volatile organic compound
VPP	Voluntary Protection Program
WAC	Waste Acceptance Criteria
WCRRF	Waste Compaction, Reduction, and Repackaging Facility
WEF	Waste Examination Facility
WETF	Weapons Engineering Tritium Facility
WFO	Work for Others
WIPP	Waste Isolation Pilot Plant

WSMR	White Sands Missile Range
WSRC	Washington Savannah River Company
WTG	Weapons Test Group
WVDP	West Valley Demonstration Project
WWTF	Wastewater Treatment Facility
XTF	Cross-wind Fire Facility
Y-12	Y-12 National Security Complex

CHEMICALS AND UNITS OF MEASURE

Bq	Becquerel
C	Celsius
Ci	curie
cm	centimeters
CFC	chlorofluorocarbons
CO	carbon monoxide
dB	decibel
dBA	decibel A-weighted
DCE	1, 2-dichloroethylene
DNA	deoxyribonucleic acid
F	Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
ft^3/s	cubic feet per second
g	grams
gal	gallons
ha	hectares
hr	hour
in	inches
kg	kilograms
km	kilometers
km^2	square kilometers
kV	kilovolts
kVA	kilovolt-ampere
kW	kilowatts
kWh	kilowatt hours
L	liters
lb	pounds
m	meters
m^2	square meters
m^3	cubic meters
m/s	meters per second
mg	milligram (one-thousandth of a gram)
mg/L	milligrams per liter
MGD	million gallons per day

MGY	million gallons per year
mi	miles
mi^2	square miles
mph	miles per hour
mrem	millirem (one-thousandth of a rem)
MVA	megavolt-ampere
MW	megawatt
MWe	megawatt electric
MWh	megawatt hour
NO_2	nitrogen dioxide
NOX	nitrogen oxides
O_3	ozone
Pb	lead
PCB	polychlorinated biphenyl
pCi	picocurie (one-trillionth of a curie)
pCi/L	picocuries per liter
PM_{10}	particulate matter (less than 10 microns in diameter)
ppb	parts per billion
ppm	parts per million
ppbv	parts per billion by volume
rem	roentgen equivalent man
s	seconds
SO_2	sulfur dioxide
T	short ton
t	metric tons
TCA	1, 1, 1-trichloroethane
TCE	trichloroethylene
yd^3	cubic yards
yr	year
µCi	microcurie (one-millionth of a curie)
µCi/g	microcuries per gram
µg	microgram (one-millionth of a gram)
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$µg/m^3$	micrograms per cubic meter

CONVERSION CHART

To Convert Into Metric			To Convert Into English		
If You Know	Multiply By	To Get	If You Know	Multiply By	To Get
Length					
inch	2.54	centimeter	centimeter	0.3937	inch
feet	30.48	centimeter	centimeter	0.0328	feet
feet	0.3048	meter	meter	3.281	feet
yard	0.9144	meter	meter	1.0936	yard
mile	1.60934	kilometer	kilometer	0.62414	mile
Area					
square inch	6.4516	square centimeter	square centimeter	0.155	square inch
square feet	0.092903	square meter	square meter	10.7639	square feet
square yard	0.8361	square meter	square meter	1.196	square yard
acre	0.40469	hectare	hectare	2.471	acre
square mile	2.58999	square kilometer	square kilometer	0.3861	square mile
Volume					
fluid ounce	29.574	milliliter	milliliter	0.0338	fluid ounce
gallon	3.7854	liter	liter	0.26417	gallon
cubic feet	0.028317	cubic meter	cubic meter	35.315	cubic feet
cubic yard	0.76455	cubic meter	cubic meter	1.308	cubic yard
Weight					
ounce	28.3495	gram	gram	0.03527	ounce
pound	0.45360	kilogram	kilogram	2.2046	pound
short ton	0.90718	metric ton	metric ton	1.1023	short ton
Force					
dyne	0.00001	newton	newton	100,000	dyne
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	l00 = 10^{2}
deka-	da	l0 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	µ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

Chapter 5
ENVIRONMENTAL IMPACTS

Chapter 5
ENVIRONMENTAL IMPACTS

Chapter 5 describes the potential environmental impacts of the alternatives. The potential environmental impacts of the programmatic alternatives (Distributed Centers of Excellence [DCE] Alternative, Consolidated Centers of Excellence [CCE Alternative], Capability-Based Alternative, and the No Action Alternative) are assessed at Los Alamos, Nevada Test Site (NTS), Pantex Site (Pantex), Savannah River Site (SRS), and the Y-12 National Security Complex (Y-12). This Chapter discusses the impacts of each alternative by resource area, in a format consistent with Chapter 4. The potential impacts of the project-specific alternatives (High Explosives [HE] Research and Development [R&D], Tritium R&D, Major Hydrodynamic Test Facilities, Flight Testing, Major Environmental Test Facilities [ETFs], and Sandia National Laboratories (SNL) Weapon Support Functions) are also assessed in this chapter.

5.0 ENVIRONMENTAL IMPACTS

The environmental impacts analysis addresses potentially affected areas in a manner commensurate with the significance of the potential effects on each area. The methodologies used for preparing the assessments for the resource areas are discussed in Appendix B of this SPEIS.

Chapter 5 is organized by site. For example, Section 5.1 discusses the environmental impacts at Los Alamos. Los Alamos is potentially affected by the programmatic alternatives, which include the No Action Alternative, the Distributed Centers of Excellence (DCE) Alternative, the Consolidated Centers of Excellence (CCE) Alternative, and the Capability-Based Alternative. Sections 5.3, 5.5, 5.8, and 5.9 discuss the environmental impacts of the programmatic alternatives at the NTS, Pantex, SRS, and the Y-12. Because there are no programmatic alternatives for Lawrence Livermore National Laboratory (LLNL) (Section 5.2), Tonopah Test Range (TTR) (Section 5.4), Sandia National Laboratories (Section 5.6), and White Sands Missile Range (WSMR) (Section 5.7), there are no discussions of programmatic impacts for those sites. Section 5.10 discusses complex-wide transportation impacts. Section 5.11 provides a qualitative sensitivity analysis of hypothetically smaller stockpiles than the one established by the Moscow Treaty to identify any potential significant effects on the proposed actions and alternatives. Section 5.12 assesses the impacts of consolidating Category I/II special nuclear material (SNM).

A classified appendix to this SPEIS has been prepared that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. Appendix B (Section B.12.3) discusses the methodology used to evaluate potential impacts associated with a terrorist threat and the methodology by which NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems. As discussed in that section, the NNSA strategy for the mitigation of environmental impacts resulting from extreme events, including intentional destructive acts or terrorism, has three distinct components: 1) prevent or deter terrorists from making successful attacks; 2) plan and provide timely and adequate response to emergency situations; and 3) progressive recovery through long-term response in the form of monitoring, remediation, and support for affected communities and their environment.

Depending on the malevolent, terrorist, or intentional destructive acts, impacts may be similar to or would exceed accident impact analyses prepared for the SPEIS. These data will provide NNSA with information upon which to base, in part, decisions regarding transformation of the Complex. The classified appendix evaluates several intentional destructive act scenarios for alternatives at the following sites (LANL [both at TA-16 and TA-55], LLNL, NTS, SRS, Pantex, and Y-12) and calculates consequences to the noninvolved worker, maximally exposed individual, and population in terms of radiation dose and LCFs. Although the results of the analyses cannot be disclosed in this unclassified SPEIS, the following general conclusion can be made: the potential consequences of intentional destructive acts are highly dependent upon distance to the site boundary and size of the surrounding population—the closer and higher the surrounding population, the higher the consequences. In addition, it is generally easier and more cost-effective to protect new facilities, as new security features can be incorporated into their design. In other words, protection forces needed to defend new facilities may be smaller due to inherent security features included in a new facility.

In addition to the discussion of the environmental impacts from the programmatic alternatives, Sections 5.13 through 5.18 discuss the potential impacts for the project-specific alternatives. These include the HE R&D, Tritium R&D, Flight Test Operations, Major Hydrodynamic Test Facilities, Major ETFs, and SNL/CA Weapon Support Functions. Section 5.19 presents the environmental impacts of tritium production in Tennessee Valley Authority reactors. Section 5.20 presents the environmental impacts of the SPEIS preferred alternatives.

5.1 LOS ALAMOS NATIONAL LABORATORY

This section discusses the potential environmental impacts associated with the following programmatic alternatives at Los Alamos:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. LANL would continue to perform its existing missions as described in Section 3.2.1, including production of up to 20 pits per year.
- **DCE Alternative.** This alternative includes a Consolidated Plutonium Center (CPC). For LANL, this SPEIS evaluates three approaches: 1) the Greenfield CPC in which an entirely new set of nuclear facilities would be constructed with a single-shift production capacity of 125 pits per year; 2) an Upgrade Alternative that would use existing and planned facilities at LANL with additional new construction to provide the capability to produce 125 pits per year; and 3) the 50/80 Alternative, which would use existing and planned facilities at LANL with minor additional construction that would be capable of producing approximately 50 to 80 pits per year (the “50/80 Alternative”).
- **CCE Alternative.** This alternative includes two options: 1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, the Consolidated Uranium Center (CUC), and the Assembly/Disassembly/High Explosives (A/D/HE) Center at one site; and 2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC at one site, and the A/D/HE Center at Pantex or NTS. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE Center, 2020-2025).
- **Capability-Based Alternatives.** In the 2008 LANL SWEIS, NNSA assessed an alternative of establishing an interim pit fabrication capacity to provide 50 pits annually. Under the Capability-Based Alternative, NNSA would achieve that level of production but no more. Manufacturing pits in TA-55 at this level would likely cause only minor differences in impacts on land use, visual resources, water resources, geology and soils, air quality, noise, ecological resources, public health, cultural resources, and infrastructure (LANL 2008). As such, these resources are not discussed for the Capability-Based Alternative. This SPEIS focuses on impacts to worker health, socioeconomics, waste management, and transportation. Under the No Net Production/Capability-Based Alternative, LANL would decrease pit production to approximately 10 pits annually. Most changes at LANL for the No Net Production/Capability-Based Alternative would be minimal for all resource areas except worker health and waste management.

The impacts are presented below for each of the following resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management. Additionally, this section analyzes the potential impacts associated with phasing out Category I/II SNM operations at LANL if it is not selected for a CPC or CNPC/CNC. That analysis, which focuses on the changes to socioeconomics, human health, accidents, and waste generation, is contained in the relevant resource areas within Section 5.1. For example, the discussion of socioeconomic impacts is contained in Section 5.1.9.5.

5.1.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.1.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.1.1-1—Potential Effects on Land Use at the Proposed Sites

<table>
<tr><th colspan="4">CPC Alternatives</th></tr>
<tr><th rowspan="4">Greenfield Alternative</th><th>Construction (acres)</th><th colspan="2">Operation (acres)</th></tr>
<tr><td rowspan="3">140</td><td colspan="2">110[a]</td></tr>
<tr><th>PIDAS</th><th>Non-PIDAS</th></tr>
<tr><td>40</td><td>70</td></tr>
<tr><th>Upgrade Alternative</th><td>13</td><td colspan="2">6.5 (All within PIDAS)</td></tr>
<tr><th>50/80 Alternative</th><td>6.5</td><td colspan="2">2.5 (All within PIDAS)</td></tr>
<tr><th colspan="4">CUC</th></tr>
<tr><th>Construction (acres)</th><td colspan="3">50</td></tr>
<tr><th rowspan="3">Operation (acres)</th><td colspan="3">Total Area: 35[b]</td></tr>
<tr><th>PIDAS</th><th colspan="2">Non-PIDAS</th></tr>
<tr><td>15</td><td colspan="2">20</td></tr>
<tr><th colspan="4">A/D/HE CENTER [d]</th></tr>
<tr><th>Construction (acres)</th><td colspan="3">300</td></tr>
<tr><th rowspan="3">Operation (acres)</th><td colspan="3">Total Area: 300[e]</td></tr>
<tr><th>PIDAS</th><th colspan="2">Non-PIDAS</th></tr>
<tr><td>Weapons A/D/Pu Storage: 180</td><td colspan="2">Administrative and High Explosives Area: 120</td></tr>
<tr><th colspan="4">CNC</th></tr>
<tr><td></td><th colspan="3">Total Area: 195[f]</th></tr>
<tr><th rowspan="2">Operation (acres)</th><th>PIDAS</th><th colspan="2">Non-PIDAS</th></tr>
<tr><td>Total: 55
• CPC: 40
• CUC: 15</td><td colspan="2">Total: 140
• Non-SNM component production: 20
• Administrative Support: 70
• Buffer Area: 50</td></tr>
<tr><th colspan="4">CNPC</th></tr>
<tr><td></td><th colspan="3">Total Area: 545[g]</th></tr>
<tr><th rowspan="2">Operation (acres)</th><th>PIDAS</th><th colspan="2">Non-PIDAS</th></tr>
<tr><td>Total: 235
• CPC: 40
• CUC: 15
• A/D/Pu Storage: 180</td><td colspan="2">Total: 310
• Non-SNM component production: 20
• Administrative Support: 70
• Explosives Area: 120
• Buffer Area: 100</td></tr>
</table>

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

[b] At Y-12, a UPF would be constructed (see Section 3.4.2).

[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.

[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.1.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional buildings or facilities would be built beyond those that NNSA has already decided to build, and no additional impacts on land use would occur at LANL beyond those of existing and future activities that are independent of this action. LANL has approximately 2,000 structures with approximately 8.6 million square feet under roof, spread over an area of approximately 25,600 acres. Table 5.1.1-2 presents the major LANL Technical Areas and associated facilities.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities

Technical Area [a]	Activities
TA-0 (Offsite Facilities)	This TA designation is assigned to structures leased by DOE that are located outside LANL's boundaries in the Los Alamos townsite and White Rock.
TA-2 (Omega Site or Omega West Reactor)	This TA in Los Alamos Canyon was home to the now demolished Omega West Reactor.
TA-3 (Core Area or South Mesa Site)	This TA is LANL's core scientific and administrative area, with approximately half of LANL's employees and total floor space. It is the location of a number of the LANL's Key Facilities, including the Chemistry and Metallurgy Research Building, the Sigma Complex, the Machine Shops, the Material Sciences Laboratory, and the Nicholas C. Metropolis Center for Modeling and Simulation. It is also the location proposed for operating the existing Biosafety Level 3 Facility.
TA-5 (Beta Site)	This TA is largely undeveloped. Located between East Jemez Road and the San Ildefonso Pueblo, it contains physical support facilities, an electrical substation, and test wells.
TA-6 (Two-Mile Mesa Site)	This TA, located in the northwestern part of LANL, is mostly undeveloped. It contains a meteorological tower, gas-cylinder-staging buildings, and aging vacant buildings that are awaiting demolition.
TA-8 (GT-Site [Anchor Site West])	This TA, located along West Jemez Road, is a testing site where nondestructive dynamic testing techniques are used for the purpose of ensuring the quality of materials in items ranging from test weapons components to high-pressure dies and molds. Techniques used include radiography, radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.
TA-9 (Anchor Site East)	This TA is located on the western edge of LANL. Fabrication feasibility and the physical properties of explosives are explored at this TA, and new organic compounds are investigated for possible use as explosives.
TA-11 (K Site Environmental Test Facility)	This TA is used for testing explosives components and systems, including vibration analysis and drop-testing materials and components under a variety of extreme physical environments. Facilities are arranged so that testing may be controlled and observed remotely, allowing devices that contain explosives, radioactive materials, and nonhazardous materials to be safely tested and observed.
TA-14 (Q-Site)	This TA, located in the northwestern part of LANL, is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-15 (R-Site)	This TA, located in the central portion of LANL, is used for high explosives research, development, and testing, mainly through hydrodynamic testing and dynamic experimentation. TA-15 is the location of two firing sites, the Dual Axis Radiographic Hydrodynamic Test Facility, which has an intense high-resolution, dual-machine radiographic capability, and Building 306, a multipurpose facility where primary diagnostics are performed.
TA-16 (S-Site)	TA-16, in the western part of LANL, is the location of the Weapons Engineering Tritium Facility, a state-of-the-art tritium processing facility. The TA is also the location of high explosives research, development, and testing, and the High Explosives Wastewater Treatment Facility.
TA-18 (Pajarito Site)	This TA, located in Pajarito Canyon, is the location of the Los Alamos Critical Experiment Facility, a general-purpose nuclear experiments facility. It is the location of the Solution High-Energy Burst Assembly and is also used for teaching and training related to criticality safety and applications of radiation detection and instrumentation. In December 2002, NNSA decided to relocate all TA-18 Security Category I and II materials and activities to the Nevada Test Site; this transfer is in process.
TA-21 (DP-Site)	TA-21 is on the northern border of LANL, next to the Los Alamos townsite. In the western part of the TA is the former radioactive materials (including plutonium) processing facility that has been partially decontaminated and decommissioned. In the eastern part of the TA are the Tritium Systems Test Assembly and the Tritium Science and Fabrication Facility. Operations from both facilities have been transferred elsewhere as of the end of 2006.
TA-22 (TD-Site)	This TA, located in the northwestern portion of LANL, houses the Los Alamos Detonator Facility. Construction of a new Detonator Production Facility began in 2003. Research, development, and fabrication of high-energy detonators and related devices are conducted at this facility.
TA-28 (Magazine Area A)	TA-28, located near the southern edge of LANL, was an explosives storage area. The TA contains five empty storage magazines that are being decontaminated and decommissioned.
TA-33 (HP-Site)	TA-33 is a remotely-located TA at the southeastern boundary of LANL. The TA is used for experiments that require isolation, but do not require daily oversight. The National Radioastronomy Observatory's Very Long Baseline Array telescope is located at this TA.
TA-35 (Ten Site)	This TA, located in the north central portion of LANL, is used for nuclear safeguards research and development, primarily in the areas of lasers, physics, fusion, materials development, and biochemistry and physical chemistry research and development. The Target Fabrication Facility, located at this TA, conducts precision machining and target fabrication, polymer synthesis, and chemical and physical vapor deposition. Additional activities at TA-35 include research in reactor safety, optical science, and pulsed-power systems, as well as metallurgy, ceramic technology, and chemical plating. Additionally, there are some Biosafety Level 1 and 2 laboratories at TA-35.
TA-36 (Kappa-Site)	TA-36, a remotely-located area in the eastern portion of LANL, has four active firing sites that support explosives testing. The sites are used for a wide variety of non-nuclear ordnance tests.
TA-37 (Magazine Area C)	This TA is used as an explosives storage area. It is located at the eastern perimeter of TA-16.
TA-39 (Ancho Canyon Site)	TA-39 is located at the bottom of Ancho Canyon. This TA is used to study the behavior of non-nuclear weapons (primarily by photographic techniques) and various phenomenological aspects of explosives.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-40 (DF-Site)	TA-40, centrally located within LANL, is used for general testing of explosives or other materials and development of special detonators for initiating high explosives systems.
TA-41 (W-Site)	TA-41, located in Los Alamos Canyon, is no longer actively used. Many buildings have been decontaminated and decommissioned; the remaining structures include historic properties.
TA-43 (the Bioscience Facilities, formerly called the Health Research Laboratory)	TA-43 is adjacent to the Los Alamos Medical Center at the northern border of LANL. Two facilities are located within this TA: the Bioscience Facilities (formerly called the Health Research Laboratory) and NNSA's local Site Office. The Bioscience Facilities have Biosafety Level 1 and 2 laboratories and are the focal point of bioscience and biotechnology at LANL. Research performed at the Bioscience Facilities includes structural, molecular, and cellular radiobiology; biophysics; radiobiology; biochemistry; and genetics.
TA-46 (WA-Site)	TA-46, located between Pajarito Road and the San Ildefonso Pueblo, is one of LANL's basic research sites. Activities have focused on applied photochemistry operations and have included development of technologies for laser isotope separation and laser enhancement of chemical processes. The Sanitary Wastewater Systems Plant is also located within this TA.
TA-48 (Radiochemistry Site)	TA-48, located in the north central portion of LANL, supports research and development in nuclear and radiochemistry, geochemistry, production of medical radioisotopes, and chemical synthesis.
TA-49 (Frijoles Mesa Site)	TA-49, located near Bandelier National Monument, is used as a training area and for outdoor tests on materials and equipment components that involve generating and receiving short bursts of high-energy, broad-spectrum microwaves. A fire support building and helipad located near the entrance to the TA are operated by the U.S. Forest Service.
TA-50 (Waste Management Site)	TA-50, located near the center of LANL, is the location of waste management facilities including the Radioactive Liquid Waste Treatment Facility and the Waste Characterization, Reduction, and Repackaging Facility. The Actinide Research and Technology Instruction Center is also located in this TA.
TA-51 (Environmental Research Site)	TA–51, located on Pajarito Road in the eastern portion of LANL, is used for research and experimental studies on the long-term impacts of radioactive materials on the environment. Various types of waste storage and coverings are studied at this TA.
TA-52 (Reactor Development Site)	TA-52 is located in the north central portion of LANL. A wide variety of theoretical and computational research and development activities related to nuclear reactor performance and safety, as well as to several environmental, safety, and health activities, are carried out at this TA.
TA-53 (Los Alamos Neutron Science Center)	TA-53, located in the northern portion of LANL, includes the LANSCE. LANSCE houses one of the largest research linear accelerators in the world and supports both basic and applied research programs. Basic research includes studies of subatomic and particle physics, atomic physics, neutrinos, and the chemistry of subatomic interactions. Applied research includes materials science studies that use neutron spallation and contributes to defense programs. LANSCE has also produced medical isotopes for the past 20 years.
TA-54 (Waste Disposal Site)	TA-54, located on the eastern border of LANL, is one of the largest TAs at LANL. Its primary function is management of solid radioactive and hazardous chemical wastes, including storage, treatment, decontamination, and disposal operations.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-55 (Plutonium Facility Complex Site)	TA-55, located in the center of LANL, is the location of the Plutonium Facility Complex and is the chosen location for the Chemistry and Metallurgy Research Building Replacement. The Plutonium Facility provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. The Chemistry and Metallurgy Research Building Replacement, currently under construction, will provide chemistry and metallurgy research, actinide chemistry, and materials characterization capabilities.
TA-57 (Fenton Hill Site)	TA-57 is located about 20 miles (32 kilometers) west of LANL on land administered by the U.S. Forest Service. The primary purpose of the TA is observation of astronomical events. TA-57 houses the Milagro Gamma Ray Observatory and a suite of optical telescopes. Drilling technology research is also performed in this TA.
TA-58 (Twomile North Site)	TA-58, located near LANL's northwest border on Twomile Mesa North, is a forested area reserved for future use because of its proximity to TA-3. The TA houses a few LANL-owned storage trailers and a temporary storage area.
TA-59 (Occupational Health Site)	This TA is located on the south side of Pajarito Road adjacent to TA-3. This is the location of staff who provides support services in health physics, risk management, industrial hygiene and safety, policy and program analysis, air quality, water quality and hydrology, hazardous and solid waste analysis, and radiation protection. The Medical Facility at TA-59 includes a clinical laboratory and provides bioassay sample analytical support.
TA-60 (Sigma Mesa)	TA-60 is located southeast of TA-3. The TA is primarily used for physical support and infrastructure activities. The Nevada Test Site Test Fabrication Facility and a test tower are also located here. Due to the moratorium on testing, these buildings have been placed in indefinite safe shutdown mode.
TA-61 (East Jemez Site)	TA-61, located in the northern portion of LANL, contains physical support and infrastructure facilities, including a sanitary landfill operated by Los Alamos County and sewer pump stations.
TA-62 (Northwest Site)	TA-62, located next to TA-3 and West Jemez Road in the northwest corner of LANL, serves as a forested buffer zone. This TA is reserved for future use.
TA-63 (Pajarito Service Area)	TA-63, located in the north central portion of LANL, contains physical support and infrastructure facilities. The facilities at this TA serve as localized storage and office space.
TA-64 (Central Guard Site)	This TA is located in the north central portion of LANL and provides offices and storage space.
TA-66 (Central Technical Support Site)	TA-66 is located on the southeast side of Pajarito Road in the center of LANL. The Advanced Technology Assessment Center, the only facility at this TA, provides office and technical space for technology transfer and other industrial partnership activities.
TA-67 (Pajarito Mesa Site)	TA-67 is a forested buffer zone located in the north central portion of LANL. No operations or facilities are currently located at the TA.
TA-68 (Water Canyon Site)	TA-68, located in the southern portion of LANL, is a testing area for dynamic experiments that also contains environmental study areas.
TA-69 (Anchor North Site)	TA-69, located in the northwestern corner of LANL, serves as a forested buffer area. The new Emergency Operations Center, completed in 2003, is located here.
TA-70 (Rio Grande Site)	TA-70 is located on the southeastern boundary of LANL and borders the Santa Fe National Forest. It is a forested TA that serves as a buffer zone.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-71 (Southeast Site)	TA-71 is located on the southeastern boundary of LANL and is adjacent to White Rock to the northeast. It is an undeveloped TA that serves as a buffer zone for the High Explosives Test Area.
TA-72 (East Entry Site)	TA-72, located along East Jemez Road on the northeastern boundary of LANL, is used by protective force personnel for required firearms training and practice purposes.
TA-73 (Airport Site)	TA-73 is located along the northern boundary of LANL, adjacent to Highway 502. The County of Los Alamos manages, operates, and maintains the community airport under a leasing arrangement with DOE. Use of the airport by private individuals is permitted with special restrictions.
TA-74 (Otowi Tract)	TA-74 is a forested area in the northeastern corner of LANL. A large portion of this TA has been conveyed to Los Alamos County or transferred to the Department of the Interior in trust for the Pueblo of San Ildefonso and is no longer part of LANL.

TA = technical area, LANSCE = Los Alamos Neutron Science Center.
[a] Names in parentheses are common or historical names that are sometimes used to refer to the Technical Areas.

5.1.1.2 *DCE Alternative*

5.1.1.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. At LANL, which has an R&D facility (the Plutonium Facility [PF-4] at TA-55), there would be three separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; and Manufacturing. These buildings would be surrounded by a Perimeter Intrusion Detection and Assessment System (PIDAS) and a buffer area. The area outside the PIDAS would have a number of smaller support facilities, a Waste Staging/Transuranic (TRU) Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be used for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two heating, ventilation, and air conditioning (HVAC) exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be High Efficiency Particulate Air (HEPA)-filtered prior to discharge through the stacks. The reference location for the CPC is Technical Area (TA)-55, a 93-acre site 1.1 miles from the townsite of Los Alamos. Approximately one-half of TA-55 is developed. A CPC would change land use in this area. In addition, there might be a modification to the current land use designation, Nuclear Materials R&D, for this area.

An estimated 140 acres of land for buildings, walkways, access, parking, buffer space, and construction-related workspace would be required to construct a CPC. NNSA believes that, should Los Alamos be selected as the CPC site, the proposed facility design could be adapted to the available space. For example, approximately 40 acres of the CPC would require protection within a PIDAS. TA-55 has adequate land available to accommodate this protected area. Additionally, the Greenfield CPC includes acreage for support facilities, waste management facilities, and parking. These would not necessarily be located at TA-55 if Los Alamos were selected for a Greenfield CPC. If the Los Alamos site were selected to host a CPC, a tiered EIS would serve to explore all reasonable siting options. The land required for the proposed CPC construction would represent approximately 0.55 percent of LANL's total land area of 25,600 acres. The developed area after construction would be approximately 110 acres.

Operations. An estimated 110 acres of land would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent approximately 0.4 percent of Los Alamos' total land area of 25,600 acres. Although there would be a change in land use (to nuclear materials production), the proposed CPC is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.2.2 Upgrade Alternative

Construction. As described in Section 3.4.1.6.1, in the Upgrade Alternative, NNSA would build the Chemistry and Metallurgy Research Replacement- Nuclear Facility (CMRR-NF), and construct a new facility (known as the "Manufacturing Annex") to augment pit-manufacturing capacity and related infrastructure capacity. The reference location for the CPC under this approach is in the area of TA-55. Land use at TA-55 has been categorized as R&D. TA-55 is a 93-acre site that is situated 1.1 miles from the townsite of Los Alamos. An estimated 13 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CMRR-NF and Manufacturing Annex at TA-55. The land required for this facility would represent approximately 14 percent of the total area at TA-55, and approximately 28 percent of the undeveloped area at TA-55.

Operations. As described in Section 3.4.1.6.1, the Upgrade Alternative would be expected to operate similar to the Greenfield CPC at LANL. An estimated 6.5 acres of additional land for buildings, walkways, building access, parking, and buffer space would be required to operate the Upgrade Alternative. Although there would be a change in land use (to nuclear materials production), the proposed CPC is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.2.3 50/80 Alternative

Construction. As described in Section 3.4.1.6.2, the 50/80 Alternative would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 to produce approximately 80 pits for the stockpile per year. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or consolidated within PF-4. Additionally, this alternative includes the CMRR-NF facility,[1] which would be expanded by approximately 9,000 square feet to approximately 209,000 square feet, to accommodate pit manufacturing operations. The construction activities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint, with 6.5 acres of total area disturbed during construction. The area required for the permanent

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[1] The CMRR, which is approximately 400,000 square feet, consists of both a nuclear and non-nuclear facility. The nuclear facility is approximately one-half of the CMRR.

footprint would represent approximately 2.7 percent of the total land area at TA-55, and approximately 5.4 percent of the undeveloped land at TA-55.

Operations. The operation of the 50/80 Alternative would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint. Although there would be a change in land use (to nuclear materials production), the 50/80 Alternative is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.3 *CCE Alternative*

5.1.1.3.1 CNC (CPC + CUC)

Land use impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.1.2 as well as the impacts discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, the CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, operations at the CUC would require approximately 35 acres. All buildings would be either one or two stories.

The land required for the proposed CUC construction would represent approximately 0.20 percent of LANL's total land area of 25,600 acres. Approximately 15 acres of the CUC would require protection within a PIDAS. TA-55 has adequate land available to accommodate this protected area. NNSA believes that, should Los Alamos be selected for the CUC (as part of a CNPC), the proposed facility design could be adapted to the space available. For example, some of the walkway, building access, parking and buffer space already allocated for TA-55 facilities could serve the CNC buildings as well so that less total acreage would be required. If the Los Alamos site were selected to host the CUC, a tiered EIS would serve to explore all reasonable siting options. Additionally, as explained in Section 5.1.1.3.2, the reference site for the full CNPC is TA-16, which affords a significant amount of undeveloped land at Los Alamos to host facilities such as the CUC.

Although there would be a change in land use, the proposed CUC is compatible with land use plans for this area. No impacts to Los Alamos land use plans or policies are expected.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNC. Of this, approximately 55 acres would be located within a PIDAS. This would be approximately 10 acres more than the undeveloped land available at TA-55. NNSA believes that, should Los Alamos be selected for the CUC (as part of a CNC), the facility design could be adapted to the space available. Administrative support buildings and non-nuclear component production would require approximately 90 acres area outside of the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. The total land required to support CNC operations would represent approximately 1 percent of LANL's total land area of 25,600 acres.

The CNC could be located in the existing TA-55 location, which would change land use in this area. Additionally, as explained in the next section, there is an alternative to locate the CNC at TA-16, as part of a full CNPC.

5.1.1.3.2 CNPC (CPC + CUC + A/D/HE Center)

Land use impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.1.2.1, the CUC construction impacts discussed in Section 5.1.1.3.1, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** As described in Section 3.5, the Assembly/Disassembly/High Explosives (A/D/HE) Center would consist of a nuclear facility within the PIDAS and high explosives facilities and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for the A/D/HE Center. Approximately 180 acres would be protected within a PIDAS.

The reference location for the A/D/HE Center (and CNPC) at LANL is TA-16, which consists of approximately 1,900 acres. TA-16, located in the western part of LANL, is the site of the Weapons Engineering Tritium Facility, which is a state-of-the-art tritium processing facility, and the High Explosives Wastewater Treatment Facility. The TA’s high explosives research, development, and testing capabilities include high explosives processing; powder manufacturing; casting, machining, and pressing; inspection and radiography of high explosives components to guarantee integrity and ensure quality control; test device assembly; and chemical analysis. There are also some biological laboratories here. Approximately one-third of TA-16 is developed, and the other two-thirds of the TA are undeveloped. As such, there are a total of approximately 1,350 acres available at TA-16 for Complex Transformation facilities.

The land required for the proposed A/D/HE Center construction would represent approximately 1.2 percent of LANL’s total land area of 25,600 acres, and approximately 22 percent of the available land at TA-16. Although there would be a change in land use, the proposed A/D/HE Center would be compatible with land use plans, although there might be a modification to the current land use designation, High Explosive R&D, for this area.

Operations: **CNPC.** As described in Section 3.5.1.2, an estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the full CNPC. Of this, approximately 235 acres would be located within a PIDAS. Administrative support buildings, non-nuclear component production, and high explosives fabrication activities would occur on approximately 210 acres outside the PIDAS. A 100-acre buffer zone would also be located outside the PIDAS. The land required for CNPC operations would represent approximately 2.3 percent of LANL’s total land area of 25,600 square miles.

5.1.2 Visual Resources

5.1.2.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. The Cerro Grande Fire of 2000 altered views of LANL from various locations in Los Alamos County. While many LANL facilities are still generally screened from view, some developed areas that were previously screened by vegetation are now more visible to passing traffic (LANL 2008).

5.1.2.2 *DCE Alternative (CPC)*

5.1.2.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, the CPC would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for the Greenfield CPC Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Thus, impacts on visual resources during construction would be minimal.

Operations. The Greenfield CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of TA-55. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV Bureau of Land Management (BLM) Visual Resource Management rating of developed areas within TA-55.

5.1.2.2.2 Upgrade Alternative

Construction. Activities related to the construction of new buildings (CMRR-NF and Manufacturing Annex) required for the Upgrade Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, new buildings being constructed, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Moreover, this change would be consistent with the currently developed areas of TA-55. Thus, impacts on visual resources during construction would be minimal.

Operations. The Upgrade Alternative would include two new two-story buildings. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

5.1.2.2.3 50/80 Alternative

Construction. Activities related to the construction of the CMRR-NF required for the 50/80 Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, a new building, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Thus, impacts on visual resources during construction would be minimal.

Operations. The 50/80 Alternative would not change the appearance of TA-55. While not visible from lower elevations, the CMRR-NF would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

5.1.2.3 *CCE Alternative*

5.1.2.3.1 CNC (CPC + CUC)

Visual resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.2.2 as well as the impacts discussed below.

***Construction:* CUC.** Construction activities for the CUC are described in Section 3.5.1.1.1. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

***Operations:* CNC.** The CNC (consisting of the CPC and CUC) would include one- and two-story buildings that would change the appearance of the reference location. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 would not change the current Class IV BLM Visual Resource Management rating of developed areas.

5.1.2.3.2 CNPC (CPC + CUC + A/D/HE Center)

Visual Resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.2.2, the CUC construction and CNC operational impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Construction activities for the A/D/HE Center are described in Section 3.5.1.2. In 2000, the Cerro Grande Fire swept across TA-16, burning V-Site (an inoperable historic Manhattan Project era site), but all other buildings were placed into a safe closed condition, and fire personnel bulldozed a fire line around the Weapons Engineering Tritium Facility. While not visible from lower elevations, the new facilities at TA-16 would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-16 area). However, this change would be consistent with the currently developed areas of TA-16. Thus, new construction within TA-16 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-16.

Bandelier National Monument is an important area from which LANL may be viewed. Separate units of the Monument border LANL to the south (Main Unit) and northeast (Tsankawi Unit). Views from the Main Unit along NM 4 are of a generally natural landscape, although there are instances where LANL structures are visible. These include miscellaneous buildings and infrastructure located in TA-33, several facilities and infrastructure associated with TA-49, and TA-16 facilities located east of NM 501 near where it meets NM 4.

Operations: **CNPC.** The CNPC would be a large complex of industrial facilities, parking lots, and a buffer area encompassing approximately 545 acres. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures. However, this change would be consistent with the currently developed areas of TA-16. Thus, new construction within TA-16 boundaries would likely not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-16.

5.1.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.1.5). Other infrastructure demands, such as fuels or industrial gases, are commodities that not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS. In general, these commodities are readily available, could be purchased, and would not affect site selection decisions.

5.1.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to infrastructure beyond current/planned activities that are independent of this action. The current power pool peak load capacity is 150 megawatts-electric [MWe]) and current usage is approximately 70 MWe for LANL and approximately 18 MWe for other Los Alamos County users. (LANL 2008).[2] As such, the available capacity is 63 MWe. LANL and Los Alamos County uses approximately 550,870 megawatt-hours (MWh)/yr of electricity. Based on a system capacity 1,314,000 MWh/yr, approximately 763,130 MWh/yr is available (LANL 2008).

5.1.3.2 *DCE Alternative (CPC)*

Construction. The projected demand on electrical resources associated with construction activities of the three approaches for the DCE Alternative at LANL (Greenfield CPC, Upgrade Alternative, and 50/80 Alternative) are shown in Table 5.1.3–1. The existing electrical infrastructure at LANL would be adequate to support annual construction requirements for the CPC.

Table 5.1.3-1—Annual Electrical Requirements for Construction of CPC, CUC, and the A/D/HE Center at LANL

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
System capacity[a]	1,314,000	150
Available capacity[a]	763,130	63
No Action Alternative		
Total site requirement[b]	550,870	87
Percent of system capacity	42%	58%
Greenfield CPC		
CPC requirement	13,000	3.0
Percent of system capacity	1%	2%
Percent of available capacity	1.7%	4.8%
Upgrade Alternative		
CPC requirement	8,760	2.0
Percent of system capacity	<1%	1.5%
Percent of available capacity	<1%	3.2%
50/80 Alternative		
CPC requirement	4,380	1.0
Percent of system capacity	<1%	<1%
Percent of available capacity	<1%	1.6%
CUC		
CUC requirement	10,950	2.5
Percent of system capacity	<1%	1.7%
Percent of available capacity	1.4%	4.0%

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[2] "Electrical energy and peak load capacity reflect the current import capacity of the electric transmission lines that deliver electric power to the Los Alamos Power Pool, as well as the completion of upgrades at the TA-3 Co-Generation Complex, which has added 40 MW of generating capacity. Values do not reflect completion of a new transmission line and other ongoing electrical power system upgrades."

Table 5.1.3-1—Annual Electrical Requirements for Construction of CPC, CUC, and the A/D/HE Center at LANL (continued)

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
A/D/HE Center		
A/D/HE Center requirement	55,000	12.7
Percent of system capacity	4.2%	8.5%
Percent of available capacity	7.2%	20%

Source: NNSA 2007.

[a] Not limited due to offsite procurement.

[b] Electrical site capacity and requirements are for Los Alamos Power Pool, which include LANL and other Los Alamos County users.

5.1.3.2.2 Operations

The estimated annual electrical requirements for the three approaches for the DCE Alternative at LANL (Greenfield CPC, Upgrade Alternative, and 50/80 Alternative) are shown in Table 5.1.3-2. The existing electrical infrastructure would be adequate to support annual operations.

5.1.3.3 *CCE Alternative*

5.1.3.3.1 CNC (CPC + CUC)

Site electrical impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.3.2 as well as the impacts discussed below.

Construction: **CUC.** The estimated site electrical requirements for construction of the CUC are presented in Table 5.1.3-1. The existing electrical infrastructure would be adequate to support annual construction requirements for the CUC.

Table 5.1.3-2—Annual Site Infrastructure Requirements for Operation of the CPC, CUC, CNC, A/D/HE Center and the CNPC at LANL

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
System capacity[a]	1,314,000	150
Available capacity[a]	763,130	63
No Action Alternative		
Total site requirement[b]	550,870	87
Percent of system capacity	42%	58%
Greenfield CPC/Upgrade		
CPC requirement	48,000	11
Percent of system capacity	3.6%	7.3%
Percent of available capacity	6.3%	17.5%
50/80 Alternative		
CPC requirement	44,000	10
Percent of system capacity	3.3%	6.7%
Percent of available capacity	5.8%	15.9%

Table 5.1.3-2—Annual Site Infrastructure Requirements for Operation of the CPC, CUC, CNC, A/D/HE Center and the CNPC at LANL (continued)

Proposed Alternatives	**Electrical**	
	Energy (MWh/yr)	**Peak Load (MWe)**
CUC		
CUC requirement	168,000	18.4
Percent of system capacity	12.8%	12.3%
Percent of available capacity	22%	29.2%
CNC (Greenfield or Upgrade Alternative CPC + CUC)		
CNC requirement	216,000	29.4
Percent of system capacity	16.4%	19.6%
Percent of available capacity	28.3%	46.7%
CNC (50/80 Alternative + CUC)		
CNC requirement	212,000	28.4
Percent of system capacity	16.1%	18.9%
Percent of available capacity	27.8	45.1%
A/D/HE Center		
A/D/HE Center requirement	52,000	11.9
Percent of system capacity	3.9%	7.9%
Percent of available capacity	6.8%	18.9%
CNPC (Greenfield and Upgrade Alternative + CUC + A/D/HE Center)		
CNPC requirement	264,000	41.3
Percent of system capacity	20.1%	27.5%
Percent of available capacity	34.6%	65.6%
CNPC (50/80 Alternative + CUC + A/D/HE Center)		
CNPC requirement	260,000	40.3
Percent of system capacity	19.9%	26.9%
Percent of available capacity	34%	64%

Source : NNSA 2007.

[a] Not limited due to offsite procurement.

[a] Electrical system capacity and current requirements are for the entire Los Alamos Power Pool, which include LANL and other Los Alamos County users.

Operations: **CNC.** The core operations of the CNC would be similar to the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site electrical requirements for operation of the CNC are presented in Table 5.1.3-2. Although the CNC operations would not exceed LANL electrical power capacity, the peak load could approach approximately 70 percent of the system capacity.

5.1.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site infrastructure impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** The estimated site infrastructure requirements for construction of the A/D/HE Center are presented in Table 5.1.3-1. The existing electrical infrastructure at LANL would be adequate to support annual construction requirements for the A/D/HE Center for the projected 6-year construction period.

Operations: **CNPC.** The core operations of the CNPC are discussed in Section 3.5.1. The estimated annual site infrastructure requirements for operation of the CNPC are presented in Table 5.1.3-2. The current power pool total electric energy capacity is 1,314,000 megawatt-hours (MWh) (based on a nominal peak load of approximately 150 MWe). The most recent data shows a peak load of approximately 69.5 MWe from LANL and 18.3 MWe from the county for a total peak load of 87 MWe (LANL 2008). Operation of a CNPC would have the potential to use approximately 65.6 percent of the peak power capacity that is available.

5.1.4 Air Quality and Noise

5.1.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The area encompassing LANL and Los Alamos County is classified as an attainment area for all six criteria pollutants. Simultaneous operation of LANL's air emission sources at maximum capacity, as described in the Title V permit application, would not exceed any state or Federal ambient air quality standards.

5.1.4.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of a CPC, or upgrades to existing facilities at LANL, would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, particulate matter less than 10 microns in diameter (PM_{10}), total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the U.S. Environmental Protection Agency (EPA) document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicle) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.1.4-1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the LANL site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.1.4-1—Estimated Peak Nonradiological Air Emissions for CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)	Estimated Annual Emission Rate (metric tons/yr)	Estimated Annual Emission Rate (metric tons/yr)
	Greenfield CPC	**Upgrade[a]**	**50/80**
Carbon monoxide	409.6	NA	57
Carbon dioxide	7,084.2	NA	52
Nitrogen dioxide	177.7	NA	0.12
Sulfur dioxide	11.6	NA	0.04
Volatile organic compounds	28.7	NA	3.2
PM_{10}	686	NA	0.34
Total Suspended Particulates	915	NA	46.8

Source: NNSA 2007.

[a] Construction of the Upgrade Alternative would be similar in size and scope as the CMRR construction. See Table 5.1.4-2 for the maximum incremental concentrations associated with construction.

Table 5.1.4-2—Incremental Concentrations for CPC Upgrade Alternative–Construction

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)[b]	
			Baseline [b]	**Upgrade**
Carbon monoxide	8-hour	7,900	192.4	22.8
	1-hour	11,900	1,071	182
Nitrogen dioxide	Annual 24-hour	75 150	7.0 40.2	0.86 23.1
Sulfur dioxide	Annual	42	10.2	0.079
	24-hour	209	83.5	2.26
	3-hour	1,050	397.3	18.1
PM_{10}	Annual	50	5.24	2.02
	24-hour	150	101.6	34.4
Total Suspended Particulates	Annual	60	5.7	3.96
	24-hour	150	135	66.7

NA = not available.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (μg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Radiological impacts. No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, U.S. Department of Energy (DOE) would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Nonradiological impacts. Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, volatile organic compounds (VOCs), and total suspended particulates. The estimated emission rates for nonradiological pollutants emitted are presented in Table 5.1.4–3. For a Greenfield CPC, a portion of these emissions would be offset by the transfer of current pit manufacturing activities to the new facilities. However, in general, the emissions would be incremental to the LANL baseline. If LANL is selected as the site for a CPC, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

Table 5.1.4–3—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

As part of a previous evaluation of the impact of air emissions, NNSA consulted the Guidance on *Clean Air Act* (CAA) Conformity requirements (DOE 2000a). It determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

The maximum concentrations (micrograms per cubic meter) at the LANL site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.1.4-4. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For most pollutants, incremental concentration increases would generally be small (less than 5 percent). The greatest increase would occur for total suspended particulates (TSP), which could increase by approximately 28 percent. Because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Radiological impacts. Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

Table 5.1.4-4—Criteria Pollutant Concentrations for CPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)[b]			
			Baseline [b]	CPC	Upgrade	50/80
Carbon monoxide	8-hour	7,900	192.4	2.58	2.58	1.0
	1-hour	11,900	1,071	3.66	3.66	1.4
Nitrogen dioxide	Annual	75	7.0	1.28	1.28	0.51
	24-hour	150	40.2	NA	NA	NA
Sulfur dioxide	Annual	42	10.2	0.06296	0.06296	0.03
	24-hour	209	83.5	0.454	0.454	0.17
	3-hour	1,050	397.3	0.992	0.992	0.38
PM$_{10}$	Annual	50	5.24	0.0356	0.0356	0.01
	24-hour	150	101.6	0.18	0.18	0.07
Total Suspended Particulates	Annual	60	5.7	NA	NA	NA
	24-hour	150	135	38.2	38.2	15

Source: Janke 2007.
NA = not available.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (μg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

NNSA estimated routine radionuclide air emissions (see Table 5.1.4-5). To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations are expected to be smaller. NNSA estimated the radiation doses to the offsite maximally exposed individual (MEI) and the offsite population surrounding LANL.

Table 5.1.4-5—Annual Radiological Air Emissions for CPC at LANL–Operations

Isotope	Baseline[a, b]	Annual Emissions (Curies [Ci]/yr)[c]	Annual Emissions (Ci/yr)[c]
		CPC (200 ppy)[d]	**50/80**
Americium-241	2.6×10^{-7}	3.12×10^{-7}	1.72×10^{-8}
Plutonium-239		1.02×10^{-5}	5.38×10^{-7}
Plutonium-240		2.66×10^{-6}	1.40×10^{-7}
Plutonium-241		1.96×10^{-4}	1.03×10^{-5}
Total Plutonium	**9.3×10^{-6}**	**2.09×10^{-4}**	**1.1×10^{-5}**
Uranium-234		5.02×10^{-9}	2.52×10^{-10}
Uranium-235		1.58×10^{-10}	7.95×10^{-12}
Uranium-236		2.56×10^{-11}	1.28×10^{-12}
Uranium-238		1.42×10^{-12}	7.14×10^{-14}
Total Uranium	**7.3×10^{-6}**	**5.21×10^{-9}**	**2.62×10^{-10}**
Total	**1.7×10^{-5}**	**2.09×10^{-4}**	**1.1×10^{-5}**

[a] Based on calendar year 2001 data.
[b] The No Action Alternative is represented by the baseline.
[c] Source: NNSA 2007.
[d] Data for a CPC producing 200 ppy is applicable to both the Greenfield CPC and the Upgrade Alternative.

As shown in Table 5.1.4-6, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 millirem (mrem) per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the CPC resulting from radiological air emissions are presented in Section 5.1.11.

Table 5.1.4-6—Annual Doses Due to Radiological Air Emissions from CPC Operations at LANL

Receptor	CPC	50/80
Offsite MEI[a] (mrem/yr)	1.5×10^{-4}	7.7×10^{-6}
Population within 50 miles (person-rem per year)[a]	6.0×10^{-4}	3.2×10^{-5}

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.1.4-5 and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.1.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud intermittent sources such as blasting. Although noise levels in construction areas could be as high as 110 A-weighted decibels (dBA), these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.1.4-7 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 1 mile) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.1.4-7—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by Occupational Safety and Health Administration (OSHA) in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 1 mile) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.1.4.3 *CCE Alternative*

5.1.4.3.1 CNC (CPC + CUC)

Air Quality and Noise impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.4.2 as well as the impacts discussed below for the CUC.

5.1.4.3.1.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for the CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.1.4-1 would be representative of the CUC. Actual construction emissions of the CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts.

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* CUC and CNC nonradiological impacts.** CUC (and CNC) activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. This derivation did not include steam production at Y-12, which is responsible for approximately 90 percent of the nonradiological emissions at Y-12. The nonradiological pollutants were modeled to determine the incremental concentrations from the CUC to the LANL baseline. The results are presented in Table 5.1.4-8. Because estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. The CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded; however, as noted in Section 5.1.2.1, because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard for the CNC.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.1.4-8—Criteria Pollutant Concentrations for CNC Operations at Los Alamos

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration(μg/m^3)			
			Baseline	CPC	CUC	CNC
Carbon monoxide	8-hour	7,900	192.4	2.58	NA	2.58
	1-hour	11,900	1,071	3.66	NA	3.66
Nitrogen dioxide	Annual 24-hour	75 150	7.0 40.2	1.28 NA	0.9 NA	2.18 NA
Sulfur dioxide	Annual	42	10.2	0.06296	2.1	2.16
	24-hour	209	83.5	0.454	2.1	2.5
	3-hour	1,050	397.3	0.992	52.4	53.4
PM_{10}	Annual	50	5.24	0.0356	17.5	17.5
	24-hour	150	101.6	0.18	17.5	17.7
Total Suspended Particulates	Annual	60	5.7	NA	NA	NA
	24-hour	150	135	38.2	NA	38.2

Source: Janke 2007.
NA = not available.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (μg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

CUC and CNC radiological impacts. The CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of the CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing Enriched Uranium (EU) facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from the CUC are conservatively estimated[3] from existing operations at Y-12. An estimated 0.010 curies (2.17 kilograms) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding LANL, and LANL workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding LANL. As shown in Table 5.1.4-9, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE

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[3] This estimate is considered "conservative" because it is expected that a new uranium facility would produce smaller radiological airborne emissions than radiological airborne emissions from existing EU facilities at Y-12 due to the incorporation of newer technology into the facility design.

(DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the CUC resulting from radiological air emissions are presented in Section 5.1.11, Human Health and Safety.

Table 5.1.4-9—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations at LANL

Receptor	CUC	CNC
Offsite MEI[b] (mrem/yr)	0.077	0.077
Population within 50 miles (person-rem per year)	0.23	0.23

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. Bounding MEI dose is for a CUC at TA-55. Bounding population dose is for a CUC at TA-16.

[b] The offsite MEI is assumed to reside at the site boundary.

5.1.4.3.1.2 Noise

Construction: **CUC.** Anticipated noise impacts from the construction of the CUC are similar to those described for the CPC in Section 5.1.4.2.2.

Operations: **CUC and CNC.** Anticipated noise impacts from the operation of the CNC are similar to those described for the CPC in Section 5.1.4.2.2.

5.1.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air Quality and Noise impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.1.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.1.4.3.2.1 Air Quality

Construction: **A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for the CPC and CUC. However, due to the potential to disturb approximately 300 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent.

The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.1.4–10. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.1.4-10—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	267
24-hour	150	1,950

Source: Janke 2007.

The results presented above represent a bounding estimate of PM_{10} emissions at the site boundary. These estimates are very conservative in choice of the stability class and the source term. The source strength was assumed to come from a relatively concentrated area for application to the Gaussian Plume equation. Use of an area source would not reduce the emissions by an order of magnitude. Therefore, the results in the table potentially overestimate the impact by about a factor of 5. Based on this analysis, a more detailed site-specific analysis would need to be performed, using project-specific information, if Los Alamos is selected for a CNPC. If that analysis shows that regulatory limits would be exceeded, then mitigation measures would need to be developed.

A/D/HE Center radiological impacts. No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and what would be required to remediate any contamination in accordance with established site procedures.

***Operations:* A/D/HE Center and CNPC nonradiological impacts.** The CNPC would release nonradiological contaminants into the atmosphere during operations. The CPC and CUC nonradiological emissions are discussed in sections 5.1.4.2.1 and 5.1.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of the CNPC would be additive of the CPC, CUC, and the A/D/HE Center (which is discussed in this section). During normal operations, the A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.1.4-11. These emissions would add to the LANL baseline.

Table 5.1.4-11—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS Emissions	Emissions
Oxides of Nitrogen (tons/year)	91
Carbon Monoxide (tons/year)	31
Volatile Organic Compounds (tons/year)	31
Particulate Matter (tons/year)	18
Sulfur Dioxide (tons/year)	5
Hazardous Air Pollutants and Effluents (tons/yr)	22

Source: NNSA 2007.

The maximum concentrations (micrograms per cubic meter) at the LANL site boundary that would be associated with the release of criteria pollutants presented in Table 5.1.4-12. These concentrations were compared to the more stringent (Federal or state) ambient air quality standards. As shown in that table, there would be a potential to exceed the 24-hour standard for nitrogen dioxide and the 24-hour standard for TSP. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are over estimated. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Table 5.1.4-12—Criteria Pollutant Concentrations for CNPC–Operations

Pollutant	Averaging Period	More Stringent Standard or Guideline [a] ($\mu g/m^3$)	Maximum Incremental Concentration ($\mu g/m^3$)			Total[b]
			Baseline	A/D/HE	CNPC	Maximum Concentration ($\mu g/m^3$)
Carbon monoxide	8-hour	7,900	192.4	90.6	93.2	285.6
	1-hour	11,900	1,071	274.7	278.4	1,349.4
Nitrogen dioxide	Annual	75	7.0	16.5	18.7	25.7
	24-hour	150	40.2	120.9	120.9	161.1
Sulfur dioxide	Annual	42	10.2	0.9	3.1	13.3
Sulfur dioxide	24-hour	209	83.5	6.6	9.1	92.6
	3-hour	1,050	397.3	29.2	82.6	479.9
PM_{10}	Annual	50	5.2	3.3	20.8	26
	24-hour	150	101.6	23.9	41.6	143.2
Total Suspended Particulates	Annual	60	5.7	4	4	9.7
	24-hour	150	135	29.2	67.4	202.4

Source: Janke 2007.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (μg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The Total concentration for each criteria pollutant is comprised of the baseline concentration and the CNPC concentration for each criteria pollutant.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

A/D/HE Center and CNPC radiological impacts. The CNPC would release radiological contaminants into the atmosphere during operations. The CPC and CUC radiological emissions are discussed in sections 5.1.4.2.1 and 5.1.4.3.1 respectively, and are not repeated here. The total radiological air impacts of the CNPC would be additive of the CPC, CUC, and the A/D/HE Center (which is discussed in this section).

During normal operations, the A/D/HE Center would release radionuclides to the air in the quantities indicated in Table 5.1.4-13.

Table 5.1.4-13—Annual Radiological Air Emissions for A/D/HE Center Operations

Radionuclide	Emissions (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Radiological Releases (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding LANL, and LANL workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding LANL. As shown in Table 5.1.4-14, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the A/D/HE Center resulting from radiological air emissions are presented in Section 5.1.11, Human Health and Safety.

Table 5.1.4-14—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations at LANL

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	5.8×10^{-5}	0.077
Population within 50 miles (person-rem per year)	1.3×10^{-4}	0.23

Source: Tetra Tech 2008.
Results calculated using CAP-88 computer code, version 3. CNPC data is presented for CPC at TA-55, CUC at TA-16 (MEI dose), CUC at TA-16 (population dose), and A/D/HE Center at TA-16.
[a] The offsite MEI is assumed to reside at the site boundary.

5.1.4.3.2.2 Noise

***Construction:* A/D/HE Center.** Anticipated noise impacts from the construction of the CNPC would be similar to those described for the CPC in Section 5.1.4.2.

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of the A/D/HE Center and CNPC would be similar to those described for the CPC in Section 5.1.4.2.

5.1.4.4 *Capability-Based Alternatives*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Increases in the level of activities at the Plutonium Facility Complex would cause a small increase in plutonium emissions. The higher level of activity would result in the annual emission of an additional 0.000019 curies per year of plutonium from the Plutonium Facility Complex. Under the No Net Production/Capability-Based Alternative, NNSA would decrease pit production above the current level of 20 pits annually to 10 pits annually. Decreases in the level of activities at the Plutonium Facility Complex would cause a small decrease in plutonium emissions. The impacts to human health are addressed in Section 5.11.

5.1.5 Water Resources

Environmental impacts associated with the programmatic alternatives at Los Alamos could affect groundwater resources. No impacts to surface water are expected. LANL uses approximately 380 million gallons of groundwater. Discharges were in compliance with permits.

5.1.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. Tables 5.1.5–1 and 5.1.5-2 summarize existing surface water and groundwater resources at Los Alamos, the total water resource requirements for each alternative, and the potential changes to water resources resulting from the programmatic alternatives.

Table 5.1.5-1—Potential Changes to Water Resources from the Construction of the CPC, CUC and A/D/HE Center at LANL

Proposed Alternatives	Water Availability and Use
Annual Water Rights (gal):	542,000,000
No Action Alternative	
Water Use (gal)	380,000,000
Greenfield CPC and Upgrade Alternative	
Water Requirement (gal)	20,900,000
Percent Change from No Action	5.5%
50/80 Alternative	
Water Requirement (gal)	550,000
Percent Change from No Action	<1%
CUC	
Water Requirement (gal)	5,200,000
Percent change from No Action Alternative	1.4%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent change from No Action Alternative	<1%

Source: LANL 2008.

Table 5.1.5-2—Water Requirements for Operation of the CPC, CUC and A/D/HE Center

Proposed Alternatives	Water Availability and Use
Annual Water Rights (gal)	542,000,000
Water Use (gal)	380,000,000
Greenfield CPC and Upgrade Alternative	
Water Requirement (gal)	80,000,000
Percent Change from No Action Alternative	21%
Total Water Use/ Water Rights Exceeded?	460,000,000/No

Table 5.1.5-2—Water Requirements for Operation of the CPC, CUC and A/D/HE Center (continued)

Proposed Alternatives	Water Availability and Use
50/80 Alternative	
Water Requirement (gal)	43,000,000
Percent Change from No Action Alternative	11.3%
Total Water Use/ Water Rights Exceeded?	423,000,000/No
CUC	
Water Requirement (gal)	105,000,000
Percent Change from No Action Alternative	27.6%
Total Water Use/ Water Rights Exceeded?	485,000,000/No
CNC (Greenfield CPC or Upgrade Alternative + CUC)	
Water Requirement (gal)	185,000,000
Percent Change from No Action Alternative	48.6%
Total Water Use/ Water Rights Exceeded?	565,000,000/Yes
A/D/HE Center	
Water Requirement (gal)	130,000,000
Percent Change from No Action Alternative	34.2%
Total Water Use/ Water Rights Exceeded?	510,000,000/No
CNPC (Greenfield CPC or Upgrade Alternative + CUC)	
Water Requirement (gal)	395,000,000
Percent Change from No Action Alternative	104%
Total Water Use/ Water Rights Exceeded?	775,000,000/Yes

Source: LANL 2008.

5.1.5.2 *DCE Alternative*

5.1.5.2.1 Greenfield CPC

***Surface Water:* construction.** Construction requirements for the CPC are described in Section 3.4.1. Surface water would not be used to support the construction of the CPC at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Although runoff from the vicinity of the site drains toward the Rio Grande, surface drainages in general are ephemeral, and infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The CPC reference location at TA-55 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

***Surface Water*: operations.** Operation requirements for the CPC are described in Section 3.4.1. No impacts on surface water resources are expected as a result of CPC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

***Groundwater:* construction.** Construction requirements for the CPC are described in Section 3.4.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. As a result, it is estimated that construction activities would require a total of approximately 20.9 million gallons of groundwater mainly to support CPC construction. Site water requirements are not expected to exceed LANL's maximum water allotment. The percent change from the No Action Alternative would be approximately 5.5 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* operations.** Operation requirements for the CPC are described in Section 3.4.1. Activities at LANL under the Greenfield CPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5–2. Site water requirements for the operation of the Greenfield CPC Alternative would increase LANL's annual use by approximately 21 percent.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.2.2 Upgrade Alternative

Construction. Construction requirements for the Upgrade Alternative are described in Section 3.4.1.2. Impacts to water during construction activities would be similar to those discussed above for the Greenfield CPC.

Operations: Operation requirements for the Upgrade Alternative are described in Section 3.4.1.2. Impacts to water during construction activities would be similar to those discussed above for the Greenfield CPC.

5.1.5.2.3 50/80 Alternative

***Surface Water:* construction.** Construction requirements for the 50/80 Alternative are described in Section 3.4.1.6.2. Impacts to surface water during construction activities would be similar to those discussed above for the Greenfield CPC.

***Surface Water:* operations.** Operation requirements for the 50/80 Alternative are described in Section 3.4.1.6.2. Impacts to surface water during operation activities would be similar to those discussed above for the Greenfield CPC.

***Groundwater:* construction.** Construction requirements for the 50/80 alternative are described in Section 3.4.1.6.2. It is estimated that construction activities would require a total of approximately 550,000 gallons of groundwater mainly to support CPC construction under the 50/80 Alternative. This would be increase LANL's annual water use by less than 1 percent.

***Groundwater:* operations.** Activities at LANL under the 50/80 Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5–2. Site water requirements for the operation of the 50/80 Alternative would increase LANL's annual use by approximately 11.3 percent (LANL 2008). Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.3 *CCE Alternative*

5.1.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.5.2 as well as the impacts discussed below.

Surface Water: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. Surface water would not be used to support the construction of the CUC at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Although runoff from the vicinity of the site drains toward the Rio Grande, surface drainages are ephemeral, and infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The CUC reference locations (TA-55 and TA-16) are not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

***Surface Water*:** **CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. No impacts on surface water resources are expected as a result of CNC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNC liquid process waste facilities for the plutonium purification process.

Groundwater: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. The percent change in water consumption from the No Action Alternative would be approximately <1 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. A summary of water usage by category and total is listed in Table 5.1.5-2. Impacts from the operation of the CNC would vary depending upon the LANL CPC alternative that is selected (Greenfield CPC, Upgrade, or 50/80). The increase in water consumption for the CNC could be as much as 48.6 percent compared to the No Action Alternative (for Greenfield CPC and Upgrade Alternative). The total water use for this CNC would be 565 million gallons/year, which would exceed the LANL water allotment by 23 million gallons/year.

Los Alamos County continues to pursue the use of San Juan-Chama water as a means of preserving water rights. On September 19, 2006, New Mexico Governor Richardson signed new repayment contracts on behalf of five towns and cities and two counties, including Los Alamos County, that formally secured water rights with the Bureau of Reclamation for San Juan-Chama project water. Unlike the previous purchase form contracts, the repayment contract has no termination date, giving Los Alamos County and other municipalities perpetual rights and thus negating the need to renegotiate and renew contracts in the future. Los Alamos County will have permanent use of the water as long as it meets the terms of the contract. Use of the San Juan-Chama project along with conservation are integral to the County's Long-Range Water Supply Plan, which was commissioned to provide a sustainable water supply for the next 40 years and was completed in August 2006 (DOE 2006a).

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Surface Water: **A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. Surface water would not be used to support the construction of the A/D/HE Center at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The A/D/HE Center reference location at TA-16 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

Surface Water: **CNPC Operations.** No impacts on surface water resources are expected as a result of CNPC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid process waste facilities for the plutonium purification process.

***Groundwater:* A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. The percent change in water consumption from the No Action Alternative would be less than 1 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNPC operations.** LANL would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5-2. A/D/HE Center operations would increase water usage by 34.2 percent compared to the No Action Alternative. Impacts from the operation of the CNPC would vary depending upon the LANL CPC alternative that is selected (Greenfield CPC, Upgrade, or 50/80). The percent change in water consumption from the No Action Alternative for the operation of the CNPC would be as much as 104 percent, and the potential increase in water demands from a CNPC would result in a total water use of approximately 775 million gallons/year, which would exceed LANL's existing water rights (542 million gallons/year) by 233 million gallons. LANL would need to obtain greater water rights.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.6 Geology and Soils

5.1.6.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on geology and soils would occur at LANL beyond those of existing and future activities that are independent of this action.

In May 2000, the Cerro Grande Fire burned approximately 43,000 acres, including about 7,700 acres on LANL (Balice, Bennett, and Wright 2004). The fire severely burned much of the mountainside that drains onto LANL (Gallaher and Koch 2004). The effects of the fire included increased soil erosion due to loss of vegetative cover, formation of hydrophobic soils, and soil disturbance during construction of fire breaks, access roads, and staging areas (DOE 2000f). The increased potential for flooding and erosion led to construction of mitigation structures to retain floodwaters and reinforce road crossings (DOE 2002i).

Los Alamos County continues to pursue the use of San Juan-Chama water as a means of preserving water rights. On September 19, 2006, New Mexico Governor Richardson signed new repayment contracts on behalf of five towns and cities and two counties, including Los Alamos County, that formally secured water rights with the Bureau of Reclamation for San Juan-Chama project water. Unlike the previous purchase form contracts, the repayment contract has no termination date, giving Los Alamos County and other municipalities perpetual rights and thus negating the need to renegotiate and renew contracts in the future. Los Alamos County will have permanent use of the water as long as it meets the terms of the contract. Use of the San Juan-Chama project along with conservation are integral to the County's Long-Range Water Supply Plan, which was commissioned to provide a sustainable water supply for the next 40 years and was completed in August 2006 (DOE 2006a).

The dominant contributor to seismic risk at LANL is the Pajarito Fault System. Five small earthquakes (magnitudes of 2 or less on the Richter scale) have been recorded in the Pajarito Fault since 1991. These small events, which produced effects felt at the surface, are thought to be associated with ongoing tectonic activity within the Pajarito Fault zone (LANL 2008).

5.1.6.2 *DCE Alternative*

5.1.6.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The construction of the Greenfield CPC is expected to disturb land adjacent to existing facilities at TA-55.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's Environmental Restoration (ER) program and in accordance with

LANL's Hazardous Waste Facility Permit. Construction of the Greenfield CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the Design Basis Earthquake (DBE) ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations. An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CPC. The operation of the CPC would not be expected to result in impacts on geologic and soil resources. TA-55 is approximately 2.8 miles from the Pajarito Fault (LANL 2007). New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1B, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.2.2 Upgrade Alternative

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 13 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the Upgrade Alternative. The land required for the proposed CPC construction would represent approximately 0.05 percent of LANL's total land area of 25,600 acres.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of a Greenfield CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations. Impacts from the operation of the Upgrade Alternative would be similar to those discussed for a Greenfield CPC (Section 5.1.6.2.1).

5.1.6.2.3 50/80 Alternative

Construction. As described in Section 3.4.1.2, the LANL 50/80 Alternative would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 up to approximately 80 pits per year without expanding the size of the building. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or downsized and consolidated within PF-4. Additionally, the currently planned CMRR would be constructed.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site’s ER program and in accordance with LANL’s Hazardous Waste Facility Permit.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration. Thus, site geologic conditions would not likely affect the facilities.

Operations. The operation of the 50/80 Alternative is described in Section 3.4.1.2. New facilities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint. The operation of the 50/80 Alternative would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.3 *CCE Alternative*

5.1.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.6.2 as well as the impacts discussed below.

Construction. **CUC.** The CUC would primarily be made up of a new structure to contain a nuclear facility composed of the UPF and HEU storage (described in Sections 3.4.2 and 3.5.1.1) within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNC. Of this, approximately 55 acres would be located within a PIDAS. The administrative support buildings and non-nuclear component production would be located on a 90-acre area outside the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** As described in Section 3.5.1.2, the A/D/HE Center would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for the A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be non-nuclear facilities, HE fabrication, and administrative support. This area would be approximately 120 acres.

The reference location for the A/D/HE Center at LANL is in TA-16. TA-16 is an approximate 1,900 acre site. In the vicinity of TA-16, deformation associated with the Pajarito Fault extends at least 5,000 feet to the east of the Pajarito Fault escarpment (LANL 2004e). The west-central area of LANL, generally between TA-3 and TA-16, lies within a part of the Pajarito Fault made up of subsidiary or distributed ruptures. Deformation extends at least 5,000 feet to the east of the Pajarito Fault Escarpment. The general north-south trend of Pajarito Fault structure is disrupted in TA-62, TA-58, and TA-3 by some east-west trending faults. These faults may be related to the Pajarito Fault, the Rendija Canyon Fault, or be independent structures. These are areas of generally higher potential for seismic surface rupture, relative to locations farther removed from the Pajarito Fault zone. A comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-16, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Operations: **CNPC.** As described in Section 3.5.1.2, an estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. Of this, approximately 235 acres would be located within a PIDAS. The administrative support buildings, HE fabrication, and non-nuclear component production would be located on a 210-acre area outside the PIDAS. A 100-acre buffer zone would also be located outside the PIDAS. The reference location for the A/D/HE Center at LANL is in TA-16. Probabilistic analyses of surface rupture potential at TA-16 indicate that, even in consideration of 1-in-10,000-year events, seismic surface rupture only becomes a significant hazard on the principal or main trace of the Pajarito Fault (LANL 2004e).

5.1.7 Biological Resources

5.1.7.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered (T&E) species would occur at LANL beyond those of existing and future activities that are independent of this action.

5.1.7.2 *DCE Alternative*

As discussed in Section 5.1, the DCE Alternative at LANL includes the evaluation of three approaches, the Greenfield CPC, the Upgrade Alternative, and the 50/80 Alternative. Biological impacts from the construction and operation will be very similar regardless of the CPC approach selected.

5.1.7.2.1 Terrestrial Resources

Construction. Construction would take place within the TA-55 built environment. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and primarily small mammals, lizards, and birds. Depending upon the CPC approach selected, approximately zero to 140 acres of low value vegetation and habitat would be affected during construction. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. The major difference between the LANL CPC approaches is the size of the modification or loss of low-value plant communities and wildlife habitat. The acreage modified or lost would range from zero to 110 acres depending upon the LANL CPC approach selected. It is important to note that the impacts would be within a previously and substantially developed location. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

5.1.7.2.2 Wetlands

Construction. Construction requirements for the CPC are described in Section 3.4.1. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Operations. There are no adverse impacts predicted to any adjacent wetland area from implementation of any of the CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect wetlands downstream of the TA-55 watershed.

5.1.7.2.3 Aquatic Resources

Construction. There are no perennial or seasonal aquatic habitats within the TA-55 location proposed for the CPC. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-55 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution into the TA-55 watershed.

5.1.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of a CPC on any threatened and endangered species. It is expected that a CPC would have minimal affect on the core and buffer area for the Mexican spotted owl as it is proposed for construction in an existing highly developed environment.

Construction. Construction requirements for the CPC are described in Section 3.4.1. A maximum of approximately 140 acres (Greenfield CPC) of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. Construction would take place within the TA-55 built environment. During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should LANL be selected for construction and operations of a CPC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Operation requirements for the CPC are described in Section 3.4.1. A maximum estimated 110 acres (Greenfield CPC) of land would be required to operate the CPC. Depending upon the CPC approach selected, acreage permanently modified or lost as foraging or prey base habitat for species of special interest would vary, but would be less than approximately 110 acres. It is important to note that the impacts would be to highly developed areas. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should have no adverse impacts to any special interest species population.

5.1.7.3 *CCE Alternative*

5.1.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.7.2 as well as the impacts discussed below.

Terrestrial resources: **CUC construction.** As described in Section 3.5.1.1, approximately 50 acres of land would be disturbed during CUC construction. Construction would take place within the TA-55 built environment. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and consists of elk, deer, bob cat, mountain lion, bears, small mammals, lizards, and birds. Approximately 50 acres of vegetation and habitat would be affected during construction. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Terrestrial resources: **CNC operations.** As described in Section 3.5.2, approximately 195 acres of land would be required to support CNC operations. It is important to note that the impacts would be within a previously and substantially developed location. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

Wetlands: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Wetlands: **CNC operations.** There are no adverse impacts predicted to any adjacent wetland area from implementation of any of the CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect wetlands downstream of the TA-55 watershed.

Aquatic resources: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. There are no perennial or seasonal aquatic habitats within the TA-55 location proposed for the CUC. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-55 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution into the TA-55 watershed.

Threatened and endangered species. Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix* *occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of a CUC on any threatened and endangered species. It is expected that a CUC would have minimal affect on the core and buffer area for the Mexican spotted owl as it is proposed for construction in an existing highly developed environment.

CUC construction. Construction requirements for a CUC are described in Section 3.5.1.1. Approximately 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. Construction requirements for the CPC are described in Section 3.4.1. Construction would take place within the TA-55 built environment. During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should Los Alamos be selected for construction and operations of the CNC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

CNC operations. Operation requirements for the CNC are described in Section 3.5.2. An estimated 195 acres of land would be required to operate the CNC. It is important to note that the impacts would be to highly developed areas. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations should not result in adverse impacts to any special interest species population.

5.1.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction.* A/D/HE Center.** As described in Section 3.5.1.2, approximately 300 acres would be required for the A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons A/D facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be a buffer zone, non-nuclear facilities, HE fabrication, and administrative support facilities. This area would be approximately 120 acres.

Construction would take place within TA-16. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and primarily small mammals, lizards, and birds. In addition to the impacts associated with the CPC and CUC, approximately 300 acres of low value vegetation and habitat would be affected during construction of the A/D/HE Center. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations: **CNPC.** As described in Section 3.5.2, approximately 545 acres of land would be required to support CNPC operations. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CNPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-16.

Wetlands: **A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the A/D/HE Center or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Wetlands: **CNPC operations.** There are no adverse impacts predicted to any adjacent wetland area from implementation of the CNPC alternative. There would be no direct untreated effluent discharges to the environment.

Aquatic resources: **A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. There are no perennial or seasonal aquatic habitats within the TA-16 location proposed for the A/D/HE Center. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-16 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNPC operations.** Operation requirements for the CNPC are described in Section 3.5.1. There would be no direct discharge of untreated operational effluent from CNPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments.

Threatened and endangered species. Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-16 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of an A/D/HE Center on any threatened and endangered species. It is expected that an A/D/HE Center would have minimal affect on the core and buffer area for the Mexican spotted owl.

A/D/HE Center construction. As described in Section 3.5.1.2, approximately 300 acres would be required for the A/D/HE Center at TA-16. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be a buffer zone and non-nuclear facilities for HE fabrication, administrative support, and disposal of explosive materials. This area would be approximately 120 acres.

During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should LANL be selected for construction and operations of the CNPC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

CNPC operations. Operation requirements for the CNPC are described in Section 3.5.1. An estimated 545 acres of land would be required to operate the CNPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations should not adversely impact any special interest species population.

5.1.8 Cultural Resources

5.1.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in 3.2.1. No additional buildings or facilities would be built beyond those that NNSA has already decided to build, and no additional impacts to cultural and paleontological resources would occur at LANL beyond those of existing and future activities that are independent of this action.

As of 2005, cultural and paleontological surveys have been conducted on approximately 90 percent of the land within LANL boundaries with 86 percent having been intensively surveyed. The majority of these surveys emphasized American Indian cultural resources. Information on these resources was obtained from the LANL cultural resources database, which is organized primarily by site type. Although about 400 cultural and paleontological sites have been determined to be eligible for the National Register of Historic Places (NRHP), most of the remaining sites have yet to be formally assessed and are therefore assumed to be eligible until assessed (LANL 2005h).

5.1.8.2 *DCE Alternative*

As discussed in Section 5.1, the DCE Alternative at LANL includes the evaluation of three approaches, the Greenfield CPC, the Upgrade Alternative, and the 50/80 Alternative. Cultural and paleontological impacts from the construction and operation will be very similar regardless of the CPC approach selected.

5.1.8.2.1 Cultural Resources

Construction. As described in Section 3.4.1, the CPC would disturb an estimated 140 acres (Greenfield CPC) and 13 acres (Upgrade Alternative) of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. For the 50/80 Alternative, the CMRR-NF would be constructed and expanded by approximately 9,000 square feet. The reference location for the CPC is at TA-55. Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during CPC construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the CPC. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico Site Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as buried artifacts, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

Operations. As described in Section 3.4.1, an estimated 110 acres (Greenfield CPC), 6.5 acres (Upgrade Alternative), and 2.5 acres (50/80 Alternative) of additional land would be required to operate the various CPC options at LANL. Operation of the CPC would have no impact on cultural resources.

5.1.8.2.2 Paleontological Resources

Construction. Only one paleontological resource has been discovered at LANL to date, and that was not found within TA-55. Such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the CPC.

Operations. Operation of the CPC would have no impact on paleontological resources.

5.1.8.3 *CCE Alternative*

5.1.8.3.1 CNC (CPC + CUC)

Cultural and paleontological resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.8.2 as well as the impacts discussed below.

***Cultural resources;* CUC construction.** As described in Section 3.4.1, the CUC would disturb an estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The reference location for the CUC is at TA-55. Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during CUC construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the CUC. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico State Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

***Cultural resources:* CNC operations.** As described in Section 3.5.2, an estimated 195 acres would be required to operate the CNC. Operation of the CNC would have no impact on cultural resources.

***Paleontological resources:* CUC construction.** Only one paleontological resource has been reported within the TA-55 boundaries, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the CUC. As discussed in Section 5.1.8.3.2, there is a higher probability that paleontological resources at TA-16 could be impacted if the CUC were sited at TA-16.

***Paleontological resources:* CNC operations.** As described in Section 3.5.2, operation of the CNC would require an estimated 195 acres. Operation of the CNC at would have no impact on paleontological resources.

5.1.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.8.2, the CNPC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Cultural resources:* A/D/HE Center construction.** The A/D/HE Center construction would disturb an estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace at TA-16. Approximately one-third of TA-16 has been disturbed through development of other facilities and HE R&D. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during A/D/HE Center construction anywhere on the LANL site, including TA-16. The number of resources that would be disturbed is unknown, but would likely increase as the number of acres disturbed increases.

The Nake'muu site, an enclosed plaza pueblo, is located approximately 2 miles away from the proposed reference location for the A/D/HE Center. Unique architectural features of the Nake’muu are still visible, making it eligible for NRHP nomination. Previously, the New Mexico SHPO concurred in this determination in correspondence to the DOE dated February 21, 1989 (LANL 1995). This site is an irregular-shaped pueblo of possibly 50 rooms. The site has been described as the best-preserved ruin in this region. This site is unusual in that it is located at a high elevation, 7,175 feet, and is built on bedrock somewhat distant from agricultural resources as compared to other similar sites in the LANL area.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the A/D/HE Center. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico SHPO and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as buried artifacts, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

***Cultural resources:* CNPC operations.** As described in Section 3.5.1.2, the CNPC would require approximately 545 acres. Operation of the CNPC would be expected to have no impact on cultural resources.

***Paleontological resources:* A/D/HE Center construction.** Only one paleontological resource has been reported within the LANL boundaries, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the A/D/HE Center.

Paleontological resources: **CNPC operations.** As described in Section 3.5.2, the CNPC would require approximately 545 acres. Operation of the CNPC at would have no impact on paleontological resources.

5.1.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and the Capability-Based Alternative.

5.1.9.1 *No Action Alternative*

Under the No Action Alternative, there would be no major changes in the workforce currently at LANL. However, the LANL SWEIS estimates that employment at LANL could experience a minor rise with both increased pit production and increased remediation and D&D activities (LANL 2008). If LANL's employment rate were to continue increasing at the same level experienced from 1996 through 2005 (2.2 percent annually), approximately 15,400 individuals could be employed at LANL by the end of 2011.

5.1.9.2 *DCE Alternative*

5.1.9.2.1 Greenfield CPC

Regional economic characteristics: **construction.** Construction of the CPC would require a total of 2,650 worker-years of labor. During peak construction, about 770 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 816 indirect jobs would be created, for a total of 1,586 jobs. This represents less than 2 percent of the total ROI labor force. It is estimated that one-half of the direct and indirect jobs would be filled by current workers in the ROI.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $23.8 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $49 million ($23.8 million direct and $25.2million indirect). Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.1.9-1—Socioeconomic Impacts from Peak Construction – CPC

Socioeconomic Factor	CPC
Worker Years	2,650
Peak Workers	770
Indirect Jobs Created	816
Total Jobs Created	1,586
ROI Average Earning (direct)	$30,900
Direct Income Increase	$23,793,000
Indirect Income Increase	$25,214,000
Total Impact to the ROI	$49,007,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operation of a CPC would require a total of 1,780 workers.[4] In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,887 indirect jobs would be created, for a total of approximately 3,667 jobs. This represents less than approximately 3 percent of the total ROI labor force. It is estimated that one-third of the direct and indirect jobs would be filled by workers migrating into the ROI.

Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.2 million ($84 million direct and $113.2 million indirect). Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC and the other facilities associated with the programmatic alternatives.

Table 5.1.9-2—Socioeconomic Impacts from Operations: All Facilities/Alternatives

Socioeconomic Factor	CPC	CUC	CNC	AD/HE	CNPC
Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,887	991	2,878	1,892	4,770
Total Jobs Created	3,667	1,926	5,593	3,677	9,270
ROI Average Earning (direct)	$47,200	$47,200	$47,200	$47,200	$47,200
Direct Income Increase	$84,016,000	$44,132,000	$128,148,000	$84,252,000	$212,400,000
Indirect Income Increase	$113,208,000	$59,466	$172,674,000	$113,526,000	$286,200,000
Total Impact to the ROI	$197,224,000	$103,598,000	$300,822,000	$197,778,000	$498,600,000

Source: NNSA 2007.

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (770 workers), a total of 1,155 new residents would be expected in the ROI. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

***Population and housing:* operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,170 new workers), approximately 1,170 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

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[4] LANL currently conducts plutonium operations, including R&D and limited pit production, with a workforce of approximately 610. Consequently, the projected workforce increase at LANL should be approximately 1,170, compared to 1,780 for other sites. However, if a CPC were located at Los Alamos, the existing workers at LANL would become part of a CPC mission. Consequently, for steady-state operations, this analysis includes these workers as part of the CPC operational workforce, and assesses income changes for this total workforce.

***Community services:* construction.** The small increase in the population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

***Community services: operations*.** The small increase in the population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.1.9.2.2 Upgrade Alternative

***Regional economic characteristics:* construction.** Construction under the Upgrade Alternative would require a total of 1,100 worker-years of labor. During peak construction, 300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 318 indirect jobs would be created, for a total of 618 jobs. This represents less than 1 percent of the total ROI labor force.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $9.3 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $17.6 million ($9.3 million direct and $8.3 million indirect). Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

Table 5.1.9-3—Socioeconomic Impacts from Peak Construction–Upgrade Alternative

Socioeconomic Factor	CPC
Worker Years	1,100
Peak Workers	300
Indirect Jobs Created	318
Total Jobs Created	618
ROI Average Earning (direct)	$30,900
Direct Income Increase	$9,270,000
Indirect Income Increase	$8,281,000
Total Impact to the ROI	$17,551,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operations under the Upgrade Alternative would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,887 indirect jobs would be created, for a total of approximately 3,667 jobs.

Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.2 million ($84 million direct and $113.2 million indirect).

Population and Housing

Construction. The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 450 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

Operation. The influx of new workers would increase the ROI population and create new housing demand. A total of 1,170 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population.

Community services: **construction.** The small increase in the ROI population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

Community services: **operations.** The small increase in the ROI population would not put increased demand on community services. Comparable services could be maintained with current staffing levels.

5.1.9.2.3 50/80 Alternative

Regional economic characteristics: **construction.** Construction relating to the 50/80 Alternative would require a total of 430 worker-years of labor. During peak construction, 190 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 201 indirect jobs would be created, for a total of 391 jobs. This represents less than 0.3 percent of the total ROI labor force.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $5.9 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $11 million ($5.9 million direct and $5.2 million indirect). Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

Table 5.1.9-4—Socioeconomic Impacts from Peak Construction–50/80 Alternative

Socioeconomic Factor	CPC
Worker Years	430
Peak Workers	190
Indirect Jobs Created	201
Total Jobs Created	391
ROI Average Earning (direct)	$30,900
Direct Income Increase	$5,871,000
Indirect Income Increase	$5,245,000
Total Impact to the ROI	$11,116,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operation under the 50/80 Alternative would require 680 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 721 indirect jobs would be created, for a total of approximately 1,401 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $32.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $75.3 million ($32.1 million direct and $43.2 million indirect).

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 285 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

***Population and housing:* operations.** The influx of new workers would increase the ROI population and create new housing demand. A total of 680 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population.

***Community services:* construction.** The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

***Community services:* operations.** The small increase in the ROI population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels.

5.1.9.3 *CCE Alternative*

5.1.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of the CNC would include the impacts discussed in Section 5.1.9.2 as well as the impacts discussed below.

Regional economic characteristics: **CUC construction.** Construction of the CUC would require approximately 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,378 indirect jobs would be created, for a total of 2,678 jobs. This represents approximately 2 percent of the total ROI labor force. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $40.2 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $76 million ($40.1 million direct and $35.9 million indirect). Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.1.9-5—Socioeconomic Impacts from Peak Construction–CUC

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	1,378
Total Jobs Created	2,678
ROI Average Earning (direct)	$30,900
Direct Income Increase	$40,170,000
Indirect Income Increase	$35,886,000
Total Impact to the ROI	$76,056,000

Source: NNSA 2007.

Regional economic characteristics: **CUC and CNC operations.** Operation of the CUC would require 935 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 991 indirect jobs would be created, for a total of 1,926 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $44.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $103.6 million ($44.1 million direct and $59.5 million indirect). Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from the operation of the CPC and CUC individually.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (1,300 workers), a total of 1,950 new residents would be expected in the ROI. This is an increase of approximately 2 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. The influx of new workers would increase the ROI population and create new housing demand. Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Population and housing: **CUC and CNC operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (935 new workers), approximately 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from operation of the CPC and CUC individually.

Community services: **CUC construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Community services: **CNC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from operation of the CPC and CUC individually.

5.1.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.1.9.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Regional economic characteristics: **A/D/HE Center construction.** Construction of the A/D/HE Center would require approximately 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 4,049 indirect jobs would be created, for a total of 7,869 jobs. This represents approximately 5 percent of the total ROI labor force. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $118 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $223.5 million ($118 million direct and $105.5 million indirect). Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Table 5.1.9-6—Socioeconomic Impacts from Peak Construction–A/D/HE Center

Socioeconomic Factor	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	4,049
Total Jobs Created	7,869
ROI Average Earning (direct)	$30,900
Direct Income Increase	$118,038,000
Indirect Income Increase	$105,449,000
Total Impact to the ROI	$223,487,000

Source: NNSA 2007.

***Regional economic characteristics:* A/D/HE Center and CNPC operations.** Operation of the A/D/HE Center would require 1,785 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,892 indirect jobs would be created, for a total of 3,677 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84.3 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.8 million ($84.3 million direct and $113.5 million indirect). Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (3,820 workers), a total of 5,730 new residents would be expected in the ROI. This is an increase of approximately 3.7 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

***Population and housing:* A/D/HE Center and CNPC operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,785 new workers), approximately 1,785 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

***Community services:* A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Community services: **A/D/HE Center and CNPC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

5.1.9.4 *Capability-Based Alternatives*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Employment at LANL is expected to continue to rise due to both increased pit production and increased remediation and D&D activities. In addition, work at LANL would likely increase beyond current operations in areas that cannot be easily identified at this time, but could be tied to expanding research efforts such as homeland security. Similar increases have been seen in recent years. LANL's employment rate were to continue increasing at the same level experienced from 1996 through 2005 (2.2 percent annually), approximately 15,400 individuals could be employed at LANL by the end of 2011, which would be an increase of about 1,890 above the 2005 level (LANL 2008). Under the No Net Production/Capability-Based Alternative, although NNSA would decrease pit production to 10 pits annually, employment was not estimated to change (NNSA 2008).

5.1.9.5 *LANL Plutonium Phaseout*

If LANL is not selected as the site for the CPC or CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations would result in a loss of approximately 610 jobs, which would represent a decrease of 4.5 percent of the workforce at LANL (13,504). The loss of 610 direct jobs would result in the loss of approximately 650 indirect jobs. Thus, the total loss of jobs in the ROI would be 1,260, which would represent less than a 1 percent decrease in the ROI workforce of 147, 792. A less than 1 percent loss in ROI jobs would have no major effect on unemployment, housing, or community services.

5.1.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.1.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations represented 57 percent of the total population within the census tracts containing LANL. In 2000, minorities were 30.9 percent of the population nationally and 55 percent of the population in New Mexico. The percentage of persons below the poverty level is 18.4 percent, which is comparable to the 2000 national average of 12.4 percent and the statewide figure of 18 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at LANL are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, cultural and archaeological resources. As shown in Section 5.1.11, Human Health and Safety, there are no large adverse impacts to any populations.

NNSA also analyzed the potential risk due to radiological exposure through subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. This special pathways receptors analysis is important to the environmental justice analysis because those consumption patterns reflect the traditional or cultural practices of minority populations in the area (LANL 2008).

5.1.11 Health and Safety

5.1.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. Based on the 2004 operational data, the total dose to the offsite MEI in 2004 was estimated at 1.68 mrem.

5.1.11.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities associated with the Greenfield CPC or the upgrade alternatives. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site, especially for the upgrade alternatives, where construction would occur in the immediate vicinity of PF-4. Workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from Bureau of Labor Statistics (BLS), U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the

Voluntary Protection Program (VPP). Additionally, the small number of fatal accidents reported in the Computerized Accident/Incident Reporting System (CAIRS) makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.1.11-1.

Table 5.1.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC Alternatives, CUC, and A/D/HE Center at LANL

Injury, Illness, and Fatality Categories	Projects Under Consideration				
	Greenfield CPC	Upgrade	50/80	CUC	A/D/HE Center
Peak Annual Employment	770	300	190	1,300	3,820
Total Recordable Cases	73	28	18	112	329
Total Lost Workday Cases	35	14	9	54	159
Total Fatalities	0.2	0.1	<0.1	0.3	0.8
Project Duration (6 years)					
Total Recordable Cases	251	98	62	384	1,128
Total Lost Workday Cases	121	47	30	184	541
Total Fatalities	0.6	0.2	0.1	0.9	2.6

Source: NNSA 2007, BLS 2007.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.1.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI) of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental latent cancer fatalities (LCFs). To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.1.11-2—Annual Radiological Impacts on the Public from CPC Alternatives, CNC, and CNPC Operations at LANL

Receptor	**Projects Under Consideration**				
	Greenfield CPC	**Upgrade**	**50/80**	**CNC**	**CNPC**
Population within 50 miles[a]					
Collective dose (person-rem)	6.0×10^{-4}	6.0×10^{-4}	3.2×10^{-5}	0.23	0.23
% of natural background radiation[a]	3×10^{-7}	3×10^{-7}	1.6×10^{-8}	1.1×10^{-4}	1.1×10^{-4}
LCFs[b]	4×10^{-7}	4×10^{-7}	2×10^{-8}	1×10^{-4}	1×10^{-4}
Offsite MEI[c]					
Dose (mrem)	1.5×10^{-4}	1.5×10^{-4}	7.7×10^{-6}	0.077	0.077
Percent of regulatory dose limit	1.5×10^{-3}	1.5×10^{-3}	7.7×10^{-5}	0.77	0.77
% of natural background radiation[a]	4.2×10^{-5}	4.2×10^{-5}	2.1×10^{-6}	0.02	0.02
Cancer fatality risk[b]	9×10^{-11}	9×10^{-11}	5×10^{-12}	5×10^{-5}	5×10^{-5}

[a] The average annual dose from background radiation at LANL is 360 mrem; the future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 would receive an annual dose of 198,760 person-rem from the background radiation. A "constant linear population growth" model was applied to estimate population increases.

[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.

[c] The offsite MEI is assumed to reside at the site boundary. An actual residence may not currently be present at this location.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be less than or equal to 9×10^{-11} per year, or about 9 chances in 100 billion. The projected number of fatal cancers to the population within 50 miles would be less than or equal to 4×10^{-7} per year, or about 4 chances in 10 million.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material "as low as reasonably achievable" (ALARA). The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.

- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard "weapons grade" isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician would receive approximately 25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.1.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in the CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CNC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CNC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2, or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations.

Table 5.1.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at LANL from Operations

	Greenfield CPC	**Upgrade**	**50/80**	**CNC**	**CNPC**
Number of Radiological Workers	**1,150**	**1,150**	**458**	**1,640**	**2,040**
Individual Workers[a]					
Average individual dose, mrem/yr[b]	290	290	380	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	2×10^{-4}	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population					
Total dose (person-rem)	333	333	154	344	386
Cancer fatality risk[c]	0.20	0.20	0.09	0.21	0.23

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level. To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at the CPC would be approximately 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Table 5.1.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC at LANL

Injury, Illness, and Fatality Categories	**Projects Under Consideration**			
	Greenfield CPC and Upgrade	**50/80**	**CNC**	**CNPC**
Total Workers	1,780	680	2,715	4,500
Total Recordable Cases	77	29	117	195
Total Lost Workday Cases	40	15	61	101
Total Fatalities	0.07	0.02	0.11	0.18

Source: NNSA 2007, BLS 2007.

5.1.11.3 *CCE Alternative*

5.1.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.11.2 as well as the impacts discussed below.

CUC construction. No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.1.11-1.

CNC operations. NNSA expects minimal public health impacts from the radiological consequences of CNC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Approximately 1,640 radiological workers would be required to conduct CNC operations. Operations in the CNC would result in an average individual worker dose of approximately 210 mrem annually. The total annual dose to workers associated with the CNC operations would be approximately 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to the CNC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 2,715. The potential risk of occupational injuries and fatalities to workers operating the CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.1.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNC would include the CPC and CUC impacts discussed above, as well as the impacts discussed below.

A/D/HE Center construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.1.11-1.

CNPC operations. DOE expects minimal public health impacts from the radiological consequences of CNC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Approximately 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of approximately 189 mrem annually. The total annual dose to workers associated with the CNPC operations would be approximately 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.1.11.4 *Capability-Based Alternative*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Worker dose from increased pit production at TA-55 would increase from 90 person-rem per year to 220 person-rem per year (LANL 2008). Statistically, a dose of 220 person-rem would result in a LCF risk of 0.13, which would equate to 1 LCF for every 7.6 years of operation. For the No Net Production/Capability-Based Alternative, worker dose is estimated to be approximately 45 person-rem (a 50 percent reduction compared to the 20 ppy scenario, and a reduction of approximately 80 percent compared to the 80 ppy scenario). Statistically, a dose of 45 person-rem would result in a LCF risk of 0.03, which would equate to 1 LCF for every 37 years of operation.

5.1.11.4.1 *LANL Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in the potential health impacts to LANL employees and the population surrounding LANL. Assuming that LANL would be producing up to 20 pits annually prior to phase out, radiation doses to workers would be expected to decrease by approximately 90 person-rem.

If LANL were to produce 20 pits annually for the stockpile prior to phaseout, plutonium emissions would decrease. This would result in less radiation exposure to the 50-mile population surrounding LANL. Phasing out NNSA plutonium operations would reduce the dose to the 50-mile population by less than 1 person-rem (LANL 2008).

5.1.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at LANL. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident’s progression and the extent of materials released. Initiating events fall into three categories:

- **Internal initiators.** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- **External initiators.** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.

- **Natural phenomena initiators.** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. Using approved computer models, NNSA predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for workers as the distance between the accident location and the worker decreases because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness, Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the LANL boundary; 2) the offsite population within 50 miles of LANL; and 3) a non-involved worker 3,281 feet from the accident location. DOE did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.1.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in detail in the LANL SWEIS (LANL 2008).

Under all alternatives analyzed in the LANL SWEIS, the facility accident with the highest radiological risk to the offsite population would be a lightning strike at the Radioassay and Nondestructive Testing Facility located in TA-54. If this accident were to occur, there could be six additional LCFs in the offsite population (LANL 2008).

Under all alternatives, the individual facility accident with the highest estimated consequences to the MEI and noninvolved workers would be a fire at a waste storage dome in TA-54. If this accident were to occur, an LCF in a noninvolved worker located about 110 yards from the site of the accident would be likely, and there would also be a 0.50 likelihood (1 chance in 2) of an LCF to the MEI, assumed to be present at the nearest site boundary for the duration of the accident release (LANL 2008).

There is little difference among the alternatives for the maximum potential wildfire, seismic, or facility accident at LANL because actions under each alternative do not, for the most part, affect the location, frequency, scenario, or material at risk of the postulated accidents. Based on the analysis in the LANL SWEIS, if a seismic accident were to occur, there would be widespread damage at LANL and across the region resulting in a large number of fatalities and injuries unrelated to LANL operations. Facilities at LANL would be affected and the public and workers at the site would be exposed to increased risks from both radiological and chemical releases. In the event of such a seismic accident, the MEI would have an increased lifetime risk of an LCF of 0.55 (1 chance in 1.8) and an additional 22 LCFs could be expected in the population; a noninvolved worker 110 feet from certain failed buildings would likely develop an LCF. Taking into account the likelihood of occurrence, the annual risks from a seismic event are estimated to be 1 chance in 3,600 for an MEI, and zero (0.009) additional LCFs in the offsite population (LANL 2008).

5.1.12.2 *Consolidated Plutonium Center*

5.1.12.2.1 Radiological Accidents

Greenfield CPC and Upgrade Alternative. The accident scenarios, material at risk, and source term for the CPC are shown below.

Accident Scenario	Material at Risk	Source Term
Beyond Evaluation Basis Earthquake and Fire	16,929 kg Pu metal 35 kg Pu oxide 24 kg Pu solution	4.23 kg Pu metal 0.0021 kg Pu oxide 0.048 kg Pu solution
Fire in a single building	7,685 kg Pu metal	1.92 kg Pu
Explosion in a feed casting furnace	4.5 kg molten Pu metal	2.25 kg Pu
Nuclear Criticality	See Appendix C	5×10^{17} fissions
Fire-induced release in the CRT Storage Room	600 kg Pu metal	0.15 kg Pu
Radioactive material spill	4.5 kg molten Pu metal	0.0045 kg Pu

Source: Tetra Tech 2008.

Table 5.1.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MELCOR Accident Consequence Code System (MACCS) computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.1.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation SPEIS* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the Design Basis Earthquake (DBE) ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet. The accident analyzed in this SPEIS is based on a beyond design basis earthquake, and assumes complete failure of structures, systems, and components, thereby resulting in the maximum possible radioisotope source term. This is a conservative approach. Higher seismic accelerations at the same annual frequency of exceedance would result in identical consequences for these facilities. Therefore, the larger seismic peak ground accelerations associated with the updated probabilistic seismic hazard analysis would not increase the consequence of this accident scenario.

Table 5.1.12-1—CPC Radiological Accident Frequency and Consequences at LANL[a]

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	87.5	0.105	44,200	26.5	1,420	1
Fire in a single building	1.0×10^{-4}	62.4	0.0749	27,600	16.6	2,200	1
Explosion in a feed casting furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1
Nuclear Criticality	1.0×10^{-2}	0.00014	$8.40\text{x}10^{-8}$	0.0372	$2.23\text{x}10^{-5}$	0.00278	$1.67\text{x}10^{-6}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	4.88	0.00293	2,160	1.3	172	0.206
Radioactive material spill	1×10^{-2}	0.146	$8.76\text{x}10^{-5}$	64.8	0.0389	5.16	0.0031

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

The results of the accident analysis indicate potential consequences that exceed NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for a CPC. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in a CPC design to ensure compliance with exposure guidelines if NNSA were to decide to build a CPC at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[5] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into a CPC design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.1.12-1) is the beyond evaluation basis earthquake and fire. Approximately 26.5 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of 87.5 rem. Statistically, this MEI would have a 0.052 chance of developing a LCF (i.e., about 1 chance in 19 of a LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.1.12-2), the accident with the highest risk is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be approximately 9×10^{-4}, or approximately 1 in 1,000. For the population, the LCF risk would be 0.19, meaning that an LCF would statistically occur once every 5 years in the population.

Table 5.1.12-2—Annual Cancer Risks for CPC at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	1.05×10^{-6}	2.65×10^{-4}	1×10^{-5}
Fire in a Single Building	7.49×10^{-6}	1.66×10^{-3}	1×10^{-4}
Explosion in a Feed Casting Furnace	8.78×10^{-4}	0.19	1×10^{-2}
Nuclear Criticality	8.40×10^{-10}	2.23×10^{-7}	1.67×10^{8}
Fire-induced Release in the CRT Storage Room	2.93×10^{-5}	1.3×10^{-2}	2.06×10^{-3}
Radioactive Material Spill	8.76×10^{-7}	3.89×10^{-4}	3.1×10^{-5}

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

50/80 Alternative. Under the 50/80 Alternatives at Los Alamos, the Plutonium Facility, Building 4 (PF-4) at TA-55 would be upgraded to provide a capability to produce as many as 80 pits/year. The potential hazards and accidents postulated for a Greenfield CPC would be applicable to the upgraded PF-4. However, for three of the accidents (Beyond Evaluation Basis Earthquake and Fire, Fire in a single building, and the Fire-induced release in the CRT Storage Room), the material-at-risk for the 50/80 Alternative would be approximately two-thirds as large as for the Greenfield CPC. The potential consequences and risks from accidents for the 50/80 Alternative are presented in Tables 5.1.12-1a and 5.1.12-2a.

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[5] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

Table 5.1.12-1a—Radiological Accident Frequency and Consequences–50/80 Alternative

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	58.6	0.07	29,614	17.8	951	1
Fire in a single building	1.0×10^{-4}	41.8	0.05	18,492	11.1	1,474	1
Explosion in a feed casting furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1
Nuclear Criticality	1.0×10^{-2}	0.00014	$8.40 \text{x} 10^{-8}$	0.0372	$2.23 \text{x} 10^{-5}$	0.00278	$1.67 \text{x} 10^{-6}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	3.3	0.002	1,447	0.9	115	0.13
Radioactive material spill	1×10^{-2}	0.146	$8.76 \text{x} 10^{-5}$	64.8	0.0389	5.16	0.003

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

Table 5.1.12-2a—Annual Cancer Risks for the 50/80 Alternative

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	$7.0 \text{x} 10^{-7}$	$1.78 \text{x} 10^{-4}$	$1 \text{x} 10^{-5}$
Fire in a Single Building	$5.0 \text{x} 10^{-6}$	$1.1 \text{x} 10^{-3}$	$1 \text{x} 10^{-4}$
Explosion in a Feed Casting Furnace	$8.78 \text{x} 10^{-4}$	0.19	$1 \text{x} 10^{-2}$
Nuclear Criticality	$8.40 \text{x} 10^{-10}$	$2.23 \text{x} 10^{-7}$	$1.67 \text{x} 10^{8}$
Fire-induced Release in the CRT Storage Room	$2.0 \text{x} 10^{-5}$	$9.0 \text{x} 10^{-3}$	$1.3 \text{x} 10^{-3}$
Radioactive Material Spill	$8.76 \text{x} 10^{-7}$	$3.89 \text{x} 10^{-4}$	$3.1 \text{x} 10^{-5}$

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

5.1.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this analysis, Emergency Response Planning Guidelines (ERPG) values are used to develop hazard indices for chemical exposures.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERP 2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERP- 3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.1.12–3 provides information on each chemical and the frequency and consequences of an accidental release under the Greenfield CPC and Upgrade Alternative. The source term shown represents the amount of the chemical that is accidentally released.

Table 5.1.12-3—Greenfield CPC and Upgrade Alternative Chemical Accident Frequency and Consequences at LANL

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary[a] (ppm)	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	10.4	10^{-4}
Formic acid	1,500	10	0.215	0.54	1.06	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 0.7 miles.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.1.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

NNSA also estimated the impacts of the potential release of the most hazardous chemicals that would be used under the 50/80 Alternative. Table 5.1.12-4 provides information on each chemical and the frequency and consequences of an accidental release. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 concentration increases, the potential number of people onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would also be expected to increase.

Table 5.1.12-4—50/80 Alternative Chemical Accident Consequences at LANL

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary[a] (ppm)	
Nitric acid	3,420	6	0.5	1.46	2.85	10^{-4}
Hydrofluoric acid	340	20	0.4	3.1	6.42	10^{-4}
Hydrochloric acid	384	20	2.1	118	264	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 0.7 miles.

None of the chemicals released in an accident would exceed ERPG-2 limits offsite. Concentrations at the location of a non-involved worker at a distance of 3,281 feet from a hydrochloric acid release would exceed ERPG-2 limits.

5.1.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the individual exposure cannot be adequately established with respect to the presence of shielding and other protective features. Noninvolved workers may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury. For the TA-55 Upgrade Alternative, the number of workers required for operations is estimated to be 630 (including security guards). Each process facility within the upgraded facility would have attached safe haven structures designed in accordance with a number of life safety, fire protection, and safeguards and security requirements

5.1.12.3 *Consolidated Uranium Center*

5.1.12.3.1 Radiological Accidents

The accident scenarios, material at risk, and source term for the CUC are shown below:

Operation	Accident	Source Term	Notes/Assumptions
EU Metal Fabrication	Major fire	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hour
Assembly	Explosion	2 kg EU (sum of metal and chips) 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hour
EU Warehouse	Fire	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (the above all represent the sum of metals, oxides, and combustibles) Pu = 1.0×10^{-6} kg Np-237 = 1.6×10^{-5} kg	Release height = 4 m Release duration = 1 hour
HEUMF	Design-basis fires	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hour
EU Operations	Aircraft crash	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

Source: Tetra Tech 2008.

Table 5.1.12–5 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.1.12-6), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated were to occur, its impacts on workers and the public would be expected to be within the range of the impacts for accidents that were evaluated.

Table 5.1.12-5—CUC Radiological Accident Frequency and Consequences at LANL

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	$10^{-4} – 10^{-6}$	0.213	1.28×10^{-4}	94.5	5.67×10^{-2}	7.53	4.52×10^{-3}
Explosion	$10^{-4} – 10^{-6}$	0.0209	1.25×10^{-5}	9.3	5.58×10^{-3}	0.612	3.67×10^{-4}
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.249	1.49×10^{-4}	110	6.6×10^{-2}	8.33	5.0×10^{-3}
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0267	1.6×10^{-5}	12	7.2×10^{-3}	0.637	3.82×10^{-4}
Aircraft crash	$10^{-4} – 10^{-6}$	0.132	7.92×10^{-5}	75.5	4.53×10^{-2}	0.8	4.8×10^{-4}

Source: Tetra Tech 2008.
[a] CUC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-6—Annual Cancer Risks for CUC at Los Alamos, TA-55

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.28×10^{-8}	5.67×10^{-6}	4.52×10^{-7}
Explosion	1.25×10^{-9}	5.58×10^{-7}	3.67×10^{-8}
Fire in EU Warehouse	1.49×10^{-8}	6.6×10^{-6}	5.0×10^{-7}
Design-basis fires for HEU Storage	1.6×10^{-7}	7.2×10^{-5}	3.82×10^{-6}
Aircraft crash	7.92×10^{-9}	4.53×10^{-6}	4.8×10^{-8}

Source: Tetra Tech 2008.
[a] CUC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Tables 5.1.12-5 and 5.1.12-7) is the fire in the EU warehouse. Depending upon whether the CUC were located at TA-55 or TA-16, approximately 0.04-0.06 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a maximum dose of 0.926 rem. Statistically, this MEI would have an LCF risk of approximately 6×10^{-4}, or approximately 1 chance in about 2,000 of an LCF. This accident has a probability of occurring approximately once every 10,000 years.

When probabilities are taken into account (see Tables 5.1.12-6 and 5.1.12-8), the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be approximately 6×10^{-7}, or less than one in a million. For the population, the LCF risk would be 7.2×10^{-5}, meaning that an LCF would statistically occur once every 13,888 years in the population.

Table 5.1.12-7—Potential Accident Consequences–CUC at Los Alamos, TA-16[a]

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
EU Metal Fabrication	0.798	4.79×10^{-4}	60.3	3.62×10^{-2}	7.53	4.52×10^{-7}
Assembly	0.0768	4.61×10^{-5}	5.95	3.57×10^{-3}	0.612	3.67×10^{-8}
EU Warehouse	0.926	5.56×10^{-4}	70.6	4.24×10^{-2}	8.33	5.0×10^{-7}
HEUMF	0.0961	5.77×10^{-5}	7.7	4.62×10^{-3}	0.637	3.82×10^{-6}
EU Operations	0.158	9.48×10^{-5}	68.2	4.09×10^{-2}	0.8	4.8×10^{-8}

Source: Tetra Tech 2008.
[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-8—Annual Cancer Risks for CUC at LANL, TA-16

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	4.79×10^{-8}	3.62×10^{-6}	0.00452
Explosion	4.61×10^{-9}	3.57×10^{-7}	0.000367
Fire in EU Warehouse	5.56×10^{-8}	4.24×10^{-6}	0.005
Design-basis fires for HEU Storage	5.77×10^{-7}	4.62×10^{-5}	0.000382
Aircraft crash	9.48×10^{-9}	4.09×10^{-6}	0.00048

Source: Tetra Tech 2008.
[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

5.1.12.3.2 Hazardous Chemicals Impacts

A CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. NNSA estimated the impacts of the potential release of the most hazardous chemical used at a CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.1.12-9 shows the consequences of the dominant loss of containment accident scenario.

Table 5.1.12-9—Consequences and Frequency of CUC Chemical Accidents, Los Alamos

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 0.7 miles.

5.1.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident.

Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.1.12.4 *Assembly/Disassembly/High Explosives Center*

5.1.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.1.12–10 and 5.1.12-11 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts for accidents that were evaluated.

Table 5.1.12-10—A/D/HE Center Radiological Accident Consequences at LANL

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	73.8	0.0886	5,580	3.35	696	0.835
Scenario 2	0.0529	3.17×10^{-5}	4	2.4×10^{-3}	0.499	2.99×10^{-4}
Scenario 3	4.42×10^{-6}	2.65×10^{-9}	0.000334	2.00×10^{-7}	4.17×10^{-5}	2.50×10^{-8}
Scenario 4	1.31	7.86×10^{-4}	545	0.327	7.94	4.76×10^{-3}
Scenario 5	1.37	8.22×10^{-4}	570	0.342	8.3	4.98×10^{-3}
Scenario 6	0.0102	6.12×10^{-6}	4.23	2.5×10^{-3}	0.0615	3.69×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-11—Annual Cancer Risks for A/D/HE Center Accidents at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Individual Noninvolved Worker[c]
Scenario 1	8.86×10^{-6}	3.35×10^{-4}	8.35×10^{-5}
Scenario 2	3.17×10^{-7}	2.4×10^{-4}	2.99×10^{-6}
Scenario 3	2.65×10^{-11}	2.00×10^{-9}	2.50×10^{-10}
Scenario 4	7.86×10^{-10}	3.27×10^{-7}	4.76×10^{-9}
Scenario 5	8.22×10^{-8}	3.42×10^{-5}	4.98×10^{-7}
Scenario 6	6.12×10^{-8}	2.54×10^{-5}	3.69×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

The results of the accident analysis indicate potential consequences that exceed NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for an A/D/HE Center. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in an A/D/HE Center design to ensure compliance with exposure guidelines if NNSA were to decide to build an A/D/HE Center at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[6] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into an A/D/HE Center design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.1.12-10) is Scenario 1, the explosive driven plutonium and tritium dispersal from an internal event. Approximately 3 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of 73.8 rem. Statistically, this MEI would have a 0.04 chance of developing a LCF (i.e., about 1 chance in 23 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.1.12-11), the explosive driven plutonium and tritium dispersal from an internal event also has the highest overall risk. For this accident, the LCF risk to the MEI would be approximately 9×10^{-6}, or approximately 1 in 100,000. For the population, the LCF risk would be 3.35×10^{-4}, meaning that an LCF would statistically occur once every 3,000 years in the population.

5.1.12.4.2 Hazardous Chemicals Impacts

NNSA has identified chlorine as the hazardous chemical dominating the risk from nonradiological releases for an A/D/HE Center (DOE 1996). Chlorine is the only chemical with the potential for significant adverse offsite consequences. Since chlorine is not carcinogenic, the consequences of exposure to chlorine (primarily acute effects) differ from the consequences of exposure to radionuclides (potential latent cancers). This difference precludes a direct comparison between the risk and consequences associated with hazardous chemical releases and radionuclide releases.

Scenario 7 involves a chlorine release. A release of chlorine to the environment due to an earthquake is an unlikely event. Should an earthquake occur with sufficient magnitude to damage a facility that uses chlorine, it could release the contents from as many as four chlorine cylinders. The magnitude of this release could be as high as 408 kilograms (900 pounds) (Pantex 1996a).

Workers in the vicinity of a chlorine release could be exposed to chlorine concentrations in excess of EPRG3 and threshold levels. No long-term adverse health effects are expected for workers who promptly evacuate the area. For any persons incapable of evacuating the area of the

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[6] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

chlorine plume, no serious or irreversible health impacts are expected from EPRG1 or EPRG2 exposures since the exposure duration is less than 1 hour. Persons incapable of evacuating an area with EPRG3 concentrations may experience adverse health impacts depending upon the actual chlorine concentrations encountered and the exposure duration. Chronic lung disease, electrocardiographic changes, and death have occurred in humans exposed to high concentrations of chlorine as a consequence of industrial accidents (Calabrese 1991). Table 5.1.12-12 depicts the potential impacts of conservative modeling of a chlorine release over the period of 1-hour with culated down-wind concentrations.

Table 5.1.12-12—A/D/HE Center Chemical Accident Frequency and Consequences

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)[a]	
Scenario 7- Chlorine Release	408.23	3	2.8	17.4	32.5	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 0.5 miles from the A/D/HE Center.

5.1.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.1.12.5 *LANL Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in the potential accident impacts to LANL employees and the population surrounding LANL. For a site-wide seismic event, the dose from TA-55 to a non-involved worker at 110 yards could be reduced by approximately 2,700 rem. This would reduce the likelihood to less than 1 that this non-involved worker would contract a fatal cancer during their lifetime from this accident. For the population surrounding LANL, a site-wide seismic event affecting TA-55 could produce a population dose of 14,000 person-rem (approximately 9 LCFs) and a MEI dose of 150 rem (a LCF risk of 0.17). Phaseout of all plutonium operations from TA-55 would reduce these consequences to zero.

Risks from chemical accidents would also be reduced. For example, phasing out the plutonium operations would eliminate the risks from a chlorine gas release. Based on the current LANL operations, there is 1 chance in 15 that a worker within approximately 200 yards of the Plutonium Facility would receive exposure in excess of limits.

5.1.13 Transportation

5.1.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at LANL, and impacts would remain unchanged from the baseline presented in Section 4.1.12. Radiological transportation under the No Action Alternative for LANL would include transport of pits from Pantex to LANL, recycle of enriched uranium parts to and from Y-12, return of reassembled pits to Pantex, shipment of TRU waste to Waste Isolation Pilot Plant (WIPP) (near Carlsbad, New Mexico), and SNM transfers between LANL and other sites, including LLNL and SRS. Low-level waste (LLW) would be disposed of onsite at LANL. The number of pits processed per year would be limited to approximately 20. Section 5.10.1 presents the impacts of the No Action Alternative impacts associated with transportation.

Because there would be no change from the baseline in operations employment under the No Action Alternative, there would be no change in traffic in the vicinity of LANL.

5.1.13.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80 Alternative)*

5.1.13.2.1 Construction

Construction for a CPC, the Upgrade Alternative, or the 50/80 Alternative would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (a maximum of 2 percent based on employment increases) compared to the average daily traffic levels reported in Section 4.1.12 and would be temporary.

5.1.13.2.2 Operations

Radiological transportation impacts are presented in Section 5.10 for all the action alternatives. The addition of a maximum of 1,170 new direct employees (Greenfield CPC) would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.3 *CCE Alternative*

5.1.13.3.1 CNC (CPC + CUC)

Construction. **CUC.** Construction of a CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.1.12 and would be temporary.

Operations. **CNC.** Radiological transportation for a CNC is assessed in Section 5.10. The addition of approximately 2,105 new direct employees for a CUC (1,170 for CPC and 935 for

CUC) would represent an increase in ROI employment of less than 2 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.4 *CNPC (CPC + CUC + A/D/HE Center)*

Construction: **A/D/HE Center.** Construction of an A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (approximately 5 percent based on employment increases) and temporary compared to average daily traffic levels reported in Section 4.1.12.

Operations: **CNPC.** If the A/D/HE Center were located at LANL as part of a CNPC, the annual radiological transportation impacts associated with the pit production alternatives and the impacts associated with a CUC would not occur, with the exception of TRU waste transportation described for the pit production alternatives. There would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. The addition of approximately 3,890 new direct employees for a CNPC (1,170 for CPC, 935 for CPC, and 1,785 for A/D/HE Center) would represent an increase in ROI employment of approximately 2.5 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.5 *Phase Out of NNSA Category I/II SNM Missions from LANL*

If NNSA's Category I/II SNM missions were eliminated at LANL, all of its Category I/II SNM inventories would be transferred to other DOE or NNSA sites. The environmental impacts of this transportation are addressed in Section 5.10.

5.1.14 Waste Management

5.1.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 5.1.14-1 shows annual waste generation volumes from LANL operations for the years 1999–2004 to facilitate comparisons of the additional alternatives presented.

Table 5.1.14-1—Annual Routine Waste Generation from LANL Operations

Waste Type	Units	1999	2000	2001	2002	2003	2004	2005
LLW	yd^3/year	2,190	5,530	3,400	9,560	7,640	19,400	7,080
Mixed LLW	yd^3/year	30	780	80	30	50	50	90
Transuranic Waste	yd^3/year	190	160	150	160	530	50	100
Mixed Transuranic Waste	yd^3/year	110	120	60	110	210	30	130
Chemical Waste	100lbs/year	34,000	61,000	60,800	3,820	1,520	2,460	4,340

Source: LANL 2008.

5.1.14.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.14.2.1 Construction Impacts of Greenfield CPC, Upgrade, 50/80 Alternatives

Construction of a new CPC, or upgrading existing facilities, could generate TRU, LLW, hazardous waste and non-hazardous waste. Table 5.1.14–2 summarizes the expected construction wastes.

Table 5.1.14-2—Construction Waste Generation from CPC Alternatives

Construction Waste Type	Greenfield CPC	Upgrade	50/80
TRU Waste (yd^3)	0	200	0
LLW (yd^3)	0	200	0
Hazardous Waste (yd^3)	6.5	4 [a]	4
Non-hazardous Solid Waste (yd^3)	9,800	578 (tons)	9,750
Non-hazardous Liquid waste (yd^3)	50,700	7,800[a]	7,800

Source: NNSA 2007.
[a] Levels not expected to be significantly above levels for the 50/80 Alternative.

Construction associated with the 50/80 Alternative and the Greenfield CPC Alternative, at LANL, would not be expected to generate any TRU or LLW. Small quantities of hazardous waste would be generated from the construction associated with the Greenfield CPC, the Upgrade, and 50/80 Alternatives. Although these quantities approach the amount currently generated by LANL, they are a fraction of what LANL generated only a few years ago. Accordingly, the capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility, presently exists.

Construction of a Greenfield CPC at LANL would generate 9,810 cubic yards of non-hazardous solid waste. Construction of the 50/80 Alternative at LANL would be expected to generate 9,750 cubic yards of non-hazardous waste. Construction of the Upgrade Alternative, at LANL would be expected to generate 578 tons of non-hazardous solid waste. Previously, solid waste and construction waste generated at LANL was disposed at the Los Alamos County Landfill, located within LANL boundaries, and operated by Los Alamos County. This landfill is now closed. Solid waste includes paper, cardboard, plastic, glass, office supplies and furniture, food waste, brush, and debris. Through an aggressive waste minimization and recycling program, the amount of solid waste at LANL requiring disposal has been greatly reduced. In 2004, 6,380 tons of solid waste were generated at LANL, of which 4,240 tons were recycled (LANL 2004p). The County currently operates a new transfer station, which would transport that waste to other solid waste landfills within the state. The Upgrade and the 50/80 Alternatives are not expected to generate substantial quantities of non-hazardous solid waste in relation to what the transfer station can accommodate.

Construction activities associated with the Greenfield CPC, Upgrade, and 50/80 Alternatives are expected to generate non-hazardous liquid wastes. The Greenfield Alternative would be expected to generate 58,000 cubic yards, and the 50/80 Alternative would be expected to generate 7,800 cubic yards. The Upgrade Alternative, at LANL would not be expected to generate liquid, non-hazardous waste significantly above the 50/80 Alternative levels. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation and has sufficient capacity to handle expected volumes. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

5.1.14.2.2 Operation of Greenfield CPC, Upgrade, 50/80 Alternatives

Normal operation under a Greenfield CPC, Upgrade, and 50/80 Alternatives would generate TRU waste, mixed TRU waste, LLW, mixed LLW (MLLW), hazardous waste, and non-hazardous waste. Table 5.1.14-3 summarizes the annual volumes of waste expected to be generated by normal operations.

Table 5.1.14-3—Operational Waste Generation from CPC Alternatives

Annual Operating Waste Type (yd^3)	Greenfield CPC	Upgrade	50/80
TRU Solid (including Mixed TRU) (yd^3)	850	850	575[1]
Mixed TRU Solid Waste (yd^3)(included in TRU solid)	310	310	2.6
TRU Liquid waste (yd^3)			6.5
Low Level Liquid Waste (yd^3)	0	0	19.5
LLW Solid (yd^3)	3,500	3,500	1,850
Mixed Low Level Solid Waste (yd^3)	3.6	3.6	65
Mixed Low Level Liquid Waste (yd^3)	0.4	0.4	0
Hazardous Solid (tons)	3.6	3.6	265
Hazardous Waste liquid (tons)	0.5	0.5	2.6
Nonhazardous Solid (yd^3)	7,400	7,400	700
Nonhazardous Liquid (gal)	69,500	69,500	16,000

Source: NNSA 2007.
[1] Includes 75 cubic yards/yr over a 10-year period to replace gloveboxes in PF-4

Operation of a Greenfield CPC would generate 850 cubic yards of TRU waste, and operation of the Upgrade Alternative would also generate 850 cubic yards of TRU waste. The 50/80 Alternative would generate a slightly smaller 575 cubic yards of TRU waste. Some portions of this TRU waste would be mixed TRU waste for the Greenfield Alternative (a little more than a third) and for the 50/80 Alternative (a little more than ten percent). This waste would be packaged in accordance with the WIPP Waste Acceptance Criteria (WAC), placed in TRUPACT-II shipping containers, and shipped to WIPP. This would be done within a new CPC or at the Solid Waste Management Facility in TA-54 for the Upgrade and 50/80 Alternatives. The liquid portions would be solidified.

Operation of the Greenfield CPC and the Upgrade Alternative would each generate 3,500 cubic yards of LLW. This amount of LLW that would be generated by the Greenfield CPC or the Upgrade Alternative would be from one-third to one-half the amount of LLW routinely generated at LANL. This waste would be processed at the newly constructed CPC, Greenfield or Upgrade Alternative facility, or at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G. Operation of the 50/80 Alternative would generate an estimated 1,850 cubic yards of LLW (reduced size and throughput), or a little more that half the amount of LLW generated by the Greenfield CPC and Upgrade Alternative. This LLW would be handled in a similar manner.

Small quantities of hazardous solid waste would be generated from the operation of a Greenfield CPC or the Upgrade Alternative. The 50/80 Alternative, relying on older, less efficient facilities, would generate substantially more (265 tons) hazardous waste. All of these amounts are small in comparison to the total amount of hazardous waste generated by LANL routine operations. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for shipment offsite and disposal at a commercial facility, presently exists, and would have little impact on routine hazardous waste operations at LANL.

Operation of a Greenfield CPC or the Upgrade Alternative would each generate 7,400 cubic yards of non-hazardous solid waste. The 50/80 Alternative is expected to generate 700 cubic yards of non-hazardous waste. The County currently operates a new transfer station, which provides all of the services that are available to residents and businesses at the existing landfill. The transfer station has the capacity to handle these volumes of waste on a regular basis.

Operation of the Greenfield CPC or the Upgrade Alternative is expected to generate just under 70,000 cubic yards of non-hazardous liquid waste. The 50/80 Alternative is expected to generate approximately 16,000 cubic yards of non-hazardous waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.3 *CCE Alternative*

Waste management impacts from the construction and operation of the CNC would include the impacts of a Greenfield CPC discussed in Section 5.1.14.2, as well as the impacts of a CUC discussed below.

5.1.14.3.1 CNC (CPC + CUC)

Construction: **CUC.** Construction of a CNC would entail construction of a Greenfield CPC, already discussed in Section 5.1.14.2.1, above, and construction of a CUC, discussed in this section. Construction of a CUC would generate LLW, hazardous waste, and solid non-hazardous sanitary waste. Table 5.1.14-4 summarizes the total volume of waste which will be generated over the entire construction period for the CUC.

Table 5.1.14-4—Total Waste Generation from Construction of the CUC

Waste Category	Quantity
Low-level solid (yd^3)	70
Mixed Low-level solid (yd^3)	0
Hazardous (tons)	6
Nonhazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

Construction associated with a CUC would generate 70 cubic yards of LLW. This amount of LLW is a small percentage of the amount of LLW routinely generated at LANL. This waste would result from the installation of equipment and processes and would be processed at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G.

Small quantities of hazardous waste would be generated from the construction of a CUC. This 6 tons of hazardous waste generated over the entire construction period could easily be handled by the existing infrastructure at LANL. These wastes would be collected, accumulated at any of the four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility.

Construction of a CUC would generate 1,000 tons of non-hazardous solid waste. Solid waste includes paper, cardboard, plastic, glass, office supplies and furniture, food waste, brush, and debris. To the extent possible, metals would be removed from this waste and recycled. The County currently operates a new transfer station, which would transport that waste to other commercially available solid waste landfills within the state.

A concrete batch plant would operate at the CNC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CNC construction is completed. A retention pond would be constructed to manage stormwater runoff from the entire CNC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

Operations: **CNC.** Operation of a CNC would entail operation of a Greenfield CPC, already discussed in Section 5.1.14.2.1, above, in addition to the operation of a CUC, discussed in this section. Operation of the CUC would generate LLW, and both solid and liquid sanitary waste. Table 5.1.14-5 summarizes the total volume of waste which will be generated by the operation of the CNC, at LANL.

Operation of a CNC would generate 850 cubic yards of TRU waste and 310 cubic yards of mixed TRU waste. This waste would be collected and then packaged in accordance with the WIPP WAC, placed in TRUPACT-II shipping containers, and shipped to WIPP.

Operation of a CNC would generate 3,515 gallons of liquid LLW and 3,616.4 gallons of mixed liquid LLW. These wastes would be solidified, processed, and packaged for disposal at the CUC or at the Solid Waste Management Facility in TA-54 and then disposed of on-site at TA-54 Area G. The mixed LLW could require additional treatment prior to solidification and disposal. In addition, operation of the CNC would generate 11,600 cubic yards of solid LLW and 72.3 cubic yards of mixed LLW. This waste would also be processed and packaged for disposal at the CPC and then disposed of on-site at TA-54 Area G. The mixed solid LLW could require additional treatment prior to disposal.

Table 5.1.14-5—Annual Waste Generation for CNC Operation

Waste Generated	CPC	CUC	CNC
TRU Solid Waste (yd^3)	850	0	850
TRU liquid waste (yd^3)	6.5		6.5
Low Level Liquid Waste (gal)	0	3,515	3,515
Low Level Solid Waste (yd^3)	3,500	8,100	11,600
Mixed Low Level Liquid Waste (gal)	0.4	3,616	3,616.4
Mixed Low Level Solid Waste (yd^3)	2.3	70	72.3
Mixed TRU Solid Waste (yd^3)	310	0	310
Hazardous waste solid (tons)	3.7	15	18.7
Hazardous waste liquid (tons)	0.52	0	0.52
Non-Hazardous Solid Waste (yd^3)	7,400	7,500	14,900
Non-Hazardous Liquid Waste (gal)	69,500	50,000	119,500

Source: NNSA 2007.

Small quantities of liquid hazardous waste and an estimated 18.7 cubic yards of solid hazardous waste would be generated by the operation of a CNC. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility, presently exists and is sufficient to handle these volumes of hazardous waste.

Operation of a CNC would generate 14,900 cubic yards of non-hazardous solid waste. The County currently operates a new transfer station, which would transport that waste to other commercially available solid waste landfills within the state. Sufficient capacity exists to handle this amount of non-0hazardous solid waste on a regular basis.

Operation of a CNC is expected to generate 119,500 gallons of non-hazardous liquid waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.3.2 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.1.14.2, the CUC impacts, discussed above, and the impacts of an A/D/HE Center, the waste impacts of which are discussed below.

***Construction:* A/D/HE Center.** The additional construction of an A/D/HE Center would generate LLW, and non-hazardous waste. Table 5.1.14-6 summarizes the total volume of waste to be generated over the 6 years construction period for an A/D/HE Center.

Table 5.1.14-6—A/D/HE Center Construction Waste

Waste Generated	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (tons)	7,100
Non-Hazardous Liquid Waste (gallons)	40,000

Source: NNSA 2007.

Construction of an A/D/HE Center is expected to generate 9,900 cubic yards of solid LLW. This waste would be processed, and packaged for disposal at the new facility or at the Solid Waste Management Facility in TA-54 and then disposed of on-site at TA-54 Area G.

Construction of an A/D/HE Center would generate 7,100 cubic yards of non-hazardous solid waste. A concrete batch plant would operate at the CNPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CNPC construction is completed. A retention pond would be constructed to manage stormwater runoff from the entire CNPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

5.1.14.4.2 CNPC Operations Impacts

Normal operation of a CNPC would generate TRU waste, LLW, MLLW, hazardous waste, and sanitary waste. Table 5.1.14-7 summarizes the estimated waste generation rates for the operation of the CNPC at LANL.

Table 5.1.14-7—Annual CNPC Operations Waste Generation

Waste Generated	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste (yd^3)	850	0	0	850
Low Level Liquid Waste (gal)		3,515	5,410	8,925
Low Level Solid Waste (yd^3)	3,500	8,100	40	11,640
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Mixed Low Level Solid Waste (yd^3)	2.3	70	0	72.3
Mixed TRU Solid Waste (yd^3)	310	0	0	310
Hazardous waste solid (yd^3)	3.7	15	1,350	1,368.7
Hazardous waste liquid (gal)	0.5	0	8,850	8,850.5
Non-Hazardous Solid Waste (yd^3)	7,400	7,500	15,000	29,900
Non-Hazardous Liquid Waste (gal)	69,500	50,000	46,000	165,500

Source: NNSA 2007.

Operation of a CNPC would generate 850 cubic yards of TRU waste and 310 cubic yards of mixed TRU waste. This waste would be collected and then packaged in accordance with the WIPP WAC, placed in TRUPACT-II shipping containers, and shipped to WIPP. Sufficient storage space to accumulate shipment quantities would exist in the CNPC.

Operation of a CNPC would generate 8,925 gallons of liquid LLW and 3,622.4 gallons of mixed liquid LLW. These wastes would be solidified, processed, and packaged for disposal at the waste processing portion of the new CNPC facility, or at the Solid Waste Management Facility in TA-54, and then disposed of on-site at TA-54 Area G. The mixed LLW could require additional treatment prior to solidification and disposal. The CNPC will have the necessary RCRA permit to allow for such treatment. In addition, operation of a CNPC would generate 11,640 cubic yards of solid LLW and 72.3 cubic yards of mixed LLW. This waste would also be processed and packaged for disposal, on-site, at TA-54 Area G. The mixed solid LLW could require additional treatment prior to disposal. This would be done at the new CNPC as it would have a RCRA permitted mixed waste treatment facility.

An estimated 1,368.7 cubic yards of solid hazardous waste and an estimated 8,850.5 gallons of liquid hazardous waste would be generated by the operation of a CNPC. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned), to solidify the liquid waste, and to ship these wastes offsite for treatment and disposal at a commercial facility, presently exists and is sufficient to handle these volumes of hazardous waste.

Operation of a CNPC at LANL would generate 29,900 cubic yards of non-hazardous solid waste. The County currently operates a new transfer station, which would transport that waste to other solid waste landfills within the state. Sufficient capacity exists to handle this volume of waste on a regular basis.

Operation of a CNPC is expected to generate 165,500 gallons of non-hazardous liquid waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.4 *Capability-Based Alternatives*

LANL is presently reestablishing an interim pit fabrication capacity that could provide up to 50 pits annually. Under the Capability-Based Alternative, this effort would continue and would not change. As a result of increased pit production, larger quantities of some radioactive wastes would be generated. Increased pit production is projected to annually result in about 240 cubic yards of additional contact-handled transuranic waste (LANL 2008). For the No Net Production/Capability-Based Alternative, LLW and TRU wastes would decrease. LLW from plutonium operations would be reduced to 68 cubic yards per year, and TRU wastes would be reduced to 42 cubic yards per year.

5.1.14.5 *Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in waste generated at LANL. Assuming that LANL would be producing 20 certifiable pits annually prior to phase out, wastes would be expected to decrease by the following amounts after interim pit production ends:

- LLW would decrease by 990 cubic yards annually (from 13,000 cubic yards to 12,010 cubic yards, a decrease of approximately 8 percent);
- MLLW would decrease by 20 cubic yards annually (from 140 cubic yards to 120 cubic yards, a decrease of approximately 14 percent); and
- TRU would decrease by 690 cubic yards annually (from 860 cubic yards to 170 cubic yards, a decrease of approximately 80 percent).

5.1.14.6 *Decontamination and Decommissioning of the CMR*

The Chemistry and Metallurgy Research Building (CMR) is a 550,000 square foot facility located within TA-3, at LANL. Constructed between 1949 and 1952, as an actinide chemistry and metallurgy research facility, the facility was expanded in 1960, and again in 1986. As presented in the Final EIS for the Chemistry and Metallurgy Research Building Replacement Project (CMRR), DOE-EIWS-0350, after a four year transition period which would transfer activities from the CMR to the newly constructed CMRR, the CMR would undergo some level of D&D. Operational experience at the CMR Building indicates some surface contamination has resulted from the conduct of various activities over the past 50 years.

Although D&D alternatives range from reuse of the entire building, to reuse of some of the building, to total demolition of the entire building, the greatest environmental impacts would be associated with the D&D and total demolition of the entire CMR Building and surrounding land. Impacts associated with the D&D and demolition of the entire CMR Building and surrounding land are expected to be limited to the creation of waste within LANL site waste management capabilities.

It is anticipated that the majority of the waste material produced by the D&D and demolition of the CMR Building would be solid waste and recyclable materials totaling an estimated 20,000 cubic yards. The amount of radioactive waste material is anticipated to be slightly less, about 16,000 cubic yards. The solid waste would be disposed of at the Los Alamos County Landfill, at LANL, or at a replacement facility. It is expected that the low-level radioactive waste could be transported offsite to a commercially licensed facility for disposal or disposed of onsite at LANL’s TA-54, Area G. Asbestos contaminated radioactive material from the demolition of the CMR Building would be disposed of in a disposal cell in TA-54, Area G, which is dedicated to the disposal of radioactively contaminated asbestos waste. It is anticipated that the amount of this material would be within the current capacity of the disposal cell. Asbestos that is not radiologically contaminated would be packaged and sent to the LANL asbestos transfer station for shipment, offsite, to a permitted asbestos disposal facility, along with other asbestos waste generated at other locations on LANL. It is anticipated that the amount of asbestos material generated by the demolition of the CMR Building would not exceed the disposal capacity of existing facilities.

Removal of the existing CMR Building would result in emissions associated with equipment and vehicle exhaust as well as particulate emissions (fugitive dust) from demolition activities. The demolition effects would be expected to result in elevated concentrations of particulate matter in the immediate vicinity of TA-3. Concentrations of other criteria pollutants could also increase but would not be expected to exceed the ambient standards in areas to which the public has regular access. Demolition activities may also result in radiological releases.

Noise levels during disposition activities at the CMR Building would be consistent with those typical of construction activities. As appropriate, workers would be required to wear hearing protection to avoid adverse effects on hearing. Non-involved workers at nearby facilities within TA-3 would be able to hear some of the activities; however, the level of noise would not likely be distracting. Construction noise at LANL is common. Some wildlife species may avoid the immediate vicinity of the CMR Building as demolition proceeds due to noise; however, any effects on wildlife resulting from noise associated with demolition activities would be temporary.

Little or no effect on water resources would be anticipated. The demolition of the CMR Building would not disturb surface water or generate liquid effluents that would be released to the surrounding environment. Silt fences, hay bales, or other appropriate Best Management Practices would be employed to ensure that fine particulates are not transported by stormwater into surface water features in the vicinity of the CMR Building. Potable water use at the site would be limited to that necessary for washing equipment, dust control, and sanitary facilities for workers.

All demolition activities would take place within TA-3, an area that has been dedicated to industrial use since the early 1940s. There are some small trees and shrubs around the CMR Building, but the immediate area consists mostly of roads, parking areas, and concrete pads. Wildlife in the vicinity could be temporarily disturbed by demolition activity and noise when the building is razed, building foundation and buried utilities removed, contaminated soils excavated, and waste trucked to disposal sites.

Under Section 106 of the *National Historic Preservation Act* (NHPA), any adverse effects to Register-eligible properties must be resolved prior to commencement of project activities. In conjunction with the State Historic Preservation Office, NNSA has developed documentation measures to reduce adverse effects to Register-eligible properties at LANL. These measures are incorporated into formal memoranda of agreement (MOAs) between the NNSA and the New Mexico Historic Preservation Division. Typical MOA terms include the preparation of a detailed report containing the history and description of the affected properties. Other terms include the identification of all drawings for each property, the production of medium-format archival photographs, and the preparation of LANL historic building survey forms. Documentation measures included in NNSA MOAs are carried out to the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Specific levels of HABS/HAER documentation are determined on a case-by-case basis.

The primary source of potential consequences to workers and members of the public would be associated with the release of radiological contaminants during the demolition process. The only radiological effect on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminate containment coupled with HEPA filters. Contaminate releases of radioactive particulate from disposition activities are expected to be lower than releases from past CMR operations. The demolition of the CMR Building would also involve the removal of some asbestos-contaminated material. Removal of asbestos-contaminated material would be conducted according to existing asbestos management programs at LANL in compliance with strict asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls, and no asbestos would likely be released that could be inhaled by members of the public.

Demolition wastes would need to be transported to storage or disposal sites at LANL or offsite location(s). Transport of contaminated waste material would present potential risks to workers and the public from radiation exposure as the waste packages are transported along roads and highways. There would also be increased risk from traffic accidents (without release of radioactive material) and radiological accidents (in which radioactive material is released).

Additional details of potential D&D activities related to the CMR Building may be found in "Preliminary Chemistry and Metallurgy Research Building Disposition Study," February 11, 2003, LA-UR-03-1122 (LANL 2003e).

5.2 LAWRENCE LIVERMORE NATIONAL LABORATORY

There are no Programmatic Alternatives for LLNL. Relevant project specific analyses for LLNL are discussed in Sections 5.12 through 5.17.

5.3 NEVADA TEST SITE

This section discusses the potential environmental impacts associated with the following programmatic alternatives at NTS:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. NTS would continue to perform its existing missions as described in Section 3.2.3 and no additional impacts would occur beyond those of existing and future activities that NNSA has already decided to perform.
- **DCE Alternative.** This alternative includes a CPC.
- **CCE Alternative.** This alternative includes two options: 1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, a Consolidated Uranium Center (CUC), and an A/D/HE Center; and 2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC, with the A/D/HE Center at Pantex. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE, 2020-2025).
- **Capability-Based Alternatives.** Under the Capability-Based Alternative and the No Net Production/Capability-Based Alternative, no additional changes would be required at NTS. As such, the No Action Alternative is the same as the Capability-Based Alternatives at NTS.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and archaeological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.3.1 Land Use

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.3.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.3.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	

Table 5.3.1-1—Potential Effects on Land Use at the Proposed Sites (continued)

CUC		
Construction (acres)	50	
Operation (acres)	Total Area: 35[b]	
	PIDAS	**Non-PIDAS**
	15	20
A/D/HE CENTER [d]		
Construction (acres)	300	
Operation (acres)	Total Area: 300[e]	
	PIDAS	**Non-PIDAS**
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120
CNC		
	Total Area: 195[f]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50
CNPC		
	Total Area: 545[g]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.3.1.1 *No Action Alternative*

Most of NTS is currently unused or provides buffer zones for ongoing programs and projects, while about 7-10 percent (60,000–86,500 acres) of the site has been disturbed. Existing land use at NTS is discussed in Section 4.3.1.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at NTS beyond those of existing and future activities that are independent of this action.

Primary facilities that support the NTS national security missions include the U1a Complex (where high explosives are detonated in the presence of aging nuclear materials to test their dynamic properties), the Big Explosives Experimental Facility (BEEF) (used for hydrodynamic testing of high explosives), the Devise Assembly Facility (DAF) (originally built for high-explosive and nuclear explosive assembly operations, and now being used for other operations including criticality experiments), and Joint Actinide Shock Physics Experimental Research

(JASPER) Facility (which uses high explosives in research and development experiments using special nuclear material), and the Hazardous Materials (HAZMAT) Spill Center (used for hazardous materials testing and training). Facilities that support the Waste Management Program include the Area 5 Radioactive Waste Management Complex, and the Area 3 Radioactive Waste Management Site.

5.3.1.2 *DCE Alternative (Greenfield CPC)*

5.3.1.2.1 Construction

As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a Perimeter Intrusion Detection and Assessment System (PIDAS) and a buffer area. The area outside the PIDAS would have a number of smaller support facilities, a Waste Staging/Transuranic (TRU) Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be used for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks.

The reference location for a CPC at NTS is within Area 6. The northern quarter of the area is designated as the Nuclear Test Zone, the south central portion is categorized as the Defense Industrial Zone, and the remaining area is designated as the Reserved Zone. The reference location would be located on land designated as a Defense Industrial Zone within Area 6.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent less than 0.02 percent of NTS's total land area of 880,000 acres. The post-construction developed area would be approximately 110 acres. Table 5.3.1-1 summarizes land use requirements for each alternative.

Although there would be a change in land use, the proposed CPC is compatible and consistent with land use plans and the current use designation (Defense Industrial Zone) for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent 0.01 percent of NTS's total land area of 880,000 acres.

Although there would be a change in land use, the proposed CPC is compatible and consistent with land use plans and the current land use designation, Defense Industrial Zone, for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.3 *CCE Alternative*

5.3.1.3.1 CNC (CPC + CUC)

Land use impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.1.2 as well as the CUC impacts discussed below.

CUC. As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside of it. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state.

The CUC reference location at NTS is within Area 6. The northern quarter of the area is designated as the Nuclear Test Zone, the south central portion is categorized as the Defense Industrial Zone, and the remaining area is designated as the Reserved Zone. The reference location would be located on land designated as a Defense Industrial Zone within Area 6.

An estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. The land required for CUC construction would represent 0.01 percent of NTS's total land area of 880,000 acres. The reference location has adequate space to accommodate the total facilities footprint.

Once constructed, the area required to support a CUC would be approximately 35 acres. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current use designation (Defense Industrial Zone) for this area. No impacts to NTS land use plans or policies are expected.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres would be located within a PIDAS. The administrative support buildings, and non-nuclear component production would consist of a 90-acre area outside the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. The land required for the proposed CNC operations would represent 0.02 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, a CNC is compatible and consistent with land use plans and the current use designation for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.3.2 CNPC (CPC + CUC + A/D/HE)

Land use impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.1.2, the CUC impacts discussed in Section 5.3.1.3, and the A/D/HE impacts discussed below.

***Construction:* A/D/HE Center.** At NTS, an A/D/HE Center would make use of the existing capabilities at the Device Assembly Facility (DAF) and other NTS facilities such that construction requirements would be reduced compared to the generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 additional acres would be required for the construction of an A/D/HE Center. The existing DAF would form the cornerstone of this Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF. There is 1.2 acres of space available in the DAF. All plant facilities located within the limited area at the plant site would be new construction.

The DAF is located in an area designated as a Defense Industrial Zone. The land required for A/D/HE construction would represent 0.02 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, the proposed A/D/HE is compatible and consistent with land use plans and the current land use designation for this area. No impacts to NTS land use plans or policies are expected.

***Operations:* CNPC.** As described in Section 3.5.1.2, an estimated 445 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC at NTS. The land required for CNPC operations would represent 0.05 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area.

5.3.2 Visual Resources

5.3.2.1 *No Action Alternative*

Existing visual resources are discussed in Section 4.3.2. The region surrounding NTS ranges from unpopulated to sparsely populated desert and rural land. Lands within NTS have a BLM Visual Resource Management rating of Class II or III. Developed areas within the site are consistent with a Visual Resource Management Class IV rating in which management activities dominate the view and are the focus of viewer attention. Existing visual resources are discussed in Section 4.3.2.

Under the No Action Alternative, there would be no impact on visual resources at NTS since no new facilities would be built.

5.3.2.2 *DCE Alternative (CPC)*

5.3.2.2.1 Construction

As described in Section 3.4.3, a CPC would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and would not be noticeable beyond the NTS boundary, which would be more than 10 miles away. Site visitors and employees observing CPC construction would find these activities similar to the past construction activities of other developed areas on the NTS.

5.3.2.2.2 Operations

The CPC facilities, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location in Area 6. However, this change would be consistent with the currently developed areas of Area 6. Thus, CPC's placement in the Defense Industrial Zone within Area 6 boundaries would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas within Area 6. As noted above, a CPC and its supporting structures would not be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network.

5.3.2.3 *CCE Alternative*

5.3.2.3.1 CNC (CPC + CUC)

Visual Resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.2.2 as well as the impacts discussed below.

Construction: **CUC.** Construction activities for a CUC are described in Section 3.5.2. Activities related to the construction of new buildings required for a CUC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and, because of its interior location on the NTS site, would not be noticeable beyond the NTS boundary. Site visitors and employees observing CUC construction would find these activities similar to the past construction activities of other developed areas on the NTS.

Operations: **CNC.** As described in Section 3.5.2, a CNC would include one- and two-story buildings that would change the appearance of the reference location. The placement in the Defense Industrial Zone with Area 6 boundaries would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas within Area 6. A CNC would not be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network. However, this change would be consistent with the currently developed areas of NTS.

5.3.2.3.2 CNPC (CPC + CUC + A/D/HE)

Visual Resources impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.2.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for construction. The existing DAF would form the cornerstone of an A/D/HE Center at NTS, along with the underground complex of tunnels at U1a, the Big Explosive Experimental Facility (BEEF), the Explosives Ordnance Disposal Unit, existing NTS site infrastructure, and the support areas of Mercury, the Control Point and Area 6 Construction.

Activities related to the construction of new buildings required for an A/D/HE Center would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and, based on the interior location within the NTS site, would not be noticeable beyond the NTS boundary.

***Operations:* CNPC.** As described in Section 3.5.2, a CNPC would include one- and two-story buildings that would change the appearance of the reference location. The DAF is in the Defense Industrial Zone and would be consistent with the current Class IV BLM Visual Resources Management. The CNPC would not be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network. However, this change would be consistent with the currently developed areas of NTS.

5.3.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.3.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS

5.3.3.1 *No Action Alternative*

An extensive network of existing infrastructure provides services to NTS activities and facilities as shown in Table 4.3.3-1. Electrical usage is below current site capacity. The annual maximum production capacity of site potable supply wells is approximately 2.1 billion gallons per year while the sustainable site capacity is estimated to be 1.36 billion gallons per year (DOE 2002l).

Baseline requirements are discussed in Section 4.3.3. Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3

5.3.3.2 *DCE Alternative (CPC)*

5.3.3.2.1 Construction

Construction requirements for a CPC are described in Section 3.4.1. The projected demand on electrical resources is shown in Table 5.3.3-1.

Table 5.3.3-1—Electrical Requirements–Construction of CPC, CUC, and A/D/HE Center

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity [a]	**176,844**	**45**
Available site capacity [a]	**75,476**	**18**
No Action Alternative		
Total site requirement	101,377	27
Percent of site capacity	57%	60%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	7%	7%
Percent of available capacity	17.3%	18%
CUC		
CUC requirement	11,000	2.5
Percent of site capacity	6.2%	5.5%
Percent of available capacity	14.6%	13.8%
A/D/HE		
A/D/HE requirement	55,000	12.7
Percent of site capacity	31%	28.2%
Percent of available capacity	73.3%	70.5%

Source: NNSA 2007.

[a] Not limited due to offsite procurement.

The existing electrical infrastructure at NTS would be adequate to support annual construction requirements for the proposed plant sizes for the projected 6-year construction period.

5.3.3.2.2 Operations

Operation requirements for a CPC are described in Section 3.4.1. The estimated annual site electrical infrastructure requirements are presented in Table 5.3.3-2. Electrical energy requirements would be within the site's available capacity.

Table 5.3.3-2—Electrical Requirements–Operation of CPC, CUC, CNC, A/D/HE Center, and CNPC at NTS

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity[a]	**176,844**	**45**
Available site capacity[a]	**75,476**	**18**
No Action Alternative		
Total site requirement	101,377	27
Percent of site capacity	57%	60%
CPC		
CPC requirement	48,000	11
Percent of site capacity	27%	24%
Percent of available capacity	64%	61%
CUC		
CUC requirement	168,000	18.4
Percent of site capacity	95%	41%
Percent of available capacity	224%	102%
CNC (CPC + CUC)		
CNC requirement	216,000	29.4
Percent of site capacity	122%	65%
Percent of available capacity	288%	163%
A/D/HE		
A/D/HE requirement	52,000	11.9
Percent of site capacity	29.4%	26%
Percent of available capacity	69.3%	66%
CNPC (CPC + CUC + A/D/HE)		
CNPC requirement	268,000	41.3
Percent of site capacity	151%	91.7%
Percent of available capacity	357%	229%

Source: NNSA 2007.

[a] Not limited due to offsite procurement.

5.3.3.3 *CCE Alternative*

5.3.3.3.1 CNC (CPC + CUC)

Site Infrastructure impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.3.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would primarily be made up of a new structure to contain a nuclear facility composed of the UPF and HEU storage (described in Sections 3.4.2 and 3.5.1.1). As shown in Table 5.3.3-1, the existing electrical infrastructure at NTS would be adequate to support annual construction requirements for a CUC.

Operations: **CNC.** The core operations of a CNC would be made up of the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site infrastructure requirements for operation of a CNC are presented in Table 5.3.3-2. Because electrical energy requirements would exceed available site electrical energy capacity, to support a CNC, NTS would have to procure additional power.

5.3.3.3.2 CNPC (CPC + CUC + A/D/HE)

Site electrical infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF and other existing NTS facilities such that construction requirements would be reduced compared to a generic A/D/HE Center described in Sections 3.5.1.2 and 3.5.1.2.1. The existing electrical infrastructure at NTS would be adequate to support annual construction requirements for an A/D/HE Center for the projected 6-year construction period. The estimated site infrastructure requirements for construction of an A/D/HE Center are shown in Table 5.3.3-1.

Operations: **CNPC.** The core operations of a full CNPC are discussed in Section 3.5.1. The estimated annual site electrical infrastructure requirements for operation of a CNPC are presented in Table 5.3.3-2. Because electrical energy requirements would exceed available site electrical energy capacity, to support a CNPC, NTS would have to procure additional power.

5.3.4 Air Quality and Noise

5.3.4.1 *No Action Alternative*

NTS is located in the Nevada Intrastate Air Quality Control region (AQCR) 147. The region is classified as an attainment area for all six criteria pollutants under the NAAQS. No emission limits for any criteria air pollutants or HAPS were exceeded (NTS 2007). Measured concentration of nonradiological criteria pollutants are below regulatory requirements (NTS 2007). For data reported for 2006, the estimated annual dose to the public from radiological emissions from current and past NTS activities is well below the 10 millirem per year dose limit (NTS 2007). Existing air quality at NTS is discussed in Section 4.3.4.1.

During periods of activity, local sound levels at NTS could vary from loud (70 dbA) to deafening (160 dbA) depending on the distance between the noise source and receptor (NTS 2006a). A description of the existing activities that produce noise at NTS is in Section 4.3.4.2. Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to air quality and noise beyond current and planned activities.

5.3.4.2 *DCE Alternative (Greenfield CPC)*

5.3.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of new structures would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, particulate matter, total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment is based on factors provided in the EPA document AP-42, “Compilation of Air Pollutant Emission Factors” (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicles), factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth moving operations depends on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 2.69 metric tons per hectare (1.20 tons per acre) per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process.

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.3.4–1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the NTS site boundary (DOE 2003d).

Table 5.3.4-1—Estimated Peak Nonradiological Air Emissions for CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

***Construction:* radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. As shown in Table 5.3.4-2, air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon dioxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). If NTS is selected for a CPC, a prevention of significant deterioration (PSD) increment analysis would be performed under a project-specific tiered EIS to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although the CPC would emit criteria pollutants, a conformity review is not necessary.

Table 5.3.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

The maximum concentrations (microgram per cubic meter) at the NTS site boundary that would be associated with the release of pollutants were modeled and are presented in Table 5.3.4-3. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For almost all the pollutants for which data were available, the incremental addition would be less than 1 percent of the most stringent standard or guideline. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.3.4-3—Criteria Pollutant Concentrations for CPC–Operations

Pollutant	Averaging Time	Most Stringent Standard[a] ($\mu g/m^3$)	Maximum Incremental Concentration ($\mu g/m^3$)	
			Baseline [d]	CPC- 200ppy
Carbon monoxide	8-hr (elevations < 5,000 ft amsl)	13,079[b]	2,995	2.68
	8-hour (elevations ≥ 5,000 ft above msl)	8,985[b]	No Data	No Data
	1-hr	52,318[c]	3,597	3.82
Nitrogen dioxide	Annual	130.8[c]	No Data	1.5
Lead	Quarterly	1.96[c]	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data
Sulfur dioxide	Annual	104.6[c]	No Data	0.09
	24-hr	477.4[c]	20.5	0.46
	3-hr	1,700[c]	85.5	1.06
PM_{10}	Annual	65.4[c]	No Data	0.037
	24-hr	196.2[c]	102.4	0.18

Source: NNSA 2007.

PM_{10}=particulate matter less than or equal to 10 microns in aerodynamic diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] State standard.

[c] Federal standard (NAAQS).

[d] Highest measured concentration at NTS.

Radiological impacts. Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. Sample transfers would occur using a vacuum tube transfer system from the Feed Preparation and Manufacturing Facilities to the Analytical Support Facility. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-ft tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.3.4-4). Total radionuclide emissions at NTS would increase by less than 0.0001 percent. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.3.4-4—Annual Radiological Air Emissions for CPC at NTS–Operations

Isotope	Annual Emissions (Ci/yr)	
	Baseline[a,b]	200 ppy
Americium-241	4.7×10^{-2}	3.12×10^{-7}
Plutonium-239		1.02×10^{-5}
Plutonium-240		2.66×10^{-6}
Plutonium-241		1.96×10^{-4}
Total Plutonium	**2.9×10^{-1}**	**2.1×10^{-4}**
Uranium-234		5.02×10^{-9}
Uranium-235		1.58×10^{-10}
Uranium-236		2.56×10^{-11}
Uranium-238		1.42×10^{-12}
Total Uranium	NA	–
Tritium	170	–
Total	**170.3**	**2.09×10^{-4}**

Source: NNSA 2007.

[a] The No Action Alternative is represented by the baseline.

[b] Onsite emissions only.

NA=not available.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-5, the expected annual radiation dose to the offsite MEI would be much lower than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations at NTS

Receptor	CPC- 200 ppy
Offsite MEI[a] (mrem/yr)	1.1×10^{-5}
Population within 50 miles (person-rem per year) [a]	2.4×10^{-5}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location. The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.2.2 Noise

Construction. Construction of new buildings at Area 6 would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Sources associated with construction at Area 6 would not include loud intermittent sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.3.4-6 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 10 miles), there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.3.4-6—Peak and Attenuated Noise Levels from Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations at Area 6. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (more than 10 miles), noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.3.4.3 *CCE Alternative*

5.3.4.3.1 CNC (CPC + CUC)

Air quality and noise impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.4.2 as well as the impacts discussed below for the CUC.

5.3.4.3.1.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.3.4–1 would bound CUC emissions. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the NTS site boundary, as the maximum baseline concentrations are more than 30 percent below the most stringent standard or guideline.

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* CUC and CNC nonradiological impacts.** CUC (and CNC) activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from the CUC to the NTS baseline. The results are presented in Table 5.3.4-7. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. The CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.3.4-7—Criteria Pollutant Concentrations at NTS Boundary for CUC and CNC Operations

Pollutant	Averaging Time	Most Stringent Standard[a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)		
			Baseline [d]	CUC	CNC
Carbon monoxide	8-hr (elevations < 5,000 ft amsl)	13,079[b]	2,995	0.2	2.78
	8-hour (elevations ≥ 5,000 ft amsl)	8,985[b]	NA	No Data	No Data
	1-hr	52,318[c]	3,597	No Data	3.66
Nitrogen dioxide	Annual	130.8[c]	No Data	0.9	2.18
Sulfur dioxide	Annual	104.6[c]	No Data	2.1	2.16
	24-hr	477.4[c]	20.5	52.4	52.8
	3-hr	1,700[c]	85.5	17.5	18.5
PM$_{10}$	Annual	65.4[c]	No Data	0.02	0.05
	24-hr	196.2[c]	102.4	0.2	0.4
Lead	Quarterly	1.96[c]	No Data	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data	No Data

Source: NNSA 2007.
NA–Not Applicable
PM$_{10}$=particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM$_{10}$ mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.
[b] State standard.
[c] Federal standard (NAAQS).
[d] Highest measured concentration at NTS.

CUC and CNC radiological impacts. A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of the CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 curies (2.17 kilograms) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding NTS, and NTS workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations–NTS

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	4.1×10^{-3}	4.1×10^{-3}
Population within 50 miles (person-rem per year)[a]	9.5×10^{-3}	9.5×10^{-3}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location. The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.3.1.2 Noise

Construction. **UC.** Anticipated noise impacts from the construction of a CUC would be similar to those described for the CPC in Section 5.3.4.2.

Operations. **CUC and CNC.** Anticipated noise impacts from the operation of a CNC would be similar to those described for the CPC in Section 5.3.4.2.

5.3.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air Quality and Noise impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.3.4.3.2.1 Air Quality

Construction: **A/D/HE Center nonradiological impacts.** Nonradiological impacts of an A/D/HE Center construction are expected to be similar to the impacts described above for a CPC and CUC. However, due to the potential to disturb approximately 200 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent.

The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.3.4-9. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The results represent a conservative estimate if PM_{10} emissions at the site boundary. As shown, these results show that concentrations would remain approximately 90 percent below any regulatory limits.

Table 5.3.4-9—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	5.67
24-hour	150	13.3

Source: Janke 2007.

Construction: **A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **A/D/HE Center and CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. The CPC and CUC nonradiological emissions are discussed in Sections 5.3.4.2.1 and 5.3.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.3.4-10. These emissions would be incremental to the NTS baseline.

Table 5.3.4-10—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS emissions (tons/year)	Emissions
Oxides of Nitrogen (tons/year)	91
Carbon Monoxide (tons/year)	31
Volatile Organic Compounds (tons/year)	31
Particulate Matter (tons/year)	18
Sulfur Dioxide (tons/year)	5
Hazardous Air Pollutants and Effluents (tons/yr)	22

Source: NNSA 2007.

The maximum concentrations (micrograms per cubic meter) at the NTS site boundary that would be associated with the release of criteria pollutants are presented in Table 5.3.4-11. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.3.4-11—Criteria Pollutant Concentrations at NTS for CNPC–Operations

Pollutant	Averaging Time	Most Stringent Standard[a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)		
			Baseline [d]	A/D/HE Center	CNPC
Carbon monoxide	8-hr (elevations < 5,000 ft above msl)	13,079[b]	2,995	0.12	3.0
	8-hour (elevations ≥ 5,000 ft above msl)	8,985[b]	NA	No Data	NA
	1-hr	52,318[c]	3,597	1.88	5.6
Nitrogen dioxide	Annual	130.8[c]	No Data	0.35	2.5
Sulfur dioxide	Annual	104.6[c]	No Data	0.02	2.2
	24-hr	477.4[c]	20.5	0.05	52.8
	3-hr	1,700[c]	85.5	0.2	18.7
PM$_{10}$	Annual	65.4[c]	No Data	0.07	0.1
	24-hr	196.2[c]	102.4	0.16	0.6
Lead	Quarterly	1.96[c]	No Data	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data	No Data

Source: NNSA 2007.
msl=mean sea level
PM$_{10}$=particulate matter less than or equal to 10 microns in aerodynamic diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM$_{10}$ mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.

[b] State standard.

[c] Federal standard (NAAQS).

[d] Highest measured concentration at NTS.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

***Operations:* A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. The CPC and CUC radiological emissions are discussed in sections 5.3.4.2.1 and 5.34.3.1 respectively, and are not repeated here. The total radiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section).

During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.3.4-12.

Table 5.3.4-12—Annual Radiological Air Emissions for A/D/HE Center Operations

Radionuclide	Emission (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding NTS, and NTS workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-12, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of an A/D/HE Center resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-13—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations–NTS

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	3.1×10^{-6}	4.1×10^{-3}
Population within 50 miles (person-rem per year) [a]	7.3×10^{-6}	9.5×10^{-3}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.3.2.2 Noise

***Construction:* A/D/HE Center.** Anticipated noise impacts from the construction of a CNPC would be similar to those described for a CPC in Section 5.3.4.2.

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of a CNPC would be similar to those described for the CPC in Section 5.3.4.2.

5.3.5 Water Resources

Environmental impacts associated with the proposed alternatives at NTS could affect groundwater resources. No impacts to surface water are expected. At NTS, groundwater resources would be used to meet all construction and operations water requirements.

5.3.5.1 *No Action Alternative*

There are no perennial streams or other naturally occurring surface waterbodies at NTS. Three principal groundwater sub-basins have been identified within the NTS region. The history of nuclear testing at NTS has contaminated groundwater in some areas. Data for 2005 indicate that groundwater at offsite locations has not been significantly impacted by nuclear testing. Results from nine NTS water supply wells and one water monitoring well continue to indicate that nuclear testing has not impacted the NTS potable water supply network. Current and planned activities would continue as required with an expected demand for water of less than 400 million gallons per year (NNSA 2008b).

Table 5.3.5-1 and 5.3.5-2 summarizes existing surface water and groundwater resources at NTS, the total NTS water resource requirements for each alternative, and the potential changes to water resources at NTS resulting from the proposed alternatives.

Table 5.3.5-1—Potential Changes to Water Resources from the Construction of the CPC, CUC and A/D/HE Center–NTS

Proposed Alternatives	Water Availability and Use
Annual Maximum Production Capacity (gal/yr)	2,100,000,000
Sustainable site capacity (gal/yr)	1,360,000,000
No Action Alternative	
Water Requirement (gal/yr)	400,000,000
Percent of Sustainable Site Capacity	29.4%
CPC	
Water Requirement (gal)	20,900,000
Percent of Sustainable Site Capacity	1.5%
CUC	
Water Requirement (gal)	5,200,000
Percent of Sustainable Site Capacity	0.4%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent of Sustainable Site Capacity	0.2%

Source: NNSA 2007.

Table 5.3.5-2—Potential Changes to Water Resources from the Operation of the CPC, CUC and A/D/HE Center–NTS

Proposed Alternatives	Water Availability and Use
Annual Maximum Production Capacity (gal/yr)	**2,100,000,000**
Sustainable site capacity (gal/yr)	**1,360,000,000**
No Action Alternative	
Water Requirement (gal)	400,000,000
Percent of Sustainable Site Capacity	29.4%
CPC	
Water Requirement (gal)	88,500,000
Percent of Sustainable Site Capacity	6.5%
Total Water Requirement/Within Sustainable Capacity?	488,500,000/Yes
CUC	
Water Requirement (gal)	105,000,000
Percent of Sustainable Site Capacity	7.8%
Total Water Requirement/Within Sustainable Capacity?	505,000,000/Yes
CNC (CPC + CUC)	
Water Requirement (gal)	193,500,000
Percent of Sustainable Site Capacity	14.2%
Total Water Requirement/Within Sustainable Capacity?	593,500,000/Yes
A/D/HE Center	
Water Requirement (gal)	130,000,000
Percent of Sustainable Site Capacity	9.5%
Total Water Requirement/Within Sustainable Capacity?	530,000,000/Yes

Table 5.3.5-2—Potential Changes to Water Resources from the Operation of the CPC, CUC and A/D/HE Center–NTS (continued)

Proposed Alternatives	Water Availability and Use
CNPC (CPC + CUC + A/D/HE Center)	
Water Requirement (gal)	323,500,000
Percent of Sustainable Site Capacity	23.7%
Total Water Requirement/Within Sustainable Capacity?	723,500,00/Yes

Source: NNSA 2007.

5.3.5.1.1 Surface Water

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts to water resources would occur at NTS.

5.3.5.1.2 Groundwater

There would be no additional impacts on groundwater availability or quality beyond current and planned activities. Current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3.

5.3.5.2 *DCE Alternative (Greenfield CPC)*

5.3.5.2.1 Surface Water

Construction. Construction requirements for a CPC are described in Section 3.4.1. Surface water would not be used to support the construction of a CPC at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for the proposed CPC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

Operations. Operation requirements for a CPC are described in Section 3.4.1. No impacts on surface water resources are expected as a result of CPC operations at NTS. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive-contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

5.3.5.2.2 Groundwater

Construction. Construction requirements for a CPC are described in Section 3.4.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of 20,900,000 gallons of groundwater mainly to support CPC construction. It is expected that construction should take approximately 6 years. The yearly peak in water use would be approximately 3.5 million gallons. The total site water requirements including these quantities would be well within the sustainable site capacity of 1.36 billion gallons. It is anticipated that this water would be derived from NTS's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Operation requirements for a CPC are described in Section 3.4.1. Activities at NTS under the CPC Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.3.5-2. The CPC operations would require 6.5 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.5.3 *CCE Alternative*

5.3.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.5.2 as well as the impacts discussed below.

Surface water: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1. Surface water would not be used to support the construction of a CUC at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for CUC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

***Surface water:* CNC operations.** Operation requirements for a CNC are described in Section 3.5.1. No impacts on surface water resources are expected as a result of CNC operations at NTS. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds. No industrial or other regulated discharges to surface waters are anticipated.

A CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures.

***Groundwater:* CUC construction.** Construction requirements for a CUC are described in Section 3.5.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of 5.2 million gallons of groundwater mainly to support CUC construction. The maximum additional water requirement for a CPC is less than 1 percent of NTS's sustainable site capacity. It is anticipated that this water would be derived from NTS's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNC operations.** CUC operations would require 7.8 percent of the sustainable site water capacity. Operation requirements for a CNC are described in Section 3.5.1. Activities at NTS under the CNC Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.3.5-2. CNC operations would require 14.2 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Surface water: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would use the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The existing DAF would form the cornerstone of an A/D/HE Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF.

Surface water would not be used to support the construction of an A/D/HE Center at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for CUC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

Surface water: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. No impacts on surface water resources are expected as a result of CNPC operations at NTS. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds. No industrial or other regulated discharges to surface waters are anticipated.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. .

***Groundwater:* A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1.

Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 2 million gallons of groundwater mainly to support A/D/HE Center construction. The maximum additional water requirement for A/D/HE Center construction would be less than 1 percent of NTS's sustainable site capacity.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. A/D/HE Center operations would require approximately 130 million gallons of water annually, which would be 9.5 percent of the sustainable site water capacity. When coupled with a CPC and CUC, a CNPC would use 323.5 million gallons of groundwater annually to support operations. CNPC operations would require 23.7 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.6 Geology and Soils

5.3.6.1 *No Action Alternative*

Soils at NTS are considered acceptable for standard construction techniques. There is no prime farmland at NTS. Past testing at NTS (underground, atmospheric, safety, and nuclear rocket and related tests) has resulted in the displacement and contamination of soils at NTS. The areas of contamination have been delineated, air monitoring and radiological surveying continue for key indicator parameters and an extensive research and development project has evaluated alternative methods for remediating the soils for possible future land use. Existing geology and soils resources are discussed in Section 4.3.6.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on geology and soils would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.6.2 *DCE Alternative (Greenfield CPC)*

5.3.6.2.1 Construction

As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to CPC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion. As discussed in Section 4.3.5, faults located in the vicinity of NTS have the potential for earthquakes.

As discussed in Section 4.3.6, NTS is located in a region with relatively high seismicity. Ground shaking associated with postulated earthquakes is possible and supported by the historical record for the region. Further, minor to moderate earthquakes have occurred within the site within the last decade. Modified Mercalli Intensity VII ground shaking would be expected to affect primarily the integrity of inadequately designed or non-reinforced structures, but damage to properly or specially designed facilities would not be expected. Nevertheless, three potentially active fault systems intersect the site and, thus, should be considered capable.[1] The closest capable fault (Cane Spring) is located about 3 miles southeast of DAF. The potential for other large scale geologic hazards to affect Area 6 facilities is generally low. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

5.3.6.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.6.3 *CCE Alternative*

5.3.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.6.2 as well as the impacts discussed below.

***Construction:* CUC.** As described in Section 3.5.1.1, a CUC would consist of multiple aboveground facilities. An estimated 50 acres of land, which includes a construction laydown area and temporary parking would be needed for construction. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, a CUC would require approximately 35 acres of land.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to CUC construction, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; therefore the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site’s Environmental Restoration Program and in accordance with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

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[1] A *capable fault* is a fault which has exhibited movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.

The CUC reference location is in a region that has been seismically active within the last few thousand to tens of thousands of years. Earthquakes on the faults in the area and larger earthquakes on the farther faults would result in ground motion at the CUC site. Ground shaking affects primarily the integrity of inadequately designed or non-reinforced structures, but does not damage or only slightly damages properly or specially designed facilities.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. The land required for CNC operations would represent less than 0.02 percent of NTS's total land area of 880,000 acres.

The operation of a CNC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** At NTS, an A/D/HE Center would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The DAF is located in an area designated as a Defense Industrial Zone. The land required for the proposed A/D/HE Center construction would represent 0.02 percent of NTS's total land area of 880,000 acres.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to A/D/HE Center construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

The A/D/HE Center representative site is located in a region that has been seismically active within the last few thousand to tens of thousands of years. Earthquakes on the faults in the area and larger earthquakes on the farther faults would result in ground motion at the A/D/HE Center site. Ground shaking affects primarily the integrity of inadequately designed or non-reinforced structures, but does not damage or only slightly damages properly or specially designed facilities.

Operations: **CNPC.** As described in Section 3.5.1, an estimated 445 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. The land required for the proposed CNPC operations would represent 0.05 percent of NTS's total land area of 880,000 acres.

The operation of the CNPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.7 Biological Resources

5.3.7.1 *No Action Alternative*

The only federally-threatened species found at NTS is the Mojave Desert population of the desert tortoise (NTS 2007). Existing biological resources are discussed in Section 4.3.7.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered (T&E) species would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.7.2 *DCE Alternative (Greenfield CPC)*

5.3.7.2.1 Terrestrial Resources

Construction. Construction requirements are described in Section 3.4.1. The area identified for construction of a CPC consists primarily of white bursage (*Ambrosia dumosa*) and creosote bush (Larrea tridentata) or saltbush and white bursage shrubland vegetation (Skougard 2002) that supports a limited diversity of wildlife. An estimated 140 acres of land would be required to construct a CPC. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. As described in Section 3.4.1, an estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.3.7.2.2 Wetlands

Construction. Construction requirements for a CPC are described in Section 3.4.1. Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed CPC site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Operations. Operation requirements for a CPC are described in Section 3.4.1. There are no adverse impacts predicted to wetlands from operation of the CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect any wetlands.

5.3.7.2.3 Aquatic Resources

Construction. Construction requirements for a CPC are described in Section 3.4.1. There are no perennial or seasonal aquatic habitats within the proposed CPC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. Operation requirements for a CPC are described in Section 3.4.1. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

5.3.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at NTS, are known to be present within the proposed site location. As discussed in section 4.3.7.4, the only federally threatened species found at NTS is the Mojave Desert population of the desert tortoise (*Gopherus agassizii*) (NTS 2007). The desert tortoise inhabits the southern one-third of the NTS at fairly low estimated densities. The abundance of tortoises at NTS is low to very low compared to other areas within the range of this species. NTS contains less than 1 percent of the total desert tortoise habitat of the Mojave Desert population (DOE 2002l). A cumulative total of 265.70 acres of tortoise habitat on the NTS has been disturbed since the desert tortoise was listed as threatened in 1992 (NTS 2006a).

Construction. Construction requirements for a CPC are described in Section 3.4.1. Approximately 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. This represents much less than 1 percent of the undeveloped area at NTS. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Operation requirements for a CPC are described in Section 3.4.1. An estimated 110 acres of land would be required to operate a CPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should not impact any special-interest species population.

5.3.7.3 *CCE Alternative*

5.3.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.7.2 as well as the impacts discussed below.

Terrestrial resources: **CUC construction.** As described in Section 3.5.1.1, approximately 50 acres of land would be modified during CUC construction. Once constructed, approximately 35 acres would be needed to support CUC operations. The area identified for construction of the CUC consists primarily of white bursage (*Ambrosia dumosa*) and creosote bush (*Larrea tridentata*) or saltbush and white bursage shrubland vegetation (Skougard 2002) that supports a limited diversity of wildlife. An estimated 140 acres of land would be required to construct the CUC. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Terrestrial resources: **CNC operations.** As described in Section 3.5.2, an estimated 195 acres of land would be modified or lost. Of this, approximately 80 acres would be located within a PIDAS. The land required for CNC operations would represent less than 0.02 percent of NTS's total land area of 880,000 acres. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production and uranium operations, CNC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

Wetlands: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed CUC site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Wetlands: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. There are no adverse impacts predicted to wetlands from operation of a CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect any wetlands.

Aquatic resources: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. There are no perennial or seasonal aquatic habitats within the proposed CUC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

Threatened and endangered species: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Approximately 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Threatened and endangered species: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. An estimate 195 acres of land would be required to operate a CNC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations should not impact any special-interest species population.

5.3.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.3.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Terrestrial resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The existing DAF would form the cornerstone of an A/D/HE Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) in the surrounding environment.

Terrestrial resources: **CNPC operations.** As described in Section 3.5.1, an estimated 445 acres of land would be required to support CNPC operations, which would represent 0.05 percent of NTS's total land area of 880,000 acres. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

Wetlands: **A/D/HE Center construction.** Construction of the A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center. Approximately 200 acres would be required for the construction of the A/D/HE Center.

Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed A/D/HE Center site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Wetlands: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. There are no adverse impacts predicted to wetlands from operation of the CNPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations are not expected to adversely affect any wetlands.

Aquatic resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center. Approximately 200 acres would be required for the construction of an A/D/HE Center.

There are no perennial or seasonal aquatic habitats within the proposed A/D/HE Center location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

Threatened and endangered species: **A/D/HE Center construction.** Construction requirements for an A/D/HE Center are described in Section 3.5.1.2. Approximately 200 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct an A/D/HE Center. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Threatened and endangered species: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. An estimate 445 acres of land would be required to operate a CNPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations should not impact to any special-interest species population.

5.3.8 Cultural Resources

5.3.8.1 *No Action Alternative*

Prehistoric sites found at NTS include habitation sites (DOE 2002l). Historic sites found at NTS include mines and prospects, trash dumps, settlements, campsites, ranches and homesteads, developed springs, roads, trails, and nuclear weapon development sites. Three ethnic groups were identified as having prehistoric and historic ties to NTS: Western Shoshone, Southern Paiute, and Owens Valley Shoshone Paiute. Existing cultural and archaeological resources are discussed in Section 4.3.8.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts to cultural and paleontological resources would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.8.2 *DCE Alternative (Greenfield CPC)*

5.3.8.2.1 Cultural Resources

Construction: **CPC.** As described in Section 3.4.1, a CPC would disturb an estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The CPC reference location at NTS has not been inventoried for cultural resources, thus the presence of resources that would be impacted during construction of a CPC is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other DOE sites under consideration. Thus, there is a low probability that resources would be impacted during CPC construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CPC at NTS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the Nevada SHPO and in accordance with the *Cultural Resources Management Plan for the Nevada Test Site* (DOE 1999d). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by DOE in consultation with the Nevada SHPO.

Operations: **CPC.** As described in Section 3.4.1, an estimated 110 acres of land would be required to operate a CPC. Operation of a CPC at would have no impact on cultural resources.

5.3.8.2.2 Paleontological Resources

Construction: **CPC.** As described in Section 3.4.1, a CPC would disturb an estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace.

No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the Quaternary deposits that make up Frenchman Flat and Area 6 could contain archaeological materials. Thus, there is a possibility that archaeological resources would be impacted due to construction of the CPC or the associated infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to archaeological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by DOE.

***Operations**:* **CPC.** As described in Section 3.4.1, an estimated 110 acres of land would be required to operate the CPC. Operation of the CPC at would have no impact on archaeological resources.

5.3.8.3 *CCE Alternative*

5.3.8.3.1 CNC (CPC + CUC)

Cultural and archaeological resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.8.2 as well as the impacts discussed below.

Cultural resources: **CUC construction.** As described in Section 3.5.1.1, a CUC would disturb an estimated 50 acres of land during construction. The CUC reference location at NTS has not been inventoried for cultural resources, thus the presence of resources that would be impacted during construction of the CUC is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other DOE sites under consideration. Thus, there is a low possibility that resources would be impacted during CUC construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CUC at NTS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Cultural resources: **CNC operations.** As described in Section 3.5.2, an estimated 195 acres would be required to operate a CNC. Operation of a CNC would have no impact on cultural resources.

Paleontological resources: **CUC construction.** As described in Section 3.5.1.1, a CUC would disturb an estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the

Quaternary deposits that make up Frenchman Flat and Area 6 could contain paleontological materials. Thus, there is a probability that paleontological resources would be impacted due to construction of the CPC or the associated infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Archaeological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by DOE.

Paleontological resources: **CNC operations.** As described in Section 3.5.2, a CNC would require an estimated 195 acres. Operation of a CNC at would have no impact on paleontological resources.

5.3.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural and paleontological resource impacts from the construction and operation of the full CNPC would include the CNC impacts discussed above, and the A/D/HE Center impacts discussed below.

Cultural resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center. Approximately 200 acres would be required for the construction of an A/D/HE Center.

The presence of resources that would be impacted during construction of the A/D/HE Center is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other sites under consideration. Thus, there is a low probability that resources would be impacted during A/D/HE Center construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Cultural resources: **CNPC operations.** As described in Section 3.5.1.2, a CNPC would require an estimated 445 acres. Operation of a CNPC would have no impact on cultural resources.

Paleontological resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of an A/D/HE Center.

No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the Quaternary deposits that make up Frenchman Flat and Area 6 could contain archaeological materials. Thus, there is a possibility that paleontological resources would be impacted due to construction of an A/D/HE Center or the associated infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Archaeological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by NNSA.

Paleontological resources: **CNPC operations.** As described in Section 3.5.1.2, the CNPC would require an estimated 445 acres. Operation of the CNPC would have no impact on paleontological resources.

5.3.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, and the CCE Alternative.

5.3.9.1 *No Action Alternative*

The NTS ROI consists of Nye and Clark Counties. The current level of NTS employment is expected to continue. Existing socioeconomic characteristics for the ROI are described in Section 4.3.9.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action.

5.3.9.2 *DCE Alternative (Greenfield CPC)*

5.3.9.2.1 Regional Economic Characteristics

Construction. Construction of a CPC would require 2,900 worker-years of labor. During peak construction, about 850 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 826 indirect jobs would be created, for a total of 1,676 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by a maximum of $38.2 million annually at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $66.6 million ($38.2 million direct and $28.4 million indirect). Table 5.3.9-1 presents the impacts to socioeconomic resources from construction of the CPC. Impacts from the construction of the CPC on population, housing, and community services characteristics within the ROI are presented in sections 5.3.9.2.2 and 5.3.9.2.3.

Table 5.3.9-1—Socioeconomic Impacts from CPC Construction

Socioeconomic Factor	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	826
Total Jobs Created	1,676
ROI Average Earning	$44,900
Direct Income Increase	$38,165,000
Indirect Income Increase	$28,456,000
Total Impact to the ROI	$66,621,000

Source: NNSA 2007.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,481 indirect jobs would be created, for a total of 3,261 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $135.1 million ($87.6 million direct and $47.5 million indirect). Table 5.3.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.3.9.2.2 Population and Housing

Construction. An influx of new workers would increase the ROI population and could create a new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 workers), a total of 1,275 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.3.9.2.3 Community Services

Construction. There would be no impact to ROI community services because the increase would be less than 1 percent over the current population.

Operations. There would be no impact to ROI community services because the increase would be less than 1 percent over the current population.

Table 5.3.9-2—Socioeconomic Impacts from Operations

Socioeconomic Factor	CPC	CUC	CNC	AD/HE	CNPC
Peak Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,481	1,713	1,704	3,270	2,824
Total Jobs Created	3,261	2,648	4,419	5,055	7,324
ROI Average Earning	$49,200	$49,200	$49,200	$49,200	$49,200
Direct Income Increase	$87,576,000	$46,002,000	$133,578,000	$87,822,000	$221,400,000
Indirect Income Increase	$47,519,000	$24,961,000	$72,479,000	$47,652,000	$120,132,000
Total Impact to the ROI	$135,095,000	$70,963,000	$206,057,000	$135,474,000	$341,532,000

Source: NNSA 2007.
Note: Construction of the UPF at Y-12 requires 900 peak workers. Construction of the CUC at NTS requires 1,300 peak workers.

5.3.9.3 *CCE Alternative*

5.3.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.9.2 as well as the impacts discussed below.

Regional economic characteristics: **CUC construction.** Construction of the CUC would require 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,563 indirect jobs would be created, for a total of 3,863 jobs. It is estimated that many of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $58.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $101.9 million ($58.4 million direct and $43.5 million indirect). Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.3.9-3—Socioeconomic Impacts from CUC Construction

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	2,563
Total Jobs Created	3,863
ROI Average Earning	$44,900
Direct Income Increase	$58,370,000
Indirect Income Increase	$43,521,000
Total Impact to the ROI	$101,891,000

Source: NNSA 2007.

Regional economic characteristics: **CNC operations.** Operation of the CNC would require 2,715 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,704 indirect jobs would be created, for a total of 4,419 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $133.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $206.1 million ($133.6 million direct and $72.5 million indirect). Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Population and housing: **CNC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (935 new workers), 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

Community services: **CUC construction.** Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing.

Community services: **CNC operations.** There would be no impact to ROI community services because the increase would be less than 1 percent over the current population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

5.3.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.3.9.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Regional economic characteristics: **A/D/HE Center construction.** At NTS, the A/D/HE Center would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center. Construction of the A/D/HE Center would require 915 worker-years of labor. During peak construction, 525 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,035 indirect jobs would be created, for a total of 1,560 jobs. It is estimated that many of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $23.6 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $41.2 million ($23.6 million direct and $17.6 million indirect). Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

Table 5.3.9-4—Socioeconomic Impacts from A/D/HE Center Construction

Socioeconomic Factor	AD/HE
Worker Years	915
Peak Workers	525
Indirect Jobs Created	1,035
Total Jobs Created	1,560
ROI Average Earning	$44,900
Direct Income Increase	$23,573,000
Indirect Income Increase	$17,576,000
Total Impact to the ROI	$41,149,000

Source: NNSA 2007.

Regional economic characteristics: **CNPC operations.** Operation of the CNPC would require 4,500 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,824 indirect jobs would be created, for a total of 7,324 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $221.4 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $341.5 million ($221.4 million direct and $120.1 million indirect). Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the A/D/HE Center.

Population and housing: **A/D/HE Center construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (525 new workers), 788 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (4,500 new workers), 4,500 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the AD/HE Center.

Community services: **A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

Community services: **CNPC operations.** The increase in population would not increase demand on local community services. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the A/D/HE Center.

5.3.10 Environmental Justice

Under Executive Order 12898, NNSA is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.3.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, approximately 1,408,250 people lived within the census tracts containing NTS. Minorities comprise 39.1 percent of this population. In 2000, minorities comprised 30.9 percent of the population nationally and 34.8 percent of the population in Nevada. The percentage of persons below the poverty level at the time of the 2000 Census was 13.7 percent, which is higher than the 2000 national average of 12.4 percent and the statewide figure of 10.5 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at NTS are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.3.11, there are no large adverse impacts to any populations.

5.3.11 Health and Safety

5.3.11.1 *No Action Alternative*

Based on 2006 operational data, NTS caused a MEI dose of 0.2 millirem per year. This dose is less than 1 percent of the DOE public dose limit for all pathways and is significantly below the EPA maximum permissible exposure limit to the public of 10 millirem per year. Existing health and safety at NTS is discussed in Section 4.3.11.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action.

5.3.11.2 *DCE Alternative (Greenfield CPC)*

5.3.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the Voluntary Protection Program

(VPP). Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for construction activities. These values are shown below in Table 5.3.11-1.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

Table 5.3.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, CUC, and A/D/HE Center–NTS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CUC	A/D/HE Center
Peak Annual Employment	850	1,300	525
Total Recordable Cases	81	112	50
Total Lost Workday Cases	38	54	25
Total Fatalities	0.2	0.3	0.1
Project Duration (6 years for CPC and CUC, 2 years for A/D/HE Center)			
Total Recordable Cases	276	384	100
Total Lost Workday Cases	143	184	50
Total Fatalities	0.7	0.9	0.2

Source: Tetra Tech 2008, BLS 2007.

5.3.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI) of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.3.3). Table 5.3.11–2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be less than or equal to 6×10^{-12} per year, or less than 6 in a trillion. The projected number of fatal cancers to the population within 50 miles would be less than or equal to 1×10^{-8} per year, or about 1 in 100 million.

Table 5.3.11-2—Annual Radiological Impacts on the Public from CPC, CNC, and CNPC Operations–NTS

Receptor	Projects Under Consideration		
	CPC	CNC	CNPC
Population within 50 miles			
Collective dose (person-rem)	2.4×10^{-5}	9.5×10^{-3}	9.5×10^{-3}
Percent of natural background radiation[a]	1.1×10^{-7}	4.4×10^{-5}	4.4×10^{-5}
LCFs[b]	1×10^{-8}	6×10^{-6}	6×10^{-6}
Offsite MEI			
Dose (mrem)	1.1×10^{-5}	4.1×10^{-3}	4.1×10^{-3}
Percent of regulatory dose limit	1.1×10^{-4}	4.1×10^{-2}	4.1×10^{-2}
Percent of natural background radiation[a]	3.5×10^{-5}	1.3×10^{-3}	1.3×10^{-3}
Cancer fatality risk[b]	6×10^{-12}	2×10^{-9}	2×10^{-9}

[a] The average annual dose from background radiation at NTS is 314 mrem ; the 69,501 people living within 50 mi of NTS in the year 2030 would receive an annual dose of 21,823 person-rem from the background radiation..

[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.

[c] The offsite MEI is assumed to reside at the site boundary, 103,680 feet south from the CPC. An actual residence may not currently be present at this location.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard "weapons grade" isotopic distribution, and americium content of 0.5 percent were assumed.

- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician approximately 25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in the CPC would result in an average individual worker dose of 290 mrem annually. The total dose to workers associated with the CPC operations would be 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.3.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at NTS from Operations

	CPC	**CNC**	**CNPC**
Number of Radiological Workers	**1,150**	**1,640**	**2,040**
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population			
Collective dose (person-rem)	333	344	386
Cancer fatality risk[c]	0.20	0.21	0.23

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level. To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at a CPC would be 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Table 5.3.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC at NTS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CNC	CNPC
Total Workers	1,780	2,715	4,500
Total Recordable Cases	77	117	195
Total Lost Workday Cases	40	61	101
Total Fatalities	0.07	0.11	0.18

Source: NNSA 2007, BLS 2002b.

5.3.11.3 *CCE Alternative*

5.3.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.11.2 as well as the impacts discussed below.

CUC construction. No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.3.11-1.

CNC operations. NNSA expects minimal public health impacts from the radiological consequences of CNC operations. Public radiation doses would likely occur from airborne releases only (Section 5.3.4). Table 5.3.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, 1,640 radiological workers would be required to conduct CNC operations. Operations in the CNC would result in an average individual worker dose of 210 mrem annually. The total annual dose to workers associated with the CNC operations would be 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to the CNC workforce.

During normal (accident-free) operations, total facility staffing would be 2,715. The potential risk of occupational injuries and fatalities to workers operating the CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.3.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNPC would include the CNC impacts discussed above, as well as the A/D/HE Center impacts discussed below.

A/D/HE Center construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for construction activities. These values are shown in Table 5.3.11-1.

A/D/HE Center operations. NNSA expects minimal public health impacts from the radiological consequences of CNPC operations. Table 5.3.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of 189 mrem annually. The total annual dose to workers associated with the CNPC operations would be 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.3.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at NTS. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident’s progression and the extent of materials released. Initiating events fall into three categories:

- **Internal initiators.** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- **External initiators.** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- **Natural phenomena initiators.** Natural occurrences are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the NTS boundary; 2) the offsite population within 50 miles of NTS; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.3.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional accident risks beyond those associated with current and planned activities. Potential accident scenarios for the No Action Alternative are addressed in detail in the NTS SWEIS (DOE 1996b) and Supplement Analysis (DOE 2002l).

The NTS SWEIS (DOE 1996b) and the Supplement Analysis for the NTS SWEIS (DOE 2002l) provide a baseline for accidents related to the No Action Alternative at NTS. Based on the analyses in those documents, the maximum reasonably foreseeable accident at the NTS would be a non-nuclear explosion involving high explosives in a storage bunker, which has a probability of occurrence of 1 in 10,000,000. The following consequences are estimated if such an accident occurs: MEI dose of 34 rem, which would result in a 0.02 probability of an LCF; population dose of 5,800 to 110,000 person-rem, which would result in 3-55 LCFs (DOE 1996b).

5.3.12.2 *Consolidated Plutonium Center*

5.3.12.2.1 Radiological Accidents

Table 5.3.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.3.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-1—CPC Radiological Accident Frequency and Consequences–NTS

Accident	**Frequency**	**Maximally Exposed Offsite Individual**[a]		**Offsite Population**[a,b]		**Noninvolved Worker**[a,c]	
		Dose (rem)	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	1.99	0.00119	788	0.473	1,770	1
Fire in a single building	1.0×10^{-4}	0.918	0.000551	354	0.212	984	1
Explosion in a feed casting furnace	1.0×10^{-2}	1.08	0.000648	414	0.248	1,150	1
Nuclear Criticality	1.0×10^{-2}	$1.89\text{x}10^{-6}$	$1.13\text{x}10^{-9}$	0.000309	$1.85\text{x}10^{-7}$	0.00124	$7.44\text{x}10^{-7}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.0717	0.000043	27.6	0.0166	76.8	0.0922
Radioactive material spill	1×10^{-2}	0.00215	$1.29\text{x}10^{-6}$	0.829	0.000497	2.31	0.00139

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

Table 5.3.12-2—Annual Cancer Risks for CPC–NTS

Accident	**Maximally Exposed Offsite Individual**[a]	**Offsite Population**[b]	**Noninvolved Worker**[c]
Beyond Evaluation Basis Earthquake with Fire	$1.19\ \text{x}10^{-8}$	$4.73\text{x}10^{-6}$	$1\text{x}10^{-5}$
Fire in a Single Building	$5.51\ \text{x}10^{-8}$	$2.12\text{x}10^{-5}$	$1\text{x}10^{-4}$
Explosion in a Feed Casting Furnace	$6.48\ \text{x}10^{-6}$	$2.48\text{x}10^{-3}$	$1\text{x}10^{-2}$
Nuclear Criticality	$1.13\text{x}10^{-11}$	$1.85\text{x}10^{-9}$	$7.44\text{x}10^{-9}$
Fire-induced Release in the CRT Storage Room	$4.3\ \text{x}10^{-7}$	$1.66\text{x}10^{-4}$	$9.22\text{x}10^{-4}$
Radioactive Material Spill	$1.29\text{x}10^{-8}$	$4.97\text{x}10^{-6}$	$1.39\text{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.3.12-1) is the beyond evaluation basis earthquake and fire. Approximately 0.47 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of approximately 2 rem. Statistically, the MEI would have a 0.001 chance of developing a LCF (i.e., about 1 chance in 1,000 of an LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.3.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be 6×10^{-6}, or approximately 1 in 150,000. For the population, the LCF risk would be approximately 2×10^{-3}, meaning that an LCF would statistically occur once every 400 years in the population.

5.3.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this analysis, Emergency Response Planning Guidelines (ERPG) values are used to develop hazard indices for chemical exposures.

DOE estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.3.12–3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor***.**

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.3.12-3 shows these consequences.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.3.12-3—CPC Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	<0.1	10^{-4}
Formic acid	1,500	10	0.215	0.54	<0.1	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 13.7 miles west.

5.3.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.12.3 *Consolidated Uranium Center*

5.3.12.3.1 Radiological Accidents

Table 5.3.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.3.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Tranformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-4—CUC Radiological Accident Frequency, Consequences, and Risks–NTS

Accident	Frequency (per year)	Maximally Exposed Offsite Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.00314	1.88×10^{-6}	1.21	0.000726	3.36	0.00202
Explosion	$10^{-4} – 10^{-6}$	0.000309	1.85×10^{-7}	0.119	0.0000714	0.252	0.000151
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.00366	2.20×10^{-6}	1.41	0.000846	3.63	0.00218
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.000398	2.39×10^{-7}	0.155	0.000093	0.243	0.000146
Aircraft crash[d]	$10^{-4} – 10^{-6}$	0.0071	4.26×10^{-6}	2.28	0.00137	2.13	0.00128

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

[d] NTS has controlled airspace over approximately 8000 square miles. Aircraft accidents are extremely unlikely and, therefore, are usually excluded from further analysis at the NTS. This accident is included as a comparison to other CUC sites.

Table 5.3.12-5—Annual Cancer Risks for CUC–NTS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.88×10^{-10}	7.26×10^{-8}	2.02×10^{-7}
Explosion	1.85×10^{-11}	7.14×10^{-9}	1.51×10^{-8}
Fire in EU Warehouse	2.20×10^{-10}	8.46×10^{-8}	2.18×10^{-7}
Design-basis fires for HEU Storage	2.39×10^{-9}	9.3×10^{-7}	1.46×10^{-6}
Aircraft crash	4.26×10^{-10}	1.37×10^{-7}	1.28×10^{-7}

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.3.12-4) is the fire in the EU warehouse. Approximately 0.0008 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a maximum dose of 0.0037 rem. Statistically, the LCF risk to the MEI would be approximately 2×10^{-6}, or about 1 in half a million. This accident has a probability of occurring approximately once every 10,000 years.

When probabilities are taken into account (see Table 5.3.12-5), the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be approximately 2×10^{-9}, or about 1 in half a billion. For the population, the LCF risk would be approximately 9×10^{-7}, or about 1 in a million.

5.3.12.3.2 Hazardous Chemicals Impacts

The CUC facility would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. .Table 5.3.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.3.12-6—CUC Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 13.7 miles.

5.3.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.12.4 *Assembly/Disassembly/High Explosives Center*

5.3.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.3.12-7 and 5.3.12-8 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables is calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-7—A/D/HE Center Radiological Accident Consequences–NTS

	Maximally Exposed Offsite Individual[a]		**Offsite Population**[b]		**Noninvolved Worker**[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	0.29	0.000174	112	0.0672	311	0.373
Scenario 2	0.000208	$1.25\text{x}10^{-7}$	0.08	0.000048	0.223	0.000134
Scenario 3	$1.74\text{x}10^{-8}$	$1.04\text{x}10^{-11}$	$6.70\text{x}10^{-6}$	$4.02\text{x}10^{-9}$	$1.86\text{x}10^{-5}$	$1.12\text{x}10^{-8}$
Scenario 4	0.043	2.58E-05	17.7	0.0106	26.3	0.0316
Scenario 5	0.045	0.000027	18.5	0.0111	27.5	0.033
Scenario 6	0.000333	$2.00\text{x}10^{-7}$	0.137	$8.22\text{x}10^{-5}$	0.204	0.000122

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

Table 5.3.12-8—Annual Cancer Risks for A/D/HE Center Accidents–NTS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
	Latent Cancer Fatalities	Latent Cancer Fatalities	Latent Cancer Fatalities
Scenario 1	$1.74\text{x}10^{-8}$	$6.72\text{x}10^{-6}$	$3.73\text{x}10^{-5}$
Scenario 2	$1.25\text{x}10^{-9}$	$4.8\text{x}10^{-7}$	$1.34\text{x}10^{-6}$
Scenario 3	$1.04\text{x}10^{-13}$	$4.02\text{x}10^{-11}$	$1.12\text{x}10^{-10}$
Scenario 4	$2.58\text{x}10^{-11}$	$1.06\text{x}10^{-8}$	$3.16\text{x}10^{-8}$
Scenario 5	$2.7\text{x}10^{-9}$	$1.11\text{x}10^{-6}$	$3.3\text{x}10^{-6}$
Scenario 6	$2.00\text{x}10^{-9}$	$8.22\text{x}10^{-7}$	$1.22\text{x}10^{-6}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 13.7 miles from release.

[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

The results of the accident analysis indicate that potential consequences would not exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The accident with the highest consequences to the offsite population (see Table 5.3.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.06 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a dose of 0.29 rem. Statistically, this MEI would have a 2×10^{-4} chance of developing a LCF (i.e., about 1 chance in 57,000 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.3.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be approximately $2\text{x}10^{-8}$, or less than 1 chance in a million. For the population, the LCF risk would be approximately $7\text{x}10^{-6}$, or approximately one chance in 150,000.

5.3.12.4.2 Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical’s vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical’s hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.3.12-9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical’s release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Table 5.3.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	2.7	17	<0.1	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 13.7 miles.

5.3.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.13 Transportation

5.3.13.1 *No Action Alternative*

Baseline transportation characteristics would remain unchanged. Under the No Action Alternative, there would be no change in the transportation activities at NTS, and impacts would remain unchanged from the baseline presented in Section 4.3.12.

5.3.13.2 *DCE Alternative (Greenfield CPC)*

5.3.13.2.1 Construction

Construction of the CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

5.3.13.2.2 Operations

Radiological transportation for the CPC is presented in Section 5.10. The addition of new employees for the CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.13.3 *CCE Alternative*

5.3.13.3.1 CNC (CPC + CUC)

Construction: **CUC.** Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

Operations**: CNC.** Radiological transportation for the CNC is presented in Section 5.10. The addition of new employees for the CUC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.13.3.2 CNPC (CPC + CUC + A/D/HE Center)

Construction: **A/D/HE Center.** Construction of the A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

Operations: **CNPC.** If the A/D/HE Center were located at NTS as part of a CNPC, there would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. There would also be new employees. The addition of new employees for the CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.14 Waste Management

5.3.14.1 *No Action Alternative*

In 2001 NTS generated 4.86 cubic yards of hazardous waste and 4,550 cubic yards of sanitary waste. In 2005, the Area 5 RWMS received shipments containing 48,169 cubic yards of low level waste (LLW) for disposal. The Area 3 RWMS received shipments containing 12,576 cubic yards of LLW. A total of 1,055 cubic yards of LLW disposed of in 2005 was generated onsite. In 2005, a total of 38,228 pounds of hazardous wastes were received at the HWSU for temporary storage and 27,172 pounds were shipped offsite from the HWSU. A total of 27,140 pounds of hazardous wastes were shipped offsite. No hazardous wastes storage limits were exceeded. Approximately 2.1 tons per day of non-hazardous waste were disposed of at the Area 23 landfill, well below permit limits (NTS 2006a). Baseline waste amounts are discussed in Section 4.3.13.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 5.3.14-1 gives a summary of the major waste categories currently being generated at NTS.

Table 5.3.14-1—Waste Volumes Generated–NTS

Waste Type	1996	1997	1998	1999	2000	2001	2005
Transuranic (yd^3)	0	0	0	0	0	0	0
Low Level Waste (yd^3)	0	0	0	7.1	0.46	0	1,055
Mixed LLW (yd^3)	0	0	0	0	0	0	0
Hazardous[a] (tons)	46	11	50.2	14	24.5	4.86	NA
Non-Hazardous Sanitary[b] (tons)	4,550	2,280	6,460	7,460	5,080	4,550	NA

Source: DOE 2002o.

[a] Includes state-regulated waste. Hazardous waste reported in metric tons.

[b] From DOE 2002o (1996 data) and DOE's Central Internet Database. Sanitary waste reported in metric tons.

5.3.14.2 *DCE Alternative (Greenfield CPC)*

5.3.14.2.1 Construction

Construction of a CPC would generate hazardous waste and both liquid and solid non-hazardous waste. Table 5.3.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the CPC at NTS. CPC construction activities would increase routine waste generation at NTS for hazardous waste and both liquid and solid non-hazardous waste over more recent waste generation volumes, but well below historic levels.

Table 5.3.14-2—CPC Construction Wastes–NTS

Waste Type	CPC
TRU Waste (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Non-hazardous Solid Waste (yd^3)	10,900
Non-hazardous Liquid Waste (gallons)	56,000

Source: NNSA 2007.

Hazardous wastes generated from the construction of a CPC would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes.

Non-hazardous wastes are currently disposed of in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. Existing and planned disposal sites at NTS have more than adequate capacity to handle all CPC construction waste. Sanitary wastewater generated during CPC construction would be disposed either by a septic system or by a lagoon system. Portable sanitary units would be used during the construction phase until the permanent wastewater system would be available.

A retention pond would be constructed to manage storm water runoff from a CPC, including the construction laydown area and concrete batch plant. The basin would be sized to limit storm water discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land. A concrete batch plant would operate at a CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.3.14.2.2 Operations

Normal operation of a CPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.3.14–3 summarizes the estimated waste generation rates for the operation of a CPC.

Table 5.3.14-3—CPC Annual Operational Wastes–NTS

Waste Category	CPC
TRU Solid Waste (Including Mixed TRU)(yd^3)	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste solid (tons)	4.0
Hazardous waste liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to construction and operation of a CPC. TRU waste generated from a CPC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CPC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would be a RCRA-permitted facility with the ability to treat mixed TRU waste and would include a staging area with capacity for the storage of approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for other facilities within the DOE complex. LLW from CPC operations would include job control waste, failed equipment, and other general operations and maintenance waste. Liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. LLW generated at the CPC would be transferred from CPC to an existing facility in Area 5, the Radioactive Waste Management Site (RWMS). Here, the LLW would undergo characterization and certification prior to disposal in either Area 3 and Area 5, at NTS. The capacity of these two LLW disposal facilities, at 3,923,888 cubic yards, could readily accommodate the projected LLW volume from CPC operations, as well as other planned volumes.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents. The projected hazardous waste volumes from CPC operations would substantially increase the annual volumes routinely managed by NTS. The waste would be sent to the Hazardous Waste Storage Unit at Area 5 and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The impacts of managing this waste at NTS would be minimal.

NTS does not routinely generate mixed LLW but manages substantial volumes in its role as one of two national disposal sites for the DOE complex. MLLW generated from CPC operations would be managed in accordance with the NTS Site Treatment Plan. The mixed LLW would be transferred to the Area 5 RWMS for characterization and identification of appropriate treatment. Once treated, the waste would be disposed onsite. The annual mixed LLW volume from CPC operations represents only a fraction of the disposal capacity 466,577 cubic yards and of the anticipated permit limit of 78,477 cubic yards for the Pit 3 disposal unit in Area 5. The impacts of managing this waste at NTS would be minimal.

Sanitary waste from CPC operations would be disposed of at the onsite landfill in Area 23. The CPC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23. Sanitary wastewater generated during CPC operations would be disposed of either by a septic system or by a lagoon system. The impacts of managing this non-hazardous sanitary waste at NTS would be minimal.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process. The waste would then be classified and handled according to the appropriate categories described above.

5.3.14.3 *CCE Alternative*

5.3.14.3.1 CNC (CPC + CUC)

Construction: **CUC.** Construction of a CNC would entail construction of a CPC, already discussed in Section 5.3.13.2.1, above and construction of a CUC, discussed in this section. Construction of a CUC would generate LLW, hazardous waste and solid non-hazardous waste. Table 5.3.14-4 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the CUC at NTS.

Table 5.3.14-4—CUC Construction Wastes–NTS

Waste Category	Quantity
Low-level Solid (yd³)	70
Mixed Low-level Solid (yd³)	0
Hazardous (tons)	6
Non-hazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CUC construction would result from installation of process waste capturing mechanisms, and other such process line installation activities. There would not be any liquid LLW resulting from actual CUC facility construction activities. LLW generated from CUC construction activities would be transferred from the CUC construction site to the Area 5 RWMS for characterization and certification prior to disposal at the RWMSs in Area 3 and Area 5. The capacity of these RWMSs could readily accommodate the projected LLW volume from CUC construction.

Non-hazardous wastes are currently disposed in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. To the extent possible, metals would be removed from this waste and recycled. Existing and planned disposal sites at NTS have more than adequate capacity to handle all CUC construction waste.

Hazardous wastes generated from the construction of a CUC would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes.

Sanitary wastewater generated during CUC construction would be disposed either by a septic system or by a lagoon system. Portable sanitary units would be used during the construction phase until the permanent wastewater system became available. A retention pond would be constructed to manage storm water runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at a CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CUC construction is completed.

Operations: **CNC.** Normal operation of a CNC would generate TRU waste, LLW, MLLW, hazardous waste, and sanitary waste. Table 5.3.14-5 summarizes the estimated waste generation rates for the operation of the CPC.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored non-classified TRU waste at NTS prior to the timeframe of CNC construction and operations. TRU waste generated from the CNC includes gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CNC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CNC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNC operations would be solidified prior to leaving the facility. The annual LLW generation for a CNC would be transferred from CNC to the Area 5 RWMS for characterization and certification prior to disposal at the RWMS in Area 3 and Area 5. The capacity of these RWMS could readily accommodate the projected LLW volume from CNC operations.

Table 5.3.14-5—Annual CNC Operational Waste–NTS

	CPC	CUC	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3) `	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to construction and operation of a CNC. TRU waste generated from a CNC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. Since this process of the CNC is the same as for the CPC, about 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CNC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would be a RCRA-permitted facility with the ability to treat mixed TRU waste and would include a staging area with capacity for the storage of approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

CNC operations would generate three times the amount of LLW of a CPC and small amounts of hazardous waste and MLLW. These wastes would include lead acid batteries, lubricating oils/fluids, rags, and absorbents. NTS has more than enough capacity to handle the projected annual generation of 12,000 cubic yards of LLW. The projected hazardous waste volumes from CNC operations would substantially increase the annual volumes routinely managed by NTS. The hazardous waste would be sent to the Hazardous Waste Storage Unit, at Area 5, for accumulation of transport quantities, packaged, and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The infrastructure to collect, package, and transport these quantities of hazardous waste already exist at NTS and the impacts of managing this waste category, at NTS, would be minimal.

Solid sanitary waste from CNC operations would be disposed of at the onsite landfill in Area 23. The CNC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23. In the event this landfill proves insufficient, there would be no impediments to creating another at NTS. Sanitary wastewater generated during CNC operations would be disposed either by a septic system or by a lagoon system. The impacts of managing this waste at NTS would be minimal. CNC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.3.14.4 *CNPC (CPC + CUC + A/D/HE CENTER)*

Waste management impacts from the construction and operation of a full CNPC would include CPC impacts discussed in Section 5.3.13.2, CUC impacts discussed above, and an A/D/HE Center. The expected waste impacts are discussed below.

5.3.14.4.1 Construction

A/D/HE Center. Construction of a CNPC would entail the construction of the CPC and CUC, discussed above, and the construction of an A/D/HE Center, discussed in this section. At NTS, an A/D/HE Center would utilize the existing DAF for disassembly operations and therefore incur less waste generation, for some waste categories, than at some of the other sites for construction related activities. The additional construction of an A/D/HE Center, at NTS, would generate LLW, and non-hazardous waste. Table 5.3.14-6 summarizes the total volume of waste to be generated over the 6 years construction period for a proposed A/D/HE Center at NTS.

Table 5.3.14-6—A/D/HE Center Construction Waste–NTS

	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,000
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	6,400
Non-hazardous Liquid Waste (gal)	40,000

Source: NNSA 2007.

A/D/HE Center construction activities would substantially increase routine LLW and Non-hazardous waste generation at NTS, with the generation of 9,000 cubic yards of LLW and 6,400 cubic yards of non-hazardous solid waste. NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from A/D/HE Center construction would result from installation of process waste capturing mechanisms, and other such process line installation activities. There would not be any liquid LLW resulting from A/D/HE Center construction activities. LLW generated from construction activities would be transferred from the A/D/HE Center construction site to the Area 5 RWMS for characterization and certification prior to disposal at the RWMSs in Area 3 and Area 5. The capacity of these RWMS disposal areas could readily accommodate the projected LLW volume from construction.

Non-hazardous wastes are currently disposed in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. Existing and planned disposal sites at NTS have more than adequate capacity to handle all A/D/HE Center construction waste. A retention pond would be constructed to manage storm water runoff from the entire A/D/HE Center site including the construction laydown area and concrete batch plant. The basin would be sized to limit storm water discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the A/D/HE Center site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once A/D/HE Center construction is completed.

5.3.14.4.2 Operations

CNPC. Normal operation of a CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.3.14-7 summarizes the estimated waste generation rates for the operation of a CNPC at NTS.

Table 5.3.14-7—Annual CNPC Operational Wastes–NTS

	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU)(yd^3)	950	0	0	950
Mixed TRU Solid Waste(included in TRU, above (yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	40	12,640
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	70	0	782.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	15	.9	19.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	12,000	27,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic yards of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to the timeframe of CNPC construction and operations. TRU waste generated from a CNPC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from a CNPC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility. The annual LLW generation for a CNPC would be transferred from a CNPC to the Area 5 RWMS for characterization and certification prior to disposal at the RWMS in Area 3 and Area 5. The capacity of these RWMS could readily accommodate the projected LLW volume from CNPC operations.

CNPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents. The projected hazardous waste volumes from CNPC operations would substantially increase the annual volumes routinely managed by NTS. The waste would be sent to the Hazardous Waste Storage Unit at Area 5 and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The impacts of managing this waste at NTS would be minimal.

Sanitary waste from CNPC operations would be disposed at the onsite landfill in Area 23. The CNPC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23.

Sanitary wastewater generated during CNPC operations would be disposed either by a septic system or by a lagoon system. The impacts of managing this waste at NTS would be minimal.

CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.4 TONOPAH TEST RANGE

There are no Programmatic Alternatives for Tonopah Test Range (TTR). The project-specific analysis for TTR is discussed in Section 5.15.

5.5 PANTEX PLANT

This section discusses the potential environmental impacts associated with the following programmatic alternatives at Pantex:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. Pantex would continue to perform its existing missions as described in Section 3.2.5.
- **DCE Alternative.** This alternative includes a CPC.
- **CCE Alternative.** By definition, adding a CPC and Consolidated Uranium Center (CUC) at Pantex would create a full CNPC because there is an existing A/D/HE mission at Pantex. In general, construction impacts would be additive because construction activities would occur in series as follows: CUC, 2011-2016; and CPC, 2017-2022).
- **Capability-Based Alternatives.** Under these alternatives, production activities at Pantex would be reduced to support stockpile requirements below the Moscow Treaty requirements. The No Net Production/Capability-Based Alternative would maintain capability at Pantex to disassemble and re-assemble weapons, perform HE R&D, and conduct surveillance testing to ensure maintenance of capability for all active weapon types. Pantex would continue to support on-going surveillance, dismantlement, and HE R&D activities to fully support the Defense Programs missions. In addition, Pantex would perform approximately 44 weapon assemblies per year in order to maintain assembly capabilities across all programs.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.5.1 Land Use

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.5.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.5.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	

Table 5.5.1-1—Potential Effects on Land Use at the Proposed Sites (continued)

CUC		
Construction (acres)	50	
Operation (acres)	Total Area: 35[b]	
	PIDAS	**Non-PIDAS**
	15	20
A/D/HE CENTER [d]		
Construction (acres)	300	
Operation (acres)	Total Area: 300[e]	
	PIDAS	**Non-PIDAS**
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120
CNC		
	Total Area: 195[f]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50
CNPC		
	Total Area: 545[g]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.5.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue on the 15,977 acre site, as required to support the missions described in Section 3.2.5. No additional buildings or facilities would be built beyond current and planned, but not built, and no additional impacts on land use would occur at Pantex beyond those of existing and future activities that are independent of this action. Existing land use at Pantex is discussed in Section 4.3.1.

Table 5.5.1-2 presents a summary of the facilities at Pantex associated with the No Action Alternative.

Table 5.5.1-2—Summary–Pantex No Action Alternative Facilities[a]

Mission	Approximate Number of Buildings	Example Facilities	Approximate Area (ft^2)	Year Built (average)	Remaining Life (average years)
A/D QA Testing, and Maintenance and Modification	94	A/D Bays, A/D Cells, Production Support Laboratories, Tool and Component Warehousing, Weapon Staging Magazines	908,000	1966	31
HE R&D	124	HE Machining Bays, HE Pressing Bays, HE Formulation, HE Synthesis, Firing Sites, Production Support Laboratories, HE Storage Magazines	498,000	1955	15
Facility Operations	141	Maintenance and Craft Shops, Security, Medical, Fire Department, ES&H, Support Laboratories, Offices	814,800	1977	22
Pit Storage	22[b]	Magazines, Vaults, Staging Facilities	74,200	1949	34

[a] Table excludes tanks, chemical storage, ramps (concrete floor enclosed walkways between buildings), guard towers, utility structures (e.g., pump houses), and miscellaneous structures (e.g., bust stop hut).

[b] Represents 18 Modified Richmond Magazines and Buildings 12-44 (Cell 8), 12-55, 12-58, and 12-116. Note 12-26 and 12-42 pit vaults and Steel Arch Construction (SAC) magazines are listed as Component Warehousing and Weapon Staging Magazines, respectively.

ES&H=Environment, Safety, and Health
HE=High Explosive(s)
A/D=Assembly and Disassembly
QA=Quality Assurance
R&D=Research and Development

5.5.1.2 *DCE Alternative (Greenfield CPC)*

5.5.1.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. A construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state. All new buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks. The CPC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. This tract of land is surrounded on all sides by a similar land use, open space. It is now considered a low maintenance area within the Protected Area boundaries.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for the proposed CPC construction would represent approximately 0.9 percent of Pantex’s total land area of 15,977 acres. The post-construction developed area would be approximately 110 acres.

5.5.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent approximately 0.7 percent of Pantex's total land area of 15,977 acres. Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

5.5.1.3 *CCE Alternative*

5.5.1.3.1 CNPC (CPC + CUC + existing A/D/HE Center)

A CNPC located at Pantex would not require the construction of the A/D/HE Center, as Pantex currently performs these missions in existing facilities. As such, a CNPC at Pantex would entail the construction of a CPC and a CUC. Land use impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.1.2 as well as the impacts for the CUC discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. The land required for CUC construction would represent approximately 0.3 percent of Pantex's total land area of 15,977 acres. The reference location has adequate space to accommodate the total facilities footprint. The CUC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East.

Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. The post-construction developed area would be approximately 35 acres. All buildings would be either one or two stories. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

Operations: **CNPC.** As described in Section 3.5, an estimated 195 acres of additional land would be required for buildings, walkways, building access, parking, and buffer space to add both a CPC and CUC to Pantex to comprise a full CNPC. The total additional land required for the CNPC operations (195 acres) would represent approximately 1.2 percent of Pantex's total land area of 15,977 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

5.5.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Pantex. Reduced operations would not change land use at Pantex.

5.5.2 Visual Resources

5.5.2.1 *No Action Alternative*

The Pantex Plant is located on the Llano Estacado portion of the Great Plains at an elevation of approximately 3,500 feet. The topography at the Pantex Plant is relatively flat and characterized by rolling grassy plains and numerous natural playa basins. The developed areas at Pantex Plant are consistent with a Visual Resource Management Class IV designation. The remainder of Pantex is consistent with a Visual Resource Management rating of Class III or IV.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. Existing visual resources are discussed in Section 4.5.2.

5.5.2.2 *DCE Alternative (Greenfield CPC)*

5.5.2.2.1 Construction

As described in Section 3.4.1, activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. The reference location is obstructed from offsite view by existing buildings and infrastructure. However, dust and construction equipment mobilization may be visible to the general public. Members of the public, as well as onsite employees and visitors, observing CPC construction would find these activities temporary and similar to the past construction activities of other developed areas on the Pantex site. Thus, impacts on visual resources during construction would be minimal.

5.5.2.2.2 Operations

A CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. Located in the midst of the industrial complex, the facility would be visible to onsite employees and visitors, but not to the general public. The offsite view of CPC buildings would be obstructed by existing buildings and infrastructure. This change would be consistent with the currently developed areas of the Pantex site. Thus, new construction would not change the current Class IV BLM Visual Resource Management rating of developed areas within Pantex boundaries.

5.5.2.3 *CCE Alternative*

5.5.2.3.1 CNPC (CPC + CUC + existing A/D/HE Center)

A CNPC located at Pantex would not require the construction of the A/D/HE Center, as Pantex currently performs these missions in existing facilities. As such, the CNPC at Pantex would entail the construction of a CPC and the CUC. Visual impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.2.2 as well as the impacts of the CUC discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, activities related to the construction of new buildings required for the CUC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. The reference location is obstructed from offsite view by existing buildings and infrastructure. However, dust and construction equipment mobilization may be visible to the general public. Members of the public, as well as onsite employees and visitors, observing CUC construction would find these activities temporary and similar to the past construction activities of other developed areas on the Pantex site. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNPC.** As described in Section 3.5.1, a CNPC would include one- and two-story buildings that would change the appearance of the reference location. The offsite view of CNPC buildings would be obstructed by existing buildings and infrastructure. This change would be consistent with the currently developed areas of the Pantex site. Thus, new construction would not change the current Class IV BLM Visual Resource Management rating of developed areas within Pantex boundaries.

5.5.2.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Pantex. Reduced operations would not change visual resource impacts at Pantex.

5.5.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.5.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.5.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this action. Baseline characteristics are described in Section 4.5.3. Pantex is expected to continue using about 81,850 MWh per year of electricity, well below the available site capacity.

5.5.3.2 *DCE Alternative (Greenfield CPC)*

5.5.3.2.1 Construction

Construction requirements for a CPC are described in Section 3.4.1. For a CPC, the projected demands on electrical infrastructure resources associated with construction activities are shown in Table 5.5.3-1. The existing electrical infrastructure at Pantex would be sufficient to support annual construction requirements for the projected 6 year construction period.

Table 5.5.3-1—Electrical Infrastructure Requirements for CPC and CUC Construction

Proposed Alternatives	**Electrical**	
	Energy (MWh/yr)	**Peak Load (MWe)**
Site capacity [a]	**201,480**	**47.5**
Available site capacity [a]	**119,630**	**33.9**
No Action Alternative		
Total site requirement	81,850	13.6
Percent of site capacity	41%	29%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	6.5%	7%
Percent of available capacity	10.8%	10%
CUC		
CUC requirement	11,000	2.5
Percent of site capacity	5.5%	5.3%
Percent of available capacity	9.2%	7.4%

Source: NNSA 2007.

[a] Not limited due to offsite procurement.

5.5.3.2.2 Operations

The estimated electrical infrastructure requirements for the operation of a CPC are shown in Table 5.5.3-2. Electrical energy requirements would be approximately 24 percent of the site capacity. The peak electrical load would be approximately 23 percent of the site capacity.

5.5.3.3 *CCE Alternative*

5.5.3.3.1 CNC (CPC + CUC)

Implementation of the CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex (see Section 5.5.3.3.2).

Table 5.5.3-2—Electrical Infrastructure Requirements for CPC and CUC Operation

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	**Peak Load (MWe)**
Site capacity [a]	201,480	47.5
Available site capacity [a]	119,630	33.9
No Action Alternative		
Total site requirement	81,850	13.6
Percent of site capacity	41%	29%
CPC		
CPC requirement	48,000	11
Percent of site capacity	24%	23%
Percent of available capacity	40%	32%
CUC		
CUC requirement	168,000	18.4
Percent of site capacity	83%	39%
Percent of available capacity	140%	54%
CNPC (CPC + CUC + existing A/D/HE)		
CNPC requirement	297,850	44
Percent of site capacity	148%	93%
Percent of available capacity	247%	130%

Source: NNSA 2007.

[a] Not limited due to offsite procurement.

5.5.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site electrical infrastructure impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.3.2 as well as the impacts discussed below.

Construction: **CUC.** Construction requirements for a CUC are described in Section 3.5.1.1. The projected demand on electrical infrastructure resources associated with construction activities for the CUC is shown in Table 5.5.3-1. The existing electrical infrastructure at Pantex would be sufficient to support annual construction requirements for the projected 6-year construction period.

Operations: **CNPC.** The estimated annual electrical infrastructure requirements for the operation of a CUC would exceed the available capacity. To support a CUC (and, thus a CNPC), Pantex would need to procure additional power.

5.5.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use would be reduced from 81,850 MWhr per year to approximately 61,000 MWhr per year. Because there is currently adequate electrical capacity at the site, this reduction would not have any major impact on operations. Under the No Net Production/Capability-Based Alternative, electrical use would be reduced to approximately 54,000 MWhr/year.

5.5.4 Air Quality and Noise

5.5.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Pantex is in compliance with all NAAQs. Existing air quality and noise resources are discussed in Section 4.5.4.

5.5.4.2 *DCE Alternative (Greenfield CPC)*

5.5.4.2.1 Air Quality

Construction. Construction of new structures would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, $PM_{10,}$ total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicles) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre/month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.5.4–1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air

Quality Standards (NAAQS) beyond the Pantex site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.5.4-1—Estimated Peak Nonradiological Air Emissions for the CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

Construction: **Radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **Nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.5.4-2. These emissions would be incremental to the Pantex baseline. If Pantex is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

Table 5.5.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on *Clean Air Act* (CAA) Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because Pantex is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

The maximum concentrations (μg/m^3) at the Pantex site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.5.4-3. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. The incremental concentration increases would be small and ambient concentrations would remain well below all ambient air quality standards. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.5.4-3—Criteria Pollutant Concentrations at Pantex for CPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)[b]	
			Baseline [b]	CPC 200 ppy
Carbon monoxide	8-hour	10,000	161	5.1
	1-hour	40,000	924	7.3
Nitrogen dioxide	Annual	100	0.90	2.2
Sulfur dioxide	Annual	80	<0.01	0.18
	24-hour	365	<0.01	0.90
	3-hour	1,300	<0.01	1.9
PM_{10}	Annual	50	8.73	0.07
	24-hour	150	88.5	0.35
Total Suspended Particulates	3-hour	200	NA	0.19
	1-hour	400	NA	0.97

Source: NNSA 2007.
NA = not available.
[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.
[b] No nonradiological air monitoring has been conducted at the Pantex Plant since November 2003, when the requirement by the Texas Commission on Environmental Quality (TCEQ) was eliminated (Pantex 2006). Data in this table is the best available data available related to NAAQS.

Operations: **Radiological impacts.** Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air. NNSA estimated routine radionuclide air emissions (see Table 5.5.4-4).

Table 5.5.4-4—Annual Radiological Air Emissions for the CPC at Pantex–Operations

Isotope	Baseline[a,b] (Ci/yr)	CPC—200 ppy Annual Emissions (Ci/yr)
Americium-241	ND	3.12×10^{-7}
Plutonium-239	ND	1.02×10^{-5}
Plutonium-240	ND	2.66×10^{-6}
Plutonium-241	ND	1.96×10^{-4}
Uranium-234	ND	5.02×10^{-9}
Uranium-235	ND	1.58×10^{-10}
Uranium-236	ND	2.56×10^{-11}
Uranium-238	ND	1.42×10^{-12}
Total Uranium	7.34×10^{-10}	
Tritium	5.53×10^{-5}	–
All Other	1.76×10^{-12}	–
Total	5.53×10^{-5}	$\mathbf{2.09 \times 10^{-4}}$

Source: NNSA 2007.
ND = No Data for individual radionuclides.
[a] Based on calendar year 2005 data.
[b] The No Action Alternative is represented by the baseline.

Total radionuclide emissions at Pantex would be much less than 1 curie of any radionuclide. To ensure that total emissions are not underestimated, DOE's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

DOE estimated the radiation doses to the offsite MEI and the offsite population surrounding Pantex. As shown in Table 5.5.4-5, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne radioactivity releases. The maximum estimated dose to the offsite population within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.5.11.

Table 5.5.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations at Pantex

Receptor	CPC-200 ppy Annual Dose
Offsite MEI[a] (mrem/yr)	4.1×10^{-5}
Population within 50 miles (person-rem per year)[a]	8.1×10^{-5}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.5.4-4and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.5.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.5.4-6 presents the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 2 miles) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by the Occupational Safety & Health Administration (OSHA) in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Table 5.5.4-6—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68

Table 5.5.4-6—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment (continued)

Source	**Noise level (dBA)**				
	Peak	**Distance from source (feet)**			
		50	**50**	**50**	**50**
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (more than 2 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.5.4.3 *CCE Alternative*

5.5.4.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.4.3.2).

5.5.4.3.2 CNPC (CPC + CUC + A/D/HE)

Air quality and noise impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.5.4.2 as well as the impacts discussed below.

5.5.4.3.2.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.5.4-1 would be representative of a CUC. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Pantex site boundary (Janke 2007).

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* CUC and CNPC nonradiological impacts.** CUC activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from a CUC to the Pantex baseline. The results are presented in Table 5.5.4-7. The PM_{10} concentration has the potential to exceed the annual standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because Pantex is located in an attainment area for all criteria pollutants. Thus, while each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.5.4-7—Criteria Pollutant Concentrations, CUC and CNPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)[b]		
			Baseline [b]	CUC	CNPC
Carbon monoxide	8-hour	10,000	161	0.2	5.3
	1-hour	40,000	924	No Data	7.3
Nitrogen dioxide	Annual	100	0.90	0.9	3.1
Sulfur dioxide	Annual	80	<0.01	2.1	2.3
	24-hour	365	<0.01	52.4	53.3
	3-hour	1,300	<0.01	17.5	19.4
PM_{10}	Annual	50	8.73	52.4	53.1
	24-hour	150	88.5	17.5	17.8
Total Suspended Particulates	3-hour	200	NA	No Data	0.19
	1-hour	400	NA	No Data	0.97

Source: NNSA 2007.
NA = not available.

[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.

[b] No nonradiological air monitoring has been conducted at the Pantex Plant since November 2003, when the requirement by the Texas Commission on Environmental Quality (TCEQ) was eliminated (Pantex 2006). Data in this table is the best available data available related to NAAQS.

***Operations:* CUC and CNPC radiological impacts.** A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of a CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 Curies (2.17 kg) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding Pantex, and Pantex workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding Pantex. As presented in Table 5.5.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.5.11.

Table 5.5.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNPC Operations–Pantex

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	0.016	0.016
Population within 50 miles (person-rem per year)	0.033	0.033

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.5.4.3.2.2 Noise

Construction: **CUC.** Anticipated noise impacts from the construction of a CUC would be similar to those described for the CPC in Section 5.5.4.2.

Operations: **CUC and CNPC.** Anticipated noise impacts from the operation of a CNC would be similar to those described for the CPC in Section 5.5.4.2.

5.5.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to air quality, Pantex is located within the Amarillo-Lubbock Intrastate Air Quality Control Region (AQCR), which is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Reduced operations would reduce the emissions from the steam plant boilers, the explosives-burning operation, and emissions from onsite vehicles. With respect to radiological emissions, because the maximum radiation levels are extremely small (less than three percent of the allowable standard), further reductions would be inconsequential.

5.5.5 Water Resources

5.5.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Pantex is expected to continue using about 130 million gallons of water per year, which is drawn from the Ogallala Aquifer. Existing water resources are discussed in Section 4.5.5.

5.5.5.2 *DCE Alternative (Greenfield CPC)*

5.5.5.2.1 Surface Water

Construction. Construction requirements for a CPC are described in Section 3.4.1. Surface water would not be used to support the construction of the construction of a CPC as groundwater is the source of water at Pantex. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction, it is estimated that one-third of the liquid wastes generated would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to Pantex's Texas Pollutant Discharge Elimination System (TPDES) permit for stormwater involving construction activities.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although runoff would likely be collected in retention ponds. In addition, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Pantex would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the CPC reference location is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

Floodplains at the Pantex site have been delineated. The CPC reference location at Pantex is not within the 100- or 500-year floodplains, or the Standard Project Flood boundaries. Therefore, no impacts to floodplains would be anticipated, nor would project facilities be expected to be impacted by flooding.

Operations. Operation requirements for a CPC are described in Section 3.4.1. No impacts on surface water resources would be expected as a result of CPC operations at Pantex. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. Pantex's current NPDES permit may require modification and approval concerning the increase in wastewater discharges. The sanitary wastewater would be treated in the Waste Water Treatment Facility (WWTF) and disposed of via land application for the irrigation of crops in cooperation with the Texas Tech University Research Farm. No industrial or other TPDES-regulated discharges to surface waters are anticipated.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid-process waste facilities for the plutonium purification process.

5.5.5.2.2 Groundwater

Construction. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water over that normally required by construction activities. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 20.9 million gallons to support CPC construction (see Table 5.5.5.-1). It is expected that construction should take approximately 6 years. Assuming an equal usage over that timeframe, it is estimated that 3.5 million gallons would be needed for CPC construction annually. This would increase current water use by approximately 2.6 percent compared to the No Action Alternative and would be within Pantex's water capacity of approximately 422.7 million gallons. It is anticipated that this water would be derived from Pantex's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

Table 5.5.5-1—Potential Changes to Water Resources from the Construction of the CPC and CUC–Pantex

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground (Ogallala Aquifer)
Water Requirement (gal)	130,000,000
CPC	
Water Requirement (gal)	20,900,000
Percent Change from No Action Alternative	16%
CUC	
Water Requirement (gal)	5,200,000
Percent Change from No Action Alternative	4%

Source: NNSA 2007.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Activities at Pantex for a CPC would use groundwater primarily to meet the potable and sanitary needs of facility personnel and for cooling tower water makeup. A summary of water needed is presented in Table 5.5.5-2. The percent change in water consumption from the No Action Alternative is approximately 68 percent. The Pantex wellfield has a water capacity of approximately 422.7 million gallons per year. For comparison, in 2001, the City of Amarillo withdrew 6.93 billion gallons of water from the Amarillo City wellfield. Pantex, governed by the Panhandle Groundwater Conservation District No. 3, does not limit the quantity of water pumped from the aquifer. However, depletion of the Ogallala Aquifer is a regional concern. The Texas portion of the Ogallala Aquifer contained approximately 146.7 trillion gallons of water in 1990. The Texas Water Development Board estimated that the net depletion rate of the Ogallala Aquifer is predicted to average about 1.2 trillion gallons per year from 1990 to 2000.

Approximately 70 percent of water use on the Texas High Plains is attributed to agriculture (Guru and Horne 2000). Pantex's total contribution to the depletion of the Ogallala Aquifer from operation of a CPC would be much less than 1 percent of the estimated annual total depletion.

Table 5.5.5-2—Potential Changes to Water Resources from Operation of the CPC and CUC–Pantex

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground (Ogallala Aquifer)
Water Requirement (gal)	130,000,000
CPC	
Water Requirement (gal)	88,500,000
Percent Change from No Action Alternative	68%
CUC	
Water Requirement (gal)	105,000,000
Percent Change from No Action Alternative	80.8%
CNPC (CPC + CUC at Pantex)	
Water Requirement (gal)	193,500,000
Percent Change from No Action Alternative	149%

Source: NNSA 2007.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these chemicals is standard and no adverse impacts would be expected.

5.5.5.3 *CCE Alternative*

5.5.5.3.1 CNC (CPC + CUC)

Implementation of a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex (see Section 5.5.5.3.2)

5.5.5.3.2 CNPC (CPC + CUC + A/D/HE)

Site infrastructure impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.5.2 as well as the impacts discussed below.

Surface water: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Surface water would not be used to support construction of a CUC as groundwater is the source of water at Pantex. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. Because plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction, it is estimated that one-third of the liquid wastes generated would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to Pantex's TPDES permit for stormwater involving construction activities.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although runoff would likely be collected in retention ponds. In addition, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Pantex would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the CUC reference location is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

Floodplains at the Pantex site have been delineated. The CUC reference location at Pantex is not within the 100- or 500-year floodplains, or the Standard Project Flood boundaries. Therefore, no impacts to floodplains would be anticipated, nor would project facilities be expected to be impacted by flooding.

Surface water: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. No impacts on surface water resources would be expected as a result of CNPC operations at Pantex. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. Pantex's current NPDES permit may require modification and approval concerning the increase in wastewater discharges. The sanitary wastewater would be treated in the WTTF and disposed of via land application for the irrigation of crops in cooperation with the Texas Tech University Research Farm. No industrial or other TPDES-regulated discharges to surface waters are anticipated.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid-process waste facilities for the plutonium purification process.

Groundwater: **CUC construction.** Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water over that normally required by construction activities. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 5,200,000 gallons to support CUC construction. It is expected that construction should take approximately 6 years. Assuming an equal usage over that timeframe, it is estimated that approximately 866,667 gallons would be needed annually for CUC construction. This would increase current water use by less than 1 percent compared to the No Action Alternative and would be within Pantex's water capacity of approximately 422.7 million gallons. It is anticipated that this water would be derived from Pantex's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNPC operations.** A CUC would require approximately 105 million gallons per year for operation. The percent change in water consumption from the No Action Alternative would be approximately 80.8 percent for a CUC. For a CNPC, groundwater would be used primarily to meet the potable and sanitary needs of facility personnel and for cooling tower water makeup. A summary of water need by category and total is presented in Table 5.5.5-2. Including the 130 million gallons per year for the existing A/D/HE operations, a CNPC would require approximately 323.5 million gallons per year of water. The Pantex wellfield has a water capacity of approximately 422.7 million gallons year. For comparison, in 2001, the City of Amarillo withdrew 6.93 billion gallons of water from the Amarillo City wellfield. Pantex, governed by the Panhandle Groundwater Conservation District No. 3, does not limit the quantity of water pumped from the aquifer. However, depletion of the Ogallala Aquifer is a regional concern. The Texas portion of the Ogallala Aquifer contained approximately 146.7 trillion gallons of water in 1990. The Texas Water Development Board estimated that the net depletion rate of the Ogallala Aquifer is predicted to average about 1.2 trillion gallons per year from 1990 to 2000. Approximately 70 percent of water use on the Texas High Plains is attributed to agriculture (Guru and Horne 2000). Pantex's total contribution to the depletion of the Ogallala Aquifer from operation of the CNPC would be less than 1 percent of the estimated annual total depletion. No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these chemicals is standard and no adverse impacts would be expected.

5.5.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in use from 130 million gallons per year to 97.5 million gallons per year would continue to be well within Pantex's water capacity of approximately 422.7 million gallons per year. While this would reduce the burden on the Ogallala Aquifer, Pantex operations account for much less than 1 percent of the total depletion of this aquifer. Under the No Net Production/Capability-Based Alternative, water use would be reduced from 130 million gallons per year to 85.8 million gallons per year.

5.5.6 Geology and Soils

5.5.6.1 No *Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to the Pullman and Randall soil series, or other geological and soil resources, beyond current and planned activities that are independent of this action. Existing geology and soils are discussed in Section 4.5.6.

5.5.6.2 *DCE Alternative (Greenfield CPC)*

5.5.6.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for CPC construction would represent approximately 0.9 percent of Pantex’s total land area of 15,977 acres. The post-construction developed area would be approximately 110 acres.

The CPC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. This tract of land is surrounded on all sides by a similar land use, open space.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at Pantex, but these resources are abundant in the Amarillo area. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Faults located in the vicinity of Pantex have little potential for earthquakes. Ground shaking affecting primarily the integrity of inadequately designed or non-reinforced structures might occur, but shaking capable of damaging property or specially designed or upgraded facilities is not expected. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety,* and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities

5.5.6.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the Concrete Batch Plant upon construction completion. The land required for CPC operations would represent approximately 0.7 percent of Pantex's total land area of 15,977 acres. The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.5.6.3 *CCE Alternative*

5.5.6.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.6.3.2).

5.5.6.3.2 CNPC (CPC + CUC + existing A/D/HE Center)

Geologic and soil impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.6.2 as well as the impacts discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. The CUC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. An estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at Pantex, but these resources are abundant in the Amarillo area. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's Environmental Restoration Program and in accordance with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Faults located in the vicinity of Pantex have little potential for earthquakes. Ground shaking affecting primarily the integrity of inadequately designed or non-reinforced structures might occur, but shaking capable of damaging property or specially designed or upgraded facilities is not expected.

Operations: **CNPC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to add both a CPC and CUC to Pantex to comprise a full CNPC. The operation of a CNPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.5.6.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact.

5.5.7 Biological Resources

5.5.7.1 *No Action Alternative*

At least 13 species of mammals were recorded at the Pantex Plant in 2005 during routine activities such as bird surveys, nuisance animal actions, and incidental observations. There are six playas on DOE-owned or leased land at Pantex: Playas 1, 2, and 3 are on the main Pantex Site; Playas 4 and 5 are on land leased from Texas Tech University; and Pantex Lake is on a separate parcel of DOE-owned property, approximately 2.5 miles northeast of the main portion of the Pantex Plant. There are no federally designated Wild and Scenic Rivers onsite. The Pantex Plant provides habitat for several species protected by Federal and state endangered species. The current status of threatened and endangered (T&E) species known to appear on, or in the vicinity of the Pantex Plant is shown in Table 4.5.7-1. Five special status species have been observed at the Pantex Plant.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.5.7.

5.5.7.2 *DCE Alternative (Greenfield CPC)*

5.5.7.2.1 Terrestrial Resources

Construction. Construction activities for a CPC are described in Section 3.4.1. The area identified for construction of a CPC is classified as a previously cultivated area that has been replanted with native grasses. This tract of land is surrounded by similar land use on all sides, which is wide-open space. The land was last cultivated in 1993 and was planted to native short grasses in 1996 (DOE 2003b). The current state of the altered shortgrass prairie is reflective of conditions of the Southern High Plains of Texas that contain relatively little native undisturbed grassland. Land in the Texas Panhandle is generally used for agricultural purposes and does not support extensive populations of endemic shortgrass prairie wildlife. The remaining undisturbed playas are “islands” of wildlife habitat, allowing the continued existence of many species. The 2002 revision of the *Integrated Plan for Playa Management at Pantex Plant* (BWXT 2002a) calls for adaptive management for species diversity that is consistent with the shortgrass prairie ecosystem of the Southern High Plains. Cultivation, intensive grazing, and invasion of honey mesquite (*Prosopis glandulosa*) have changed species diversity and supporting habitat. Consequently, the importance of managed shortgrass prairie has increased for wildlife and plant species. Thus, preservation and management of remaining grassland is an important goal for biotic community protection. This management issue takes on special significance because few federally managed public lands occur on the Southern High Plains, an important part of the Central Flyway for migratory birds.

Approximately 140 acres of primarily shortgrass prairie and habitat would be cleared or modified during CPC construction. During site-clearing activities, highly mobile wildlife species, such as some mammals and birds, would be able to relocate to adjacent, less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur on a very small scale during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations: Operation requirements for a CPC are described in Section 3.4.1. Approximately 110 acres of primarily shortgrass prairie and habitat would be cleared or modified for CPC operation. In addition to the areas to be disturbed, there could be impacts to wildlife in habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. Further loss of shortgrass prairie habitat on the site is of regional and local concern due to fragmentation of habitat. However, adverse impacts to wildlife due to the loss of grassland in Zone 11 would be negligible.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.5.7.2.2 Wetlands

Construction. The two nearest wetlands to the CPC reference location are Playa 1 and Playa 2. Measuring from the center of the CPC site, the center of Playa 1 is approximately 3,860 feet northeast and the center of Playa 2 is approximately 5,200 feet west (DOE 2003b). There would be no direct impacts to wetlands as there are no wetlands within the area proposed for construction of a CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of Playas 1 and 2.

Operations. There would be no adverse impacts predicted to wetlands from operation of a CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect Playa 1, Playa 2, or other wetlands.

5.5.7.2.3 Aquatic Resources

Construction. There are no perennial or seasonal aquatic habitats within the CPC reference location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the Pantex watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other Pantex built environments and the quantity would represent a very minor contribution to the watershed.

5.5.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at Pantex, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of a CPC on any threatened and endangered species.

Construction. Table 4.5.7-1 identifies those Federal- and state-threatened and endangered listed species and other special interest species that occur or may occur within Carson County and Pantex. The CPC would disturb approximately 140 acres of restored shortgrass vegetation and habitat would be cleared or modified during CPC construction. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Approximately 110 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should not impact any special-interest species population. The USFWS has told Pantex that construction within Zones 11 and 12 would not have adverse impacts on threatened and endangered species. The contractor would be advised to move any Texas horned lizards encountered and to notify the Pantex Regulatory Compliance Department should any bird nests be discovered.

5.5.7.3 *CCE Alternative*

5.5.7.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.7.3.2).

5.5.7.3.2 CNPC (CPC + CUC + existing A/D/HE)

Biological resource impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.7.2 as well as the impacts discussed below.

***Construction:* CUC.** Approximately 50 acres of primarily shortgrass prairie and habitat would be cleared or modified during CUC construction. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of a CPC in Section 5.5.7.2.

***Operations:* CNPC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to add both a CPC and CUC to Pantex to comprise a full CNPC. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for operations of a CPC in Section 5.5.7.2.

5.5.7.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact.

5.5.8 Cultural Resources

5.5.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no expected impacts to the 69 identified cultural and paleontological resources beyond current and planned activities that are independent of this action. Current cultural resources are discussed in Section 4.5.8.

5.5.8.2 *DCE Alternative (Greenfield CPC)*

5.5.8.2.1 Construction

Under this alternative, approximately 140 acres of land would be disturbed during construction of a CPC. As discussed in section 4.5, systematic archaeological inventories at Pantex have included approximately half of the facility acreage with the other half of the site consisting mainly of industrial areas, playa wetlands, or uplands between playas with very low probability of site occurrence. The probability of impacting cultural and paleontological resources would depend on the location, because some areas (near playas or in developed areas) can exhibit a higher density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the Texas SHPO and in accordance with the Cultural Resource Management Plan. If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop, and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the Texas SHPO.

5.5.8.2.2 Operations

Operation of a CPC would have no impact on cultural and paleontological resources.

5.5.8.3 *CCE Alternative*

5.5.8.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.8.3.2).

5.5.8.3.2 CNPC (CPC + CUC + existing A/D/HE)

Cultural and paleontological impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.8.2 as well as the impacts discussed below.

***Construction:* CUC.** Construction activities for a CUC are discussed in Section 3.5.1.1. Approximately 50 acres of land would be disturbed during construction. Impacts cultural and paleontological resources would be similar to those described for construction of a CPC in Section 5.5.8.2.

***Operations:* CNPC.** Operation of a CNPC would have no impact on cultural and paleontological resources.

5.5.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to cultural resources, reduced operations would have no impact.

5.5.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and Capability-Based Alternative.

5.5.9.1 *No Action Alternative*

Under the No Action Alternative, Pantex would be expected to continue employing approximately 3,800 employees in order to maintain current and planned activities as required to support the missions described in Section 3.2.5. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Existing socioeconomic characteristics are discussed in Section 4.5.9.

5.5.9.2 *DCE Alternative (Greenfield CPC)*

5.5.9.2.1 Regional Economic Characteristics

Construction. Construction of the CPC would require 2,900 worker-years of labor. During peak construction, 850 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 677 indirect jobs would be created, for a total of 1,527 jobs. This represents approximately 1.5 percent of the total ROI labor force.

Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $38.2 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $63.7 million ($38.2 million direct and $25.6 million indirect). Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.5.9-1—Socioeconomic Impacts from CPC Construction

Socioeconomic Factor	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	677
Total Jobs Created	1,527
ROI Average Earning	$44,900
Direct Income Increase	$38,165,000
Indirect Income Increase	$25,563,000
Total Impact to the ROI	$63,728,000

Source: NNSA 2007, BEA 2007.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,707 indirect jobs would be created, for a total of approximately 3,487 jobs. The ROI income would increase by approximately 1 percent as a result of the new jobs created.

Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $136 million ($87.6 million direct and $48.4 million indirect). Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of CPC and other programmatic facilities.

5.5.9.2.2 Population and Housing

Construction. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 new workers), 1,275 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Table 5.5.9-2—Socioeconomic Impacts for All Alternatives–Operations

Socioeconomic Resource	CPC	CUC	CNC	A/D/HE	CNPC
Peak Workers	1,780	935	NA	NA	2,715
Indirect Jobs Created	1,707	897	NA	NA	2,604
Total Jobs Created	3,487	1,832	NA	NA	5,319
ROI Average Earning (direct)	49,200	49,200	NA	NA	49,200
Direct Income Increase	$87,576,000	$46,002,000	NA	NA	$133,578,000
Indirect Income Increase	$48,403,000	$25,425,000	NA	NA	$73,828,000
Total Impact to the ROI	$135,979,000	$71,427,000	NA	NA	$207,406,000

Source: NNSA 2007, BEA 2007.

Note: There are no numbers under the CNC alternative because if the CNC is constructed then the CNPC would be located at Pantex. There are no numbers under the A/D/HE alternative because this mission already exists at Pantex and no new impacts are anticipated. The numbers under the CNPC alternative reflect the changes to socioeconomic resources from addition of the CPC and CUC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.5.9.2.3 Community Services

Construction. The increase in population would put an increased demand on local community services. Because the population would increase by less than 1 percent, comparable levels of service could be maintained without increased staffing. Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operations. The increase in population would not increase demand on local community services. Because the population would increase by less than 1 percent, comparable levels of service could be maintained without increased staffing. Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.5.9.3 *CCE Alternative*

5.5.9.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.9.3.2).

5.5.9.3.2 CNPC (CPC + CUC + A/D/HE)

Socioeconomic impacts from the construction and operation of a full CNPC at Pantex (which operates the existing A/D/HE mission) would include the CPC impacts discussed above and the CUC impacts discussed below.

Regional economic characteristics: **CUC construction.** Construction of a CUC would require 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,036 indirect jobs would be created, for a total of 2,336 jobs. This represents less than 2 percent of the total ROI labor force.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $58.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $97.5 million ($58.4 million direct and $39.1 million indirect).

Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Table 5.5.9-3—Socioeconomic Impacts from CUC Construction

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	1,036
Total Jobs Created	2,336
ROI Average Earning (direct)	$44,900
Direct Income Increase	$58,370,000
Indirect Income Increase	$39,096,000
Total Impact to the ROI	$97,466,000

Source: NNSA 2007, BEA 2007.

Regional economic characteristics: **CNPC operations.** Operation of a CNPC at Pantex would require 2,715 new workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,604 indirect jobs would be created, for a total of 5,319 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $133 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $207 million ($133 million direct and $74 million indirect). Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (2,715 new workers), 2,175 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

Community services: **CUC construction.** The minor increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Community services: **CNPC operations.** The minor increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

5.5.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced operations would reduce the workforce from 1,644 to 1,230. This workforce, which currently represents approximately 1.3 percent of area employment, would fall to 1.2 percent. This change would not have a major impact on the socioeconomics of the region. Under the No Net Production/Capability-Based Alternative, reduced operations would reduce the workforce from 1,644 to 1,085.

5.5.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.5.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 30.1 percent of the ROI population surrounding Pantex. In 2000, minorities comprised 30.9 percent of the population nationally and 47.6 percent of the population in Texas. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 14 percent, which is higher than the 2000 national average of 12.4 percent but lower than the statewide figure of 15.4 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at Pantex are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural resources. As shown in Section 5.5.11, there are no large adverse impacts to any populations.

5.5.11 Health and Safety

5.5.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that Pantex would emit a dose to the MEI of 4.28 x 10^{-9} mrem per year. This is significantly below the EPA maximum permissible exposure limit to the public. Existing health and safety at Pantex is discussed in Section 4.5.11.

5.5.11.2 *DCE Alternative (Greenfield CPC)*

5.5.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from Bureau of Labor Statistics (BLS), U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the Voluntary Protection Program (VPP). Additionally, the small number of fatal accidents reported in the Computerized Accident/Incident Reporting System makes associated calculated fatality rates statistically invalid. The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are presented in Table 5.5.11-1.

Table 5.5.11-1—Injury, Illness, and Fatality Estimates for Construction of a CPC and CUC–Pantex

Injury, Illness, and Fatality Categories	CPC	CUC
Peak Annual Employment	850	1,300
Total Recordable Cases	81	112
Total Lost Workday Cases	38	54
Total Fatalities	0.2	0.3
Project Duration (6 years)		
Total Recordable Cases	276	384
Total Lost Workday Cases	143	184
Total Fatalities	0.7	0.9

Source: NNSA 2007.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with a CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.5.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Table 5.5.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.5.11-2—Annual Radiological Impacts on the Public from the CPC and CNPC Operations–Pantex

Receptor	CPC	CNC/CNPC[1]
Population within 50 mi		
Collective dose (person-rem)	8.1×10^{-5}	0.033
Percent of natural background radiation[a]	6.2×10^{-8}	2.6×10^{-5}
LCFs[b]	5×10^{-8}	2×10^{-5}
Offsite MEI		
Dose (mrem)	4.1×10^{-5}	0.016
Percent of regulatory dose limit	4.1×10^{-4}	0.16
Percent of natural background radiation[a]	1.2×10^{-5}	4.8×10^{-3}
Cancer fatality risk[b]	2×10^{-11}	1×10^{-8}

Source: Tetra Tech 2008.
[a] The average annual dose from background radiation at Pantex is 335 mrem; the 386,000 people living within 50 miles of Pantex in the year 2030 would receive an annual dose of 129,310 person-rem.
[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.
[c] The offsite MEI is assumed to reside at the site boundary at distance of approximately 2.2 miles. An actual residence may not currently be present at this location.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-11} per year (i.e., about 2 chances in 100 billion).

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[1] By definition, a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex.

The projected number of fatal cancers to the population within 50 miles would be less than or equal to 5×10^{-8} per year (i.e., about 5 chances in 100 million).

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE/NNSA has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of a CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct “hands-in-gloves” labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.5.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in a CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to a CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.5.11-3—Annual Radiological Impacts on CPC and CNPC Workers at Pantex from Operations

	CPC	CNC/CNPC[2]
Number of Radiological Workers	1,150	2,040
Average individual dose, mrem/yr[b]	290	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.3×10^{-4}
Collective dose (person-rem)	333	386
Cancer fatality risk[c]	0.20	0.23

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at a CPC would be approximately 1,780. The potential risk of occupational injuries and fatalities to workers operating a CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are presented in Table 5.5.11-4.

Table 5.5.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC–Pantex

Injury, Illness, and Fatality Categories	CPC	CNC/CNPC[3]
Total Workers	1,780	4,500
Total Recordable Cases	77	195
Total Lost Workday Cases	40	101
Total Fatalities	0.07	0.18

Source: Tetra Tech 2008, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of a CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.5.11.3 *CCE Alternative*

5.5.11.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.11.3.2).

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[2] By definition, a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex.

[3] By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex.

5.5.11.3.2 CNPC (CPC + CUC + A/D/HE)

Because Pantex operates the existing A/D/HE mission, a CNPC would include the CPC impacts discussed in Section 5.5.11.3.1 as well as the CUC impacts discussed below.

***Construction:* CUC.** No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents at Pantex makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.5.11-1.

***Operations:* CNPC.** DOE expects minimal public health impacts from the radiological consequences of CNPC operations. Table 5.5.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. The estimates of annual radiological doses to workers are provided in Table 5.5.11-3. As shown in the table, approximately 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of approximately 189 mrem annually. The total annual dose to workers associated with CNPC operations would be approximately 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to a CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.5.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.5.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced operations would reduce the number of workers involved in radiological operations from approximately 334 to 250. This would reduce the total worker dose from 44.1 person-rem to 33 person-rem. Statistically, the number of LCFs would be reduced from 2.6×10^{-2} to 2.0×10^{-2}, which would be an inconsequential change. Impacts to the surrounding population would also be inconsequential. Under the No Net Production/Capability-Based Alternative, reduced operations would reduce the number of workers involved in radiological operations to approximately 220. The total worker dose would be reduced to approximately 29 person-rem.

5.5.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at Pantex. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident’s progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases because the individual worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the Pantex boundary; 2) the offsite population within 50 miles of Pantex; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.5.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in Section 5.5.12.4.

5.5.12.2 *Consolidated Plutonium Center*

5.5.12.2.1 Radiological Accidents

Table 5.5.12–1 and 5.5.12-2 present the frequencies, consequences, and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MELCOR Accident Consequence Code System (MACCS) computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012.

Table 5.5.12-1—CPC Radiological Accident Frequency and Consequences–Pantex

Accident		Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
	Frequency	Dose (rem)	Latent Cancer Fatalities[d]	Dose (Person-rem)	Latent Cancer Fatalities[e]	Dose (rem)	Latent Cancer Fatalities[d]
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	23.1	0.0277	9,840	5.9	1,550	1
Fire in a single building	1.0×10^{-4}	11.4	0.00684	4,610	2.77	988	1
Explosion in a feed casting furnace	1.0×10^{-2}	13.3	0.00798	5,400	3.24	1,160	1
Nuclear Criticality	1.0×10^{-2}	$3.17\text{x}10^{-5}$	$1.90\text{x}10^{-8}$	0.00446	$2.68\text{x}10^{-6}$	0.00126	$7.56\text{x}10^{-7}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.888	0.000533	360	0.216	77.2	0.0926
Radioactive material spill	1×10^{-2}	0.0266	0.000016	10.8	0.00648	2.32	0.00139

Source: Tetra Tech 2008.

[a] At site boundary, approximately 2.2 miles from release.

[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.

[c] At 1000 meters from release.

Table 5.5.12-2—Annual Cancer Risks for CPC–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Beyond Evaluation Basis Earthquake with Fire	$2.77\text{x}10^{-7}$	$5.9\text{x}10^{-5}$	$1\text{x}10^{-5}$
Fire in a Single Building	$6.84\text{x}10^{-7}$	$2.77\text{x}10^{-4}$	$1\text{x}10^{-4}$
Explosion in a Feed Casting Furnace	$7.98\text{x}10^{-5}$	$3.24\text{x}10^{-2}$	$1\text{x}10^{-2}$
Nuclear Criticality	$1.90\text{x}10^{-10}$	$2.68\text{x}10^{-8}$	$7.56\text{x}10^{-9}$
Fire-induced Release in the CRT Storage Room	$5.33\text{x}10^{-6}$	$2.16\text{x}10^{-3}$	$9.26\text{x}10^{-4}$
Radioactive Material Spill	$1.6\text{x}10^{-7}$	$6.48\text{x}10^{-5}$	$1.39\text{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 2.2 miles from release.

[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.

[c] At 1000 meters from release.

The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report, Supporting Documentation for the Accident Impacts and Normal Operations Presented in the Complex 2030 Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. In the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-1) is the beyond evaluation basis earthquake and fire in the absence of mitigation measures. Approximately 5.9 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a dose of 23.1 rem. Statistically, the MEI would have a

0.01 chance of developing a LCF (i.e., about 1 chance in 100 of an LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.5.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be approximately $8x10^{-5}$, or approximately one in 10,000. For the population, the LCF risk would be $3x10^{-2}$, meaning that an LCF would statistically occur once every 31 years in the population.

5.5.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor***.***

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.5.12–3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.5.12-3 shows the consequences of the dominant accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.5.12-3—CPC Chemical Accident Frequency and Consequences–Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}
Hydrofluoric acid	550	20	0.5	5.1	0.55	10^{-4}
Formic acid	1,500	10	0.22	0.56	<0.1	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 2.2 miles east.

5.5.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.5.12.3 *Consolidated Uranium Center*

5.5.12.3.1 Radiological Accidents

Table 5.5.12–4 presents the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.5.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.5.12-4—CUC Radiological Accident Frequency and Consequences–Pantex

		Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities[c]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[c]**	**Dose (rem)**	**Latent Cancer Fatalities[d]**
Major fire	$10^{-4} – 10^{-6}$	0.0388	0.0000233	15.8	0.00948	3.38	0.00203
Explosion	$10^{-4} – 10^{-6}$	0.00383	$2.30x10^{-6}$	1.56	0.000936	0.283	0.00017
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.0454	0.0000272	18.4	0.011	3.77	0.00226
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.00494	$2.96x10^{-6}$	2.01	0.00121	0.303	0.000182
Aircraft crash	$10^{-4} – 10^{-6}$	0.0719	0.0000431	26.4	0.0158	2.68	0.00161

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table 5.5.12-5—Annual Cancer Risks for CUC–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Major fire	2.33×10^{-9}	9.48×10^{-7}	2.03×10^{-7}
Explosion	$2.30x10^{-10}$	9.36×10^{-8}	1.7×10^{-8}
Fire in EU Warehouse	2.72×10^{-9}	1.1×10^{-6}	2.26×10^{-7}
Design-basis fires for HEU Storage	$2.96x10^{-8}$	1.21×10^{-5}	1.82×10^{-6}
Aircraft crash	4.31×10^{-9}	1.58×10^{-6}	1.61×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-4) is the aircraft crash into the EU facilities. Approximately 0.0158 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a maximum dose of 0.07 rem. Statistically, this MEI would have a 0.00004 chance of developing a LCF, or about 1 in 25,000. This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.5.12-5), the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be approximately $3x10^{-8}$, or approximately 1 in 33 million. For the population, the LCF risk would be $1x10^{-5}$, or approximately 1 in 100,000.

5.5.12.3.2 Hazardous Chemicals Impacts

A CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.5.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.5.12-6—CUC Chemical Accident Frequency and Consequences–Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 2.2 miles.

5.5.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.5.12.4 *Assembly/Disassembly/High Explosives*

Accidents associated with the A/D/HE Center, which are included under the No Action Alternative, are presented in Tables 5.5.12-7 through 5.5.12-9 below.

Table 5.5.12-7—Potential Consequences of A/D/HE Accidents–Pantex

	Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	Dose (rem)	Latent Cancer Fatalities[c]	Dose (Person-rem)	Latent Cancer Fatalities[d]	Dose (rem)	Latent Cancer Fatalities[c]
Scenario 1	3.59	0.00215	1,460	0.876	312	0.374
Scenario 2	0.00257	1.54×10^{-6}	1.04	0.000624	0.224	0.000134
Scenario 3	2.15×10^{-7}	1.29×10^{-10}	8.73×10^{-5}	5.24×10^{-8}	1.87×10^{-5}	1.12×10^{-8}

Table 5.5.12-7—Potential Consequences of A/D/HE Accidents–Pantex (continued)

	Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities[c]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[d]**	**Dose (rem)**	**Latent Cancer Fatalities[c]**
Scenario 4	0.453	0.000272	208	0.125	25.2	0.0302
Scenario 5	0.474	0.000284	218	0.131	26.3	0.0316
Scenario 6	0.00352	2.11×10^{-6}	1.61	0.000966	0.195	0.000117

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table 5.5.12-8—Annual Cancer Risks for A/D/HE Accidents–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Scenario 1	2.15×10^{-7}	8.76×10^{-5}	3.74×10^{-5}
Scenario 2	1.54×10^{-8}	6.24×10^{-6}	1.34×10^{-6}
Scenario 3	1.29×10^{-12}	5.24×10^{-10}	1.12×10^{-10}
Scenario 4	2.72×10^{-10}	1.25×10^{-7}	3.02×10^{-8}
Scenario 5	2.84×10^{-8}	1.31×10^{-5}	3.16×10^{-6}
Scenario 6	2.11×10^{-8}	9.66×10^{-6}	1.17×10^{-6}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.876 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 3.6 rem. Statistically, this MEI would have a 0.002 chance of developing a LCF (i.e., about 1 chance in 460 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.5.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be 2×10^{-7}, or approximately 1 in 5 million. For the population, the LCF risk would be approximately 9×10^{-5}, or approximately 1 in 10,000.

For chemical accidents, NNSA estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.5.12–9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Table 5.5.12-9—Chlorine Accident Frequency and Consequences–Pantex

Chemical Released	**Quantity Released (kg)**	**ERPG-2 [a]**		**Concentration [a]**		**Frequency**
		Limit (ppm)	**Distance to Limit (km)**	**At 1,000 m (ppm)**	**At Site Boundary (ppm) [a]**	
Chlorine	408.23	3	2.8	17.5	1.8	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 2.2 miles east.

5.5.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accidents are largely a function of the operation being conducted, rather than the number of times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.5.13 Transportation

5.5.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at Pantex, and impacts would remain unchanged from the baseline presented in Section 4.5.12.

5.5.13.2 *DCE Alternative (Greenfield CPC)*

Construction. Construction of a CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels and would be temporary.

Operations. If a CPC were sited at Pantex there would be no significant transportation of plutonium within the nuclear weapons complex. Radiological transportation for the CPC would include the recycle of enriched uranium parts to Y-12, return of enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. LLW would be disposed of at NTS. The addition of CPC employees would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.5.12.

5.5.13.3 *CCE Alternative*

5.5.13.3.1 CNPC (CPC + CUC)

Construction: **CUC.** Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels and would be temporary.

Operations: **CNPC.** If a CUC were located at Pantex as part of a CNPC, only the impacts of transporting TRU waste and LLW for the CPC would occur. There would be a one-time transport of SNM from Y-12 to the CNPC, as described in Section 5.10. The addition of new employees for a CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic levels.

5.5.13.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in employees from 1,644 to 1,230 (or 1,085 for the No Net Production/Capability-Based Alternative) would not be noticed on area roads. Reduced operations would have a minimal impact on: 1) the transportation of pits between Pantex and LANL, and 2) the transportation of secondaries and cases between Pantex and Y-12. As discussed in Section 5.10, the annual transportation impacts for pits and secondaries and cases, for both incident-free transportation and potential accidents, would be small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts).

5.5.14 Waste Management

5.5.14.1 *No Action Alternative*

The types of wastes generated at Pantex Plant include hazardous wastes, regulated under RCRA, universal waste, non-hazardous wastes, wastes regulated under TSCA, LLW, MLLW, and sanitary waste.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to waste management resources beyond current and planned activities. Table 5.5.14-1 presents annual waste generation volumes from Pantex Operations.

Table 5.5.14–1—Annual Waste Volumes Generated–Pantex

Waste Type	1993	2003	2004	2005
TRU (yd^3)	0	0	0	0
Low-Level Waste (yd^3)	375.4	75.8	95.6	96.8
Mixed LLW (yd^3)	49	0.8	3.3	1.8
Hazardous Waste (yd^3)	483.8	8,798.9	337.6	711
Universal Waste[a] (yd^3)	-	31.9	24	30.7
TSCA Waste (yd^3)	147.7	542.9	1,481.8	2,036.1
Non-hazardous Waste (yd^3)	14,237	14,208.3	6,050	6,374.5
Sanitary Waste (yd^3)	800.5	988.8	1,061	944.9

Source: Pantex 2006.

[a] In 2001, Pantex began managing some hazardous Waste under the Universal Waste Rules.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Pantex does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective, exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities. DOE/NNSA also routinely ship LLW to off-site commercial LLW disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted where necessary to address changes in the options available to DOE/NNSA for disposition of these wastes.

5.5.14.2 *DCE Alternative (Greenfield CPC)*

5.5.14.2.1 Construction

Construction of CPC would generate hazardous waste, and both solid and liquid sanitary waste. Table 5.5.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for a CPC.

Table 5.5.14-2—Waste Generation from CPC Construction–Pantex

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Nonhazardous Solid (yd^3)	10,900
Nonhazardous Liquid (gallons)	56,000

Source: NNSA 2007.

CPC construction would increase Pantex's 2005 routine hazardous waste generation by less than one percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and is the normal method currently used to treat Pantex's hazardous waste. The onsite Hazardous Waste Treatment and Processing Facility (HWTPF) may also be used to treat hazardous waste generated from CPC construction activities.

Solid non-hazardous waste generated from CPC construction activities would result in a 70 percent increase over the 2005 level for Pantex. Although a large increase, this volume of non-hazardous waste would present no issues at Pantex, as substantial capacity is available for the disposal of this material. The waste would be disposed of onsite, in the Construction Debris Landfill or at offsite facilities, such as the City of Amarillo Landfill. These disposal facilities, or their replacements, are expected to have adequate capacity to handle the projected amount of waste. To the extent practicable, metal and other recyclable materials would be removed from this waste stream prior to its disposal.

Sanitary wastewater generated during CPC construction would be treated in the onsite Waste Water Treatment Facility (WWTF). DOE recently completed upgrades to this facility sufficient to satisfy the increased treatment requirements of the CPC as well as other planned program requirements at Pantex.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acres per 40 acres of developed land.

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.5.14.2.2 Operations

Normal operation of a CPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.5.14-3 summarizes the estimated waste generation rates for a CPC.

Table 5.5.14-3—CPC Annual Operational Waste Generation–Pantex

Waste Type	CPC
TRU Solid Waste (including Mixed TRU)(yd^3)	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste solid (tons)	4.0
Hazardous waste liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

Normal operations at Pantex do not generate TRU waste. While there are procedures to manage TRU, there is presently no TRU waste management infrastructure at Pantex. CPC operations would generate about 1,290 cubic yards of TRU waste annually (950 TYRU plus 340 Mixed TRU). TRU waste generated from plutonium pit manufacturing would include gloves, filters, and other operations/maintenance waste from gloveboxes. About 26 percent of the TRU waste would be mixed waste. The TRU and mixed TRU waste would be transferred from the CPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). This capacity is more than sufficient to allow for the packaging of this waste according to the WIPP Waste Acceptance Criteria and one to two months of accumulation prior to shipment to WIPP. A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CPC operations represent about 2-4 percent of the annual routine hazardous waste volumes presently managed by Pantex. Commercial treatment is readily available and currently used to treat most Pantex hazardous wastes.

LLW generation from the operation of a CPC would be a small percentage of the 2005 Pantex LLW generation volume. The LLW would be packaged according to DOE, NRC, and DOT requirements, and transferred to NTS for disposal. LLW from CPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. This waste could also be disposed of at a commercial LLW disposal facility.

Pantex's current mixed LLW generation level is small. The majority of the mixed LLW is presently transferred offsite to commercial facilities for treatment and disposal. CPC operations would increase the annual generation of mixed LLW generation by 20-48 percent over current amounts. The waste would be managed in accordance with the Pantex Site Treatment Plan. The mixed LLW would be managed onsite at the HWTPF or shipped offsite to commercial facilities. The impact to the capacity of these onsite or commercial facilities would be small.

Non-hazardous waste from CPC operations includes sanitary solid waste and wastewater. Volumes of this waste generated by the operation of a CPC would be about 27 percent greater than the amount generated by Pantex in 2005. This sanitary solid waste would be disposed of at offsite facilities, such as the City of Amarillo Landfill. Some waste may be suitable for disposal onsite in the Construction Debris Landfill. Sanitary wastewater from a CPC would be treated in the onsite WWTF. DOE recently completed upgrades to this facility to provide flexibility to increase the treatment volume. There would be adequate capacity to manage the sanitary wastewater from CPC operations.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.5.14.3 *CCE Alternative*

Since the A/D/HE Center already exists at Pantex, the addition of a CNC at Pantex would create a CNPC. The impacts of this alternative are discussed above in Section 5.5.13.4, and there is no need to present them here.

5.5.14.3.1 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction of a CPC and CUC would be the same as for a CNPC, since Pantex already is operating an A/D/HE Center.

Construction: **CUC.** For Pantex, construction of a CNPC would entail only the construction of a CPC, already discussed in Section 5.5.14.2.1 and a CUC, discussed in this Section, since an A/D/HE Center already exists. Table 5.5.14-4 describes the wastes expected to be generated by the construction of a CPC and CUC at Pantex.

Table 5.5.14-4—Waste Generation from CUC Construction–Pantex

Waste Category	CPC	CUC	CNPC
TRU Solid Waste (yd^3)	0	0	0
Low Level Solid Waste (yd^3)	0	70	70
Mixed TRU Solid Waste (yd^3)	0	0	0
Hazardous waste (tons)	7.0	6	13
Non-Hazardous Solid Waste (tons)	10,900	1,000	11,900

Source: NNSA 2007.

Construction of a CUC would generate LLW, hazardous waste, and both solid and liquid sanitary waste. CUC construction would increase Pantex's annual routine hazardous waste generation by less than 3 percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat Pantex's hazardous waste. The onsite HWTPF may also be used to treat hazardous waste generated from CUC construction activities.

Hazardous waste generated through the construction of a CUC at Pantex would be a small percentage of the amount of hazardous waste generated by Pantex in 2005. This waste would be managed according to RCRA requirements and shipped off-site for treatment and disposal at a commercial facility. LLW volume from the construction of a CUC would be about 72 percent of the LLW generated by Pantex in 2005. The LLW would be packaged and transferred to NTS for disposal.

Solid nonhazardous waste from CUC construction activities would result in a 70 percent increase over the 2005 volume. The waste would be disposed of onsite in the Construction Debris Landfill or at offsite facilities, such as the City of Amarillo Landfill. These disposal facilities, or their replacements, are expected to have more than adequate capacity to handle the projected amount of waste. Sanitary wastewater generated during CUC construction would be treated in the onsite WWTF. DOE recently completed upgrades to this facility sufficient to satisfy the increased treatment requirements of a CUC. A retention pond would be constructed to manage stormwater runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acres per 40 acres of developed land. A concrete batch plant would operate at the CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities.

Operations: **CNPC.** Normal operation of a CNPC at Pantex would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.5.14-5 summarizes the estimated waste generation rates for the CNPC**.** It should be noted that the A/D/HE Center operational waste generation rates do not appear on this table since these wastes are presently being generated at Pantex and are therefore attributable to the no action alternative. Pantex current waste generation rates are described in Table 4.5.13.

Table 5.5.14-5—Annual Wastes Generated by the Operation of Facilities–Pantex

Waste Type	**Projects Under Consideration**		
	CPC	**CUC**	**CNPC (CPC + CUC + existing A/D/HE)**
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3)	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Normal operations at Pantex do not generate TRU waste. While there are procedures to manage TRU, there is presently no TRU waste management infrastructure at Pantex. CNPC operations would result in the generation of about 950 cubic yards of TRU waste, annually. TRU waste generated from plutonium pit manufacturing would include gloves, filters, and other operations/maintenance waste from gloveboxes. About 36 percent of the TRU waste would be mixed waste. The TRU and mixed TRU waste would be transferred from the CNPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

CNPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CNPC operations represent about 2-4 percent of the annual hazardous waste volumes presently managed by Pantex. Commercial treatment is readily available and currently used to treat most Pantex hazardous wastes.

LLW generation for a CNPC would substantially increase the current Pantex LLW generation volumes. The LLW would be packaged at a waste management portion of a new CNPC, in accordance with DOE, NRC, and DOT requirements, and transferred to NTS for disposal. Due to the large increase in routine LLW generation, additional storage capacity would be needed to manage the waste until it can be accumulated into shipment quantities and shipped offsite for disposal. LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility.

Pantex's current mixed LLW generation level is small. The majority of this mixed LLW is presently transferred offsite to commercial facilities for treatment and disposal. CNPC operations would drastically increase the annual routine mixed LLW generation at Pantex. The waste would be managed in accordance with the Pantex Site Treatment Plan, and similar to the small quantities presently being generated, shipped offsite to commercial facilities. Since the CNPC would contain a RCRA-permitted mixed waste treatment facility, this would pose no issues to the normal Pantex operations. The impact from managing this increased mixed LLW waste stream would be small.

Non-hazardous waste from CNPC operations would include sanitary solid waste and paper, debris, and general office waste. Sanitary solid wastes would be disposed of at offsite facilities, such as the City of Amarillo Landfill. Some waste may be suitable for disposal onsite in the Construction Debris Landfill. Annual non-hazardous waste volumes would increase by a factor of 4–5 relative to current Pantex operations. This increase could accelerate the rate at which DOE consumed the available onsite capacity and require more off-site, commercial treatment and disposal.

Sanitary wastewater from the CNPC would be treated in the onsite WWTF. DOE recently completed upgrades to this facility to provide flexibility to increase the treatment volume. There would be adequate capacity to manage the sanitary wastewater from CNPC operations. CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.5.14.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to waste management, reduced operations would reduce wastes generated as shown in Table 5.5.14-6.

Table 5.5.14-6—Annual Wastes Generated for the No Action Alternative and the Capability-Based Alternative–Pantex

Waste Category	No Action	Capability-Based Alternative	No Net Production/Capability-Based Alternative
Low-level Waste (yd^3)	96.8	73	64
Mixed Low-level Waste (yd^3)	1.8	1.4	1.2
Hazardous Waste (yd^3)	711	530	470
Nonhazardous Waste (yd^3)	6,375	4,800	4,200

Source: NNSA 2007, NNSA 2008.

Because Pantex has adequate facilities to manage the wastes under the No Action Alternative (what Pantex is doing today), neither alternative would present major impacts to waste management, as the Capability-Based Alternatives generates less waste than the No Action Alternative. Reductions in LLW generation would reduce the transportation of LLW to NTS. As discussed in Section 5.10, these impacts are small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts) under the No Action Alternative.

5.5.15 Impacts Associated with Closing and D&D of Pantex Facilities

If a CNPC were to be constructed at a site other than Pantex, Pantex would close. As a part of estimating the overall environmental impacts associated with such an action, this section discusses, in general terms, what would be necessary for the closure and remediation of the Pantex Plant, and what these activities might entail.

In May 1994, the Pantex Plant was listed on the National Priorities List (NPL) as a Superfund Site. This action required complete site characterization and the development of a remediation plan. The remediation plan was completed in July 2003. This plan, prepared by BWXT Pantex, with oversight by the EPA and the Texas Commission on Environmental Quality, entails a reduction of building usage to only what is actually being used (thereby reducing the usable footprint) and a comprehensive clean-up of the rest of the site. The plan has four major strategies: 1) accelerate soil clean-up, 2) accelerate clean-up of the perched aquifer, 3) continued monitoring of the Ogallala Aquifer, and 4) reduction of operating footprint and clean-up of entire site areas.

It is estimated that these actions would require a total expenditure of $131 million through 2114. The plan calls for the operations footprint reduction to occur by 2008. Pantex is presently finalizing remediation plans for the accelerated soil clean-up from previously identified Solid Waste Management Units. A pump and treat system will be utilized to remove contaminants from the perched aquifer, directed by a predictive groundwater modeling program to direct and prioritize activities. In addition to the above mentioned remediation, clean-up of the Ogallala Aquifer will be required, once final characterization has been completed. It has been estimated by the Innovative Treatment Remediation Demonstration (ITRD) Program that restoration of the Ogallala Aquifer would be a 30 year project costing an estimated $30 million. This would entail the drilling of up to 50 monitoring/injection/extraction/treatment wells.

All of the remediation actions detailed above have been committed to by DOE/NNSA and BWXT Pantex (the current operating contractor at the site), and would be done regardless of alternatives being considered by the Complex Transformation SPEIS. Accordingly, these remediation actions, for purposes of this analysis, are considered part of the No Action Alternative and not a part of the proposed actions. Although the Pantex Plant covers approximately 16,000 acres (about 25 square miles), the majority of Plant operations are conducted on about 2,500 acres. Pantex has about 640 buildings covering almost 3 million square feet of floor space, 55 miles of paved roads, 60 miles of fences, and 17,000 pieces of Plant equipment. There are nine miles of steam/condensate lines, 17 miles of natural gas lines, 30 miles of main line water piping, 33 miles of electrical distribution lines and five water production wells (see Section 4.5).

Once these remediation activities which NNSA/DOE has already committed to have been completed, the Pantex Plant will be left with approximately 400 buildings, comprising approximately 1,875,000 square feet, with which to conduct ongoing operations. It is this footprint which if decisions were to be made to close the Pantex Plant that would be attributable to that decision. Although many of these buildings, especially the administrative and office complexes could be of use to DOE and/or others, for purposes of this analysis, it is assumed that the entire site would be razed and the waste from this activity managed in accordance with all applicable requirements. It is further assumed that the roads, electric supply system, water supply system, and natural gas supply system would remain intact as a potential asset for future use of the property. The closing and decontamination and decommissioning (D&D) of these facilities would be expected to entail the impacts detailed in Table 5.5.15-1. It should be noted that this analysis is not a rigorous engineering assessment intended to serve as the basis of decisionmaking or serve as a cost analysis. It was constructed only to give the reader some idea of the magnitude of the effort associated with the closure and D&D of this facility.

Table 5.5.15-1—Impacts from Closure and D&D–Pantex

Activity	Quantity		
Total floorspace ft^2			
Admin	10% x 1,875,000	187,500	
Industrial	90% x 1,875,000	1,687,500	
TOTAL			1,875,000
No of buildings			
Admin	10 % x 400	40	
Industrial	90 % x 400	360	
TOTAL			400
Non-Hazardous Solid Waste (yds^3)			
Admin buildings	4 yds^3 x 40	160	
Industrial buildings	2 yds^3 x 360	720	
TOTAL			880
Concrete/bock/brick (yds^3)			
Admin buildings	187,500 ft^2 x .064 yds^3/ ft^2	12,000	
Industrial buildings	1,687,500 ft^2 x .09 yds^3/ ft^2	151,875	
TOTAL			163,865
Steel and scrap iron (tons)			
Steam pipe	17.8lb/ft x 47,520 / 2,000	423	
Rebar		20	
Misc		20	
Scrap equip		120	
TOTAL			583
Soil excavation (yds^3)	360 bldg x 20% x 200 yds^3 / bldg		14,400
LLW generated (yds^3)			
Concrete	2% x 151,875	3,036	
Soil	1% x 14,400	144	
Equip		50	
TOTAL			3,230
TRU generated (yds^3)			0
Mixed LLW (yds^3)			20
Hazardous waste (yds^3)			
from rubble	2% x 151,875	3,036	
from soils	2% x 14,440	288	
unused storage		100	
TOTAL			3,424
Asbestos waste (yds^3)	400 bldg x 4 yds^3/bldg		1,600
Employment			
Admin buildings	5 persons/bldg x 40	200	
Industrial buildings	8 persons/bldg x 360	2,880	
TOTAL			3,080
Peak employment			4,000

Table 5.5.15-1—Impacts from Closure and D&D–Pantex (continued)

Activity	Quantity
Total worker hours	2,000 x 4yrs x 3,080 24,640,000
Time required (yrs)	4
Asbestos waste (yds^3)	400 bldg x 4 yds^3/bldg 1,600
Water requirements (gal/yr)	
Workers	2gal x 200 days x 3,080 workers 1,232,000
construction	1000 gal/hr x 11 hrs x 100 days 1,100,000
TOTAL	2,332,000

Source: NNSA 2007.

Once the buildings were vacated, all reusable fixtures, doors copper pipe, copper wire, equipment, office furniture etc. would be removed inspected for radioactivity or the presence of hazardous wastes and sold. The buildings would then be cleaned of all remaining loose items. It is expected that this would result in the generation of 880 cubic yards of non hazardous solid waste. This waste would be disposed of, on-site, as Class 2 non-hazardous waste, as defined by Title 30 of the Texas Administrative Code. Once this has been completed, all buildings and structures would be demolished. This would involve hand cutting, detonations, and large earthmoving equipment.

As detailed in Table 5.5.15-1, above, an estimated 12,000 cubic yards of concrete/block/brick rubble would be generated from the administration buildings (not expected to be contaminated) and 151, 875 cubic yards generated from the razing of the industrial buildings and structures. All of this material would undergo analysis for the presence of radioactive material and hazardous waste contamination. Contaminated quantities would be removed and handled according to their classification. It is assumed that 2 percent of this waste originating from the industrial facilities would be contaminated with radioactive materials and be considered LLW. Another 2 percent of this waste originating from the industrial buildings would be assumed to be contaminated with hazardous waste and be handled accordingly. This would leave approximately 157,800 cubic yards of concrete, brick, block, rebar and rubble, which would likely be disposed of on-site as Class 2 non-hazardous waste, as defined by Title 30 of the Texas Administrative Code.

An estimated 14,400 cubic yards of soil would be removed from around and under the industrial buildings and structures. This soil would be tested for the presence of radioactive materials and for hazardous wastes. Soil found not to be contaminated with these materials would be mounded and stored, to be used as grade material and fill once the buildings were removed and the surrounding areas cleaned up. These mounds would be covered with vegetation or tarps to minimize erosion. The D&D of this soil would be expected to generate about 288 cubic yards of LLW. An additional 3,036 cubic yards of LLW would be expected to be generated from the concrete, brick, and block, along with 50 cubic yards of LLW from contaminated equipment. The 3,230 cubic feet of LLW, which amounts to about thirty-five times the annual LLW generation rate for Pantex would be packaged for transport, taken to NTS and disposed of at NTS. In addition it is expected that 20 cubic yards of mixed LLW would be generated. This waste would be packaged for transport and transported to NTS for treatment and disposal.

Approximately 3,424 cubic yards of hazardous waste would be expected to be generated from the demolition process. About 100 cubic yards of hazardous waste would come from unused chemicals and "empty drums," bottles, etc. left in buildings. The hazardous waste would be packaged and transported to a commercial facility for treatment and disposal. From 2003–2005, Pantex generated an average of 3,282 cubic yards of hazardous waste. It is estimated that 1,600 cubic yards of asbestos waste would be generated. This waste would be removed from buildings (prior to demolition) packaged and shipped off-site, in accordance with TSCA requirements and then disposed of at a TSCA certified disposal facility.

5.6 SANDIA NATIONAL LABORATORIES/NEW MEXICO

There are no Programmatic Alternatives for SNL/NM. Relevant project-specific analyses for SNL/NM are discussed in Sections 5.12 through 5.17.

5.7 WHITE SANDS MISSILE RANGE

There are no Programmatic Alternatives for WSMR. Project-specific analysis for WSMR is discussed in Section 5.15.

5.8 SAVANNAH RIVER SITE

This section discusses the potential environmental impacts associated with the following programmatic alternatives at SRS:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. SRS would continue to perform its existing missions as described in Section 3.2.8. In addition, construction of the Mixed Oxide Fuel (MOX) Facility was started in August, 2007, and is expected to begin operation in 2016. Construction of the Pit Disassembly and Conversion Facility (PDCF) is scheduled to start in 2010, and begin operation in 2019.
- **DCE Alternative.** This alternative includes a CPC, which could be either a "Greenfield" facility or a facility that uses the mixed-oxide (MOX) fuel fabrication facility and the pit disassembly and conversion facility (PDCF) infrastructure. Operations would be the same for either the Greenfield facility or MOX/PDCF option.
- **CCE Alternative.** This alternative includes two options: (1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, a Consolidated Uranium Center (CUC), and an A/D/HE Center; and (2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC, with the A/D/HE Center at Pantex. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE Center, 2020-2025.
- **Capability-Based Alternatives.** Under the Capability-Based Alternative and the No Net Production Capability-Based Alternative, tritium activities at SRS would be reduced to support stockpile requirements below the Moscow Treaty requirements.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.8.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.8.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.8.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	
CUC			
Construction (acres)	50		
Operation (acres)	Total Area: 35[b]		
	PIDAS	**Non-PIDAS**	
	15	20	
A/D/HE CENTER [d]			
Construction (acres)	300		
Operation (acres)	Total Area: 300[e]		
	PIDAS	**Non-PIDAS**	
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120	
CNC			
	Total Area: 195[f]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50	
CNPC			
	Total Area: 545[g]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100	

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.8.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at SRS beyond those of existing and future activities that are independent of this action. Planned construction includes the MOX/ PDCF facilities. Construction of the MOX facility began in August 2007, and construction of the PDCF is scheduled to begin in 2010. Together these two facilities will disturb 77 acres in the F-Area. Existing land resources is discussed in Section 4.8.1.

Table 5.8.1-2 identifies the major facilities at SRS for the No Action Alternative.

Table 5.8.1-2—Savannah River Site No Action Alternative Facilities

Administrative facilities	
Area A	Provides office space, training areas, and records storage. Houses Savannah River National Lab
Area B	Provides office space, training areas, and records storage. Over the last ten years most admin. functions have been transferred to B Area, with A Area and M Area undergoing some closure activities
Heavy water reprocessing **D Area**	Now closed, had facilities for supporting heavy water coolant/moderator for the reactors, heavy water purification facilities, an analytical laboratory, and a power plant
Non-nuclear facilities	
N Area	Central Shops, containing construction and craft facilities and the primary facilities for storage of construction material
T Area	Also known as TNX-Area, used to contain facilities that tested equipment and developed new designs
Nuclear/radiological facilities **M Area**	Fuel/Target Fabrication facilities housed the metallurgical/foundry operations for fabricating fuel and target elements for the SRS reactors. This area is undergoing closure activities
Reactors **C, K, L, P, and R Areas**	Housed the C, K, L, P, and R reactors. These reactors were used for nuclear production, are permanently shut down and are being evaluated for D & D. Fuel storage basins at the L reactor contain spent nuclear fuel. Portions of the K reactor have been converted to the K Area Material Storage Facility. Decontamination capability has been installed in the C Area.
Processing facilities	
H Area	Process, stabilize, separate, and recover nuclear materials. Includes the Tritium Extraction Facility, Tritium Loading, Unloading, and Surveillance Facility, Effluent Treatment Facility, High Level Tanks.
F Area	Chemical Separation Facility (now closed). Houses high level tanks, Mixed Oxide Fuel Fabrication Facility (under construction), Pit Disassembly and Conversion Facility (proposed), Waste Solidification Facility (proposed)
Waste Management facilities	
G Area	Storage and disposal of radioactive waste
E Area	Storage and disposal of radioactive waste; LLW Disposal Facilities (2) TRU Waste Storage Facilities
S Area	Defense Waste Processing Facility, Salt Waste Processing Facility(under construction)
Z Area	Saltstone Production Facility, Saltstone Disposal Facility, Salt Waste Processing Facility (under construction)

5.8.1.2 *DCE Alternative (CPC)*

5.8.1.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a PIDAS with a 300-foot wide buffer area outside the PIDAS. The area outside the PIDAS and buffer area would consist of a number of smaller support facilities, a Waste Staging/TRU Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks.

The CPC reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent 0.07 percent of SRS's total land area of 198,400 acres. Use of the MOX/PDCF facilities would reduce the land disturbance by approximately 10 percent. The reference location has adequate space to accommodate the total CPC footprint. The post-construction developed area would be approximately 110 acres.

Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation (Site Industrial) for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for CPC operations would represent 0.06 percent of SRS's total land area of 310 square miles.

Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation (Site Industrial) for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.3 *CCE Alternative*

5.8.1.3.1 CNC (CPC + CUC)

Land Use impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.1.2 as well as the impacts for the CUC discussed below.

Construction: **CUC.** As described in Section 3.5.2, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, operations at a CUC would require approximately 35 acres. All buildings would be either one or two stories.

The CUC reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial. The land required for CUC construction would represent 0.02 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres would be located within a PIDAS. The land required for CNC operations would represent approximately 0.1 percent of SRS's total land area of 310 square miles. Although there would be a change in land use, a CNC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.3.2 CNPC (CPC + CUC + A/D/HE Center)

Land use impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.1.2, the CUC impacts discussed in Section 5.8.1.3, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** As described in Section 3.5, an Assembly/Disassembly/High Explosives (A/D/HE) Center would consist of a nuclear facility within the PIDAS and high explosives facilities and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for an A/D/HE Center. Approximately 180 acres would be protected within a PIDAS.

The A/D/HE Center reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward

Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial. The land required for A/D/HE Center construction would represent approximately 0.1 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, an A/D/HE Center is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

Operations: **CNPC.** An estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 235 acres would be located within a PIDAS. The land required for CNPC operations would represent approximately 0.2 percent of SRS's total land area of 310 square miles. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at SRS. Reduced operations would not change land use at SRS.

5.8.2 Visual Resources

5.8.2.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. No additional impacts to visual resources would occur beyond current and planned activities that are independent of this action. Construction of the MOX/PDCF facilities will temporarily change the visual appearance of the F-Area. Since this is an already developed site and the two buildings will be of a similar type to those there now, there will not be a change in the visual classification. Existing visual resources is discussed in Section 4.8.2.

5.8.2.2 *DCE Alternative (CPC)*

5.8.2.2.1 Construction

Activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary (approximately 6.7 miles away). Site visitors and employees observing CPC construction would find these activities similar to the past construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Cranes used during construction of a CPC could create short-term visual impacts, but would not be out of character for an industrial site such as SRS. The construction lay-down areas, temporary parking, and temporary construction office trailers would also be typical for an industrial site. After construction of the facilities are complete, cranes and temporary construction office trailers would be removed, and construction lay-down areas would be regraded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel.

5.8.2.2.2 Operations

A CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. Views of the buildings, tanks, and exhaust stacks by visitors or employees using the SRS road network (Road C and Burma Road) would be limited by the forest vegetation and rolling terrain surrounding the location. Only the exhaust stacks would exceed the height of the forest vegetation. However, this change would be consistent with the currently developed areas of SRS.

5.8.2.3 *CCE Alternative*

5.8.2.3.1 CNC (CPC + CUC)

Visual resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.2.2 as well as the impacts discussed below.

Construction: **CUC.** Activities related to the construction of new buildings required for a CUC would be similar to a CPC described in Section 5.8.2.2.1. There would be a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary. Site visitors and employees observing CUC construction would find these activities similar to the past construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNC.** A CNC would encompass approximately 195 acres of buildings, walkways, parking, and buffer space. Structures would include one- and two-story industrial facilities, cooling towers, and water tanks that would change the appearance of the reference location. Views of the buildings, tanks, and exhaust stacks by visitors or employees using the SRS road network would be limited by the forest vegetation and rolling terrain surrounding the location. Any changes would be consistent with the currently developed areas of SRS.

5.8.2.3.2 CNPC (CPC + CUC + A/D/HE Center)

Visual resources impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.2.2, the CUC impacts discussed in Section 5.8.2.3.1, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Activities related to the construction of new buildings required for an A/D/HE Center would be similar in nature to a CPC and CUC. Any changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary. Site visitors and employees observing A/D/HE Center construction would find these activities similar to the past construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNPC.** A CNPC would be a large complex of industrial facilities, parking lots, and a buffer zone encompassing approximately 545 acres. Because of the reference site's interior location on the SRS site, a CNPC would not be noticeable beyond the SRS boundary. Views of the complex by visitors or employees using the SRS road network would be limited by the forest vegetation and rolling terrain surrounding the location. Any changes would be consistent with the currently developed areas of SRS.

5.8.2.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at SRS.

5.8.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.8.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.8.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to the site electrical infrastructure beyond current and planned activities (MOX/PDCF facilities) that are independent of this action. SRS currently uses about 370,000 MWh per year of electricity. Additional site infrastructure information is discussed in Section 4.8.3.

5.8.3.2 *DCE Alternative (Greenfield CPC)*

5.8.3.2.1 Construction

The projected demand on the site electrical infrastructure resources associated with construction activities for a CPC are shown in Table 5.8.3-1.

Table 5.8.3-1—Electrical Infrastructure Requirements for Construction of CPC, CUC, and the A/D/HE Center–SRS

Proposed Alternatives	**Electrical**	
	Energy (MWh/yr)	**Peak Load (MWe)**
Site capacity	4,400,000	330
Available site capacity	4,030,000	260
No Action Alternative		
Total site requirement	370,000	70
Percent of site capacity	8%	21%
CPC		
Total site requirement	13,000	3.0
Percent of site capacity	<1%	1%
Percent of available capacity	<1%	1.2%
CUC		
Total site requirement	11,000	2.5
Percent of site capacity	<1%	<1%
Percent of available capacity	<1%	1%
A/D/HE Center		
Total site requirement	55,000	12.7
Percent of site capacity	1.2%	3.8%
Percent of available capacity	1.4%	4.9%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.
NA = not applicable.

The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for a CPC (Greenfield or use of MOX/PDCF) for the projected 6-year construction period.

5.8.3.2.2 Operations

The estimated annual site electrical infrastructure requirements for a CPC are presented in Table 5.8.3-2. There would be negligible impacts to site infrastructure.

Table 5.8.3-2—Electrical Infrastructure Requirements for Operations Of the CPC,CUC, A/D/HE Center, CNC, and the CNPC–SRS

Proposed Alternatives	**Electrical**	
	Energy	**Peak Load**
	(MWh/yr)	**(MWe)**
Site capacity	4,400,000	330
Available site capacity	4,030,000	260
No Action Alternative		
Total site requirement	370,000	70
Percent of site capacity	8%	21%
CPC		
Total site requirement	48,000	11
Percent of site capacity	1.1%	3.3%
Percent of available capacity	1%	4.2%
CUC		
Total site requirement	168,000	18.4
Percent of site capacity	3.8%	5.6%
Percent of available capacity	4.1%	7.1%
A/D/HE Center		
Total site requirement	52,000	11.9
Percent of site capacity	1.2%	3.6%
Percent of available capacity	1.3%	4.6%
CNPC (CPC + CUC + A/D/HE Center)		
Total site requirement	268,000	41.3
Percent of site capacity	6.1%	12.4%
Percent of available capacity	6.6%	15.9%

Source: NNSA 2007.

5.8.3.3 *CCE Alternative*

5.8.3.3.1 CNC (CPC + CUC)

Site electrical infrastructure impacts from the construction of a CUC and operation of a CNC would include the CPC impacts discussed in Section 5.8.3.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would require additional infrastructure demands during the construction phase. During construction, these facilities would require a peak electrical demand of approximately 2.5 MWe, which is approximately 1 percent of the current electrical usage at SRS and less than 1 percent of available capacity. The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for a CUC for the projected 6-year construction period. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources. The estimated electrical infrastructure requirements for construction of a CUC are presented in Table 5.8.3-1.

***Operations:* CNC.** During operations, a CNC would require approximately 15 percent of the current available electrical capacity at SRS. The core operations of a CNC would be similar to the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site electrical infrastructure requirements for operation of a CNC are presented in Table 5.8.3-2. There would be negligible impacts to site infrastructure.

5.8.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site electrical infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for an A/D/HE Center for the projected 5-year construction period. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources. The estimated site electrical infrastructure requirements for construction of an A/D/HE Center are presented in Table 5.8.3-1.

***Operations:* CNPC.** During operations, a CNPC would require less than 20 percent of the current available electrical capacity at SRS. The estimated annual site electrical infrastructure requirements for operation of a CNPC are presented in Table 5.8.3-2. There would be negligible impacts to the site electrical infrastructure.

5.8.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use at the tritium facilities would be reduced from 27,500 MWhr per year to 22,500 MWhr per year. Because there is currently adequate electrical capacity at the site, this reduction would not have any major impact on operations.

5.8.4 Air Quality and Noise

5.8.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. The SRS is located in the Augusta-Aiken Interstate AQCR. All areas within this region are classified as achieving attainment with the NAAQS (40 CFR 50).There would be no additional impacts to air quality and noise beyond temporary fugitive dust emissions, and traffic and construction noise resulting from construction of the MOX/PDCF facilities. Operation of these facilities is not expected to diminish the existing level of air quality, impact existing permits, or exceed any established air release limits. SRS is presently in compliance with all NAAQs. Existing air quality and noise resources is discussed in Section 4.8.4.

5.8.4.2 *DCE Alternative (CPC)*

5.8.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of new structures would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, $PM_{10,}$ total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on factors provided in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicle) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons/acres per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.8.4-1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the SRS site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.8.4-1—Estimated Peak Nonradiological Air Emissions for the CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

***Construction:* Radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* Nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.8.4–2. These emissions would be incremental to the SRS baseline. If SRS is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary. The maximum concentrations ($\mu g/m^3$) at the SRS site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.8.4-3.

Table 5.8.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

Table 5.8.4-3—Criteria Pollutant Concentrations at SRS Boundary for CPC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline [a] ($\mu g/m^3$)	Background Ambient Air Concentration	CPC—200 ppy Maximum Incremental Concentration ($\mu g/m^3$)
Carbon Monoxide	8-hour(1)	10	No Data	2.58
	1-hour(1)	40	No Data	3.66
Lead	Quarterly Average	1.5	0.001	No Data
Nitrogen Dioxide	Annual	100	7.9	1.28
Particulate Matter (PM_{10})	Annual(2)	50	17.6	0.0356
	24-hour(1)	150	36	0.18
Particulate Matter ($PM_{2.5}$)	Annual(3)	15	13.5	No Data
	24-hour(4)	65	32.1	No Data
Ozone	8-hour(5)	0.08 ppm	0.069 ppm	No Data
	1-hour(6)	0.12 ppm	0.082 ppm	No Data
Sulfur Oxides	Annual	80	4.5	0.06296
	24-hour(1)	365	18.3	0.454
	3-hour(1)	1300	34.0	0.992
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.05

Source: SCDHEC 2005; Janke 2007.

[1] Not to be exceeded more than once per year.

[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration within an area must not exceed 50 ug/m^3.

[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations must not exceed 15.0 ug/m^3.

[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 65 ug/m^3.

[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations must not exceed 0.08 ppm.

[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1; (b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Operations: **Radiological impacts.** Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.8.4-4). Releases would be small. Total radionuclide emissions at SRS would increase by less than 1 percent. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.8.4-4—Annual Radiological Air Emissions for the CPC at SRS–Operations

Isotope	Baseline [a] (Ci/yr)	Annual Emissions (Ci/yr)
Americium-241	2.67×10^{-4}	3.12×10^{-7}
Plutonium-239	2.20×10^{-3}	1.02×10^{-5}
Plutonium-240	8.51×10^{-7}	2.66×10^{-6}
Plutonium-241	6.70×10^{-6}	1.96×10^{-4}
Uranium-234	3.26×10^{-4}	5.02×10^{-9}
Uranium-235	1.10×10^{-5}	1.58×10^{-10}
Uranium-236	7.17×10^{-10}	2.56×10^{-11}
Uranium-238	4.12×10^{-4}	1.42×10^{-12}
Tritium	4.74×10^{4}	–
Krypton-85	6.47×10^{4}	–
All other	$\mathbf{3.06 \times 10^{-1}}$	–
Total	$\mathbf{1.12 \times 10^{5}}$	$\mathbf{2.09 \times 10^{-4}}$

Source: NNSA 2007.

[a] Based on calendar year 2001 data. The No Action Alternative is represented by the baseline.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-5, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations–SRS

Receptor	CPC-200 ppy
Offsite MEI[a] (mrem/yr)	2.1×10^{-6}
Population within 50 miles (person-rem per year) [a]	1.5×10^{-4}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.8.4-4and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.8.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.8.4-6 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately

55–85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (approximately 6.7 miles) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.8.4-6—Peak Noise Levels Expected from Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 6.7 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely produce increases in traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.8.4.3 *CCE Alternative*

5.8.4.3.1 CNC (CPC + CUC)

Air Quality and Noise impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.4.2 as well as the impacts discussed below for the CUC.

5.8.4.3.1.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.8.4-1 would be representative of a CUC. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model CPC construction activities and tend to overestimate impacts.

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Table 5.8.4-7—Criteria Pollutant Concentrations at SRS for CUC and CNC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline (μg/m^3)	Background Ambient Air Concentration (μg/m^3)	CUC Maximum Incremental Concentration (μg/m^3)	CNC Maximum Incremental Concentration (μg/m^3)
Carbon Monoxide	8-hour(1)	10	No Data	0.2	2.78
	1-hour(1)	40	No Data	No Data	3.66
Lead	Quarterly Average	1.5	0.001	No Data	No Data
Nitrogen Dioxide	Annual	100	7.9	0.9	2.18
Particulate Matter (PM$_{10}$)	Annual(2)	50	17.6	52.4	52.4
	24-hour(1)	150	36	17.5	17.7

Table 5.8.4-7—Criteria Pollutant Concentrations at SRS for CUC and CNC–Operations (continued)

Pollutant	Averaging Times	Most Stringent Standard or Guideline (μg/m^3)	Background Ambient Air Concentration (μg/m^3)	CUC Maximum Incremental Concentration (μg/m^3)	CNC Maximum Incremental Concentration (μg/m^3)
Particulate Matter ($PM_{2.5}$)	Annual$^{(3)}$	15	13.5	0.02	0.02
	24-hour$^{(4)}$	65	32.1	0.2	0.2
Ozone	8-hour$^{(5)}$	0.08 ppm	0.069 ppm	No Data	No Data
	1-hour$^{(6)}$	0.12 ppm	0.082 ppm	No Data	No Data
Sulfur Oxides	Annual	80	4.5	2.1	2.16
	24-hour$^{(1)}$	365	18.3	52.4	52.8
	3-hour$^{(1)}$	1300	34.0	17.5	18.5
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.05$^{(7)}$	0.1

Source: SCDHEC 2005; Janke 2007.

[1] Not to be exceeded more than once per year.

[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.

[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.

[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.

[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1, as determined by appendix H.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

[7] No data exists for TSP for the CUC. TSP concentrations estimated based on CPC data.

***Operations:* CUC and CNC nonradiological impacts.** CUC activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, and sulfur dioxide. The estimated emission rates for non-radiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from a CUC to the SRS baseline. The results are presented in Table 5.8.4-7. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. CUC contribution to non-radiological emissions should not cause any standard or guideline to be exceeded. As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

***Operations:* CUC and CNC radiological impacts.** A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of a CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 Curies (2.17 kg) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding SRS, and SRS workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations–SRS

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	8.2×10^{-4}	8.2×10^{-4}
Population within 50 miles (person-rem per year)	0.06	0.06

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary

5.8.4.3.1.2 Noise

***Construction:* CUC.** Anticipated noise impacts from the construction of a CUC are similar to those described for a CPC in Section 5.8.4.2.

***Operations:* CUC and CNC.** Anticipated noise impacts from the operation of a CNC are similar to those described for a CPC in Section 5.8.4.2.

5.8.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air quality and noise impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.8.4.3.2.1 Air Quality

***Construction:* A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for a CPC and CUC. However, due to the potential to disturb approximately 300 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons/acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.8.4-8a. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.8.4-8a—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	0.15
24-hour	150	41.2

Source: Janke 2007.

The results presented above represent a conservative estimate if PM_{10} emissions at the site boundary. As shown, concentrations would remain well below any regulatory limits.

Construction: **A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **A/D/HE Center and CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. CPC and CUC non-radiological emissions are discussed in sections 5.8.4.2.1 and 5.8.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.8.4-9. These emissions would be incremental to the SRS baseline.

Table 5.8.4-9—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS emissions (tons/year)	
Oxides of Nitrogen	91
Carbon Monoxide	31
Volatile Organic Compounds	31
Particulate Matter	18
Sulfur Dioxide	5
Hazardous Air Pollutants and Effluents	22

Source: NNSA 2007.

The maximum concentrations (µg/m^3) at the SRS site boundary that would be associated with the release of criteria pollutants presented in Table 5.8.4-10. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. There would be a potential to exceed the annual standards for PM-10 and PM-2.5. However, because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.8.4-10—Criteria Pollutant Concentrations at the SRS Site Boundary for the CNPC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline (µg/m^3)	Background Ambient Air Concentration (µg/m^3)	A/D/HE Center Maximum Incremental Concentration (µg/m^3)	CNPC Maximum Incremental Concentration (µg/m^3)
Carbon Monoxide	8-hour$^{(1)}$	10	No Data	1.91	4.69
	1-hour$^{(1)}$	40	No Data	5.8	9.46
Lead	Quarterly Average	1.5	0.001		
Nitrogen Dioxide	Annual	100	7.9	0.01	2.19
Particulate Matter (PM_{10})	Annual$^{(2)}$	50	17.6	0.0019	52.4
	24-hour$^{(1)}$	150	36	0.5	18.2
Particulate Matter ($PM_{2.5}$)	Annual$^{(3)}$	15	13.5	0.0019	52.4
	24-hour$^{(4)}$	65	32.1	0.5	18.2
Ozone	8-hour$^{(5)}$	0.08 ppm	0.069 ppm	No Data	No Data
	1-hour$^{(6)}$	0.12 ppm	0.082 ppm	No Data	No Data

Table 5.8.4-10—Criteria Pollutant Concentrations at the SRS Site Boundary for the CNPC–Operations (continued)

Pollutant	Averaging Times	Most Stringent Standard or Guideline (μg/m^3)	Background Ambient Air Concentration (μg/m^3)	A/D/HE Center Maximum Incremental Concentration (μg/m^3)	CNPC Maximum Incremental Concentration (μg/m^3)
Sulfur Oxides	Annual	80	4.5	0.005	2.16
	24-hour$^{(1)}$	365	18.3	0.14	52.94
	3-hour$^{(1)}$	1300	34.0	0.62	19.1
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.0024	0.1

Source: SCDHEC 2005; Janke 2007.

[1] Not to be exceeded more than once per year.

[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.

[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.

[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.

[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1, as determined by appendix H.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

Operations: **A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. CPC and CUC radiological emissions are discussed in sections 5.8.4.2.1 and 5.8.4.3.1 respectively, and are not repeated here. The total radiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section).

During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.8.4-11.

Table 5.8.4-11—Annual Radiological Air Emissions for A/D/HE Center–Operations

Radionuclide	Emissions (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding SRS, and SRS workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-12, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of an A/D/HE Center resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-12—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations–SRS

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	6.2×10^{-7}	8.2×10^{-4}
Population within 50 miles (person-rem per year)	4.5×10^{-5}	0.06

Source: Tetra Tech 2008.

[a] The offsite MEI is assumed to reside at the site boundary.

5.8.4.3.2.2 Noise

Construction: **A/D/HE Center.** Anticipated noise impacts from the construction of an A/D/HE Center would be similar to those described for a CPC in Section 5.8.4.2.

Operations: **A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of an A/D/HE Center and CNPC would be similar to those described for a CPC in Section 5.8.4.2.

5.8.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to air quality, SRS is located within the Augusta-Aiken Interstate AQCR. All areas within this region are classified as achieving attainment with the NAAQS (40 CFR 50). Reduced tritium operations would have no significant impact on nonradiological air quality at SRS. With respect to radiological emissions, normal operations tritium air emissions could decrease to approximately 2,500 Curies. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. Tritium oxide releases accounted for 66 percent of the dose to the MEI. Reducing tritium emissions would not significantly change this already small dose.

5.8.5 Water Resources

Environmental impacts associated with the proposed alternatives at SRS could affect groundwater resources. No impacts to surface water are expected. At SRS, groundwater resources would likely be used to meet all construction and operations water requirements. Table 5.8.5–1 summarizes existing surface water and groundwater resources at SRS, the total SRS site-wide water resource requirements for each alternative, and the potential changes to water resources at SRS resulting from the proposed alternatives are summarized in Table 5.8.5-2.

Table 5.8.5-1—Potential Changes to Water Resources from the CPC, CNC, and CNPC – SRS, Construction

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground
Water Use (gallons per year)	3,500,000,000
CPC	
Water Requirement (total gallons)	20,900,000
Percent change from No Action Alternative	<1%
CUC	
Water Requirement (total gallons)	5,200,000
Percent change from No Action Alternative	<1%
A/D/HE Center	
Water Requirement (total gallons)	2,022,000
Percent change from No Action Alternative	<1%

Source: NNSA 2007.

5.8.5.1 *No Action Alternative*

The regional drainage is dominated by the north to south running Savannah River. The Savannah River is classified as a freshwater source that is suitable for primary and secondary contact recreation, drinking after appropriate treatment, balanced native aquatic species development, and industrial and agricultural purposes. Data from the river's monitoring locations generally indicate that South Carolina's freshwater standards are being met (NRC 2005). SRS is expected to continue using approximately 3.5 billion gallons of water per year.

The SRS is underlain by southeast-dipping wedges of unconsolidated sediments of the Atlantic Coastal Plain that extends from its contact with the Piedmont Province at the Fall Line to the edge of the continental shelf. Contaminant fate and transport models predict that the aquifer is expected to return to an uncontaminated state within 2 to 115 years, depending on the specific contaminant (NRC 2005).

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Existing water resources are discussed in Section 4.8.5.

5.8.5.2 *DCE Alternative (CPC)*

5.8.5.2.1 Surface Water

Construction. Surface water would not be used to support the construction of a CPC at SRS as groundwater is the source of water at SRS. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, no onsite discharge of sanitary wastewater would be minimized.

During construction, an estimated 10.5 million gallons of liquid wastes would be generated. It is expected that construction should take approximately 6 years. Assuming an equal generation of liquid waste over that timeframe, it is estimated that 1.75 million gallons per year of liquid waste would be generated. It is estimated that one-third of the liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to SRS's NPDES permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. SRS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The CPC reference location at SRS is not within the 100-year floodplain. Therefore, no impact on the floodplain is anticipated. Information concerning the 500-year floodplain in the area of the reference location is not available.

Operations. No impacts on surface water resources are expected as a result of operations at SRS. No surface water would be used to support facility activities. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. SRS's current NPDES permit would require modification and approval concerning any increase in wastewater discharges. Sanitary wastewater would be treated, monitored, and discharged into site streams and the Savannah River, as required under SRS's NPDES permit. No industrial or other NPDES-regulated discharges to surface waters are anticipated.

The CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, analyzed, and only discharged if uncontaminated. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

Table 5.8.5-2—Changes to Water Resources from CPC, CNC, and CNPC–Operations

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground
Water Use (gal/yr)	3,500,000,000
CPC	
Water Requirement (gal/yr)	80,500,000
Percent change from No Action Alternative	2.3%
CUC	
Water Requirement (gal/yr)	105,000,000
Percent change from No Action Alternative	3%
CNC (CPC + CUC)	
Water Requirement (gal/yr)	185,500,000
Percent change from No Action Alternative	5.3%
A/D/HE Center	
Water Requirement (gal/yr)	130,000,000
Percent change from No Action Alternative	3.7%
CNPC (CPC + CUC + A/D/HE Center)	
Water Requirement (gal/yr)	315,500,000
Percent change from No Action Alternative	9%

Source: NNSA 2007.

5.8.5.2.2 Groundwater

Construction. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require 20,900,000 gallons, of groundwater. The percent change from the No Action Alternative would be less than 1 percent. The total site water requirement including these quantities would be feasible since SRS has absolute ownership of the groundwater resource underlying SRS land and has no limit on the amount of water withdrawn annually.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Activities at SRS for a CPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup.

Approximately 80.5 million gallons per year is needed for the operation of a CPC. This would represent a 2.3 percent increase in water use at SRS. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually. However, SRS withdrawal routinely exceeds 100,120 gallons per day of water, and therefore the withdrawal rate is reported to the South Carolina Water Resource Commission.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.8.5.3 *CCE Alternative*

5.8.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.5.2 as well as the impacts discussed below.

***Surface water:* CUC construction.** Surface water would not be used to support the construction of a CUC at SRS as groundwater is the source of water at SRS. Therefore, there would be no impact to surface water availability from construction. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. SRS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The CUC reference location at SRS is not within the 100-year floodplain. Therefore, no impact on the floodplain is anticipated. Information concerning the 500-year floodplain in the area of the reference location is not available.

***Surface water:* CNC operations.** No impacts on surface water resources are expected as a result of operations at SRS. No surface water would be used to support facility activities. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. SRS's current NPDES permit would require modification and approval concerning any increase in wastewater discharges. Sanitary wastewater would be treated, monitored, and discharged into site streams and the Savannah River, as required under SRS's NPDES permit. No industrial or other NPDES-regulated discharges to surface waters are anticipated. Minimal impacts to groundwater quality are expected from the operation of a CNC because groundwater extracted would be collected and treated in on-site treatment facilities to meet the discharge limits of the NPDES permit prior to release to surface water. Utility and sanitary wastewater would be treated prior to discharge in accordance with the applicable permits.

A CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNC liquid process waste facilities for the plutonium purification process.

Groundwater: **CUC construction.** Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require 5.2 million gallons of groundwater. The percent change from the No Action Alternative is less than 1 percent. The total site water requirement including these quantities would be feasible since SRS has absolute ownership of the groundwater resource underlying SRS land and has no limit on the amount of water withdrawn annually.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNC operations.** Activities at SRS for a CNC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. The percent change from the No Action Alternative would be 5.3 percent. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control.

5.8.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Surface water: **A/D/HE Center construction.** Surface water impacts from the construction of an A/D/HE Center would be similar to those discussed for the construction of a CPC and CUC.

***Surface water:* CNPC operations.** Surface water impacts from the operation of an A/D/HE Center would be similar to those discussed for a CPC and CUC.

***Groundwater:* A/D/HE Center construction.** It is estimated that construction activities would require approximately 2 million gallons of groundwater. Additional impacts from the construction of an A/D/HE Center would be similar to those discussed for the construction of a CPC and CUC.

***Groundwater:* CNPC operations.** Activities at SRS for a CNPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. The percent change in water consumption from the No Action Alternative would be approximately 9 percent. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control.

5.8.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in water use would be inconsequential, as SRS has plentiful water supplies. Reduced operations could reduce tritium effluents. Tritium accounts for more than 99 percent of the total amount of radioactivity released from the site to the Savannah River. In 2005, a total of 4,480 Ci of tritium were released to the river. This total—based on the measured tritium concentration at River Mile 118.8—includes releases from Georgia Power Company’s Vogtle Electric Generating Plant (1,860 Ci). The 12-month average tritium concentration measured in Savannah River water near River Mile 118.8 (5.46×10^{-4} pCi per liter) was 17 percent less than the 2004 concentration of 6.61×10^{-4} pCi per liter. These concentrations are well below the EPA maximum tritium contaminant level of 20,000 pCi per liter for drinking water.

5.8.6 Geology and Soils

5.8.6.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to geology and soil resources beyond current and planned construction of the MOX/PDCF facilities which are expected to have minor impacts on Coastal Plain Sediments, which would be mitigated by soil erosion and surface water runoff protective measures. Existing geology and soils resources are discussed in Section 4.8.6.

5.8.6.2 *DCE Alternative (CPC)*

5.8.6.2.1 Construction

The construction of a CPC is expected to disturb land adjacent to existing facilities at SRS. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent 0.07 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total CPC footprint, whether a Greenfield facility or use of the MOX/PDCF infrastructure. The post-construction developed area would be approximately 110 acres.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes as it is not presently farmed. The FPPA (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) since the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to CPC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

5.8.6.2.2 Operations

The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1B, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.8.6.3 *CCE Alternative*

5.8.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.6.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would primarily be made up of a new structure to contain a nuclear facility composed of the Uranium Processing Facility (UPF) and HEU storage (described in Sections 3.4.2 and 3.5.1.1) within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. The land required for CUC construction would represent 0.03 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes as it is not presently farmed. The Farmland Protection Policy Act (FPPA) (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) since the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to CUC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities.

Operations: **CNC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres would be located within a PIDAS. The land required for CNC operations would represent 0.09 percent of SRS's total land area of 310 square miles, an extremely small proportion.

The operation of a CNC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.8.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Construction of an A/D/HE Center would require an estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The land required for A/D/HE Center construction would represent 0.03 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes because it is not presently farmed. The FPPA (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) because the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to A/D/HE Center construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

Operations: **CNPC.** An estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 235 acres would be located within a PIDAS. The operation of a CNPC would not be expected to result in impacts on geologic and soil resources.

5.8.7.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact**.**

5.8.7 Biological Resources

5.8.7.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Small animals, reptiles and birds may be temporarily dislocated during the construction process, but no permanent changes to biological resources are expected as a result of construction and operation of the MOX/PDCF facilities. Existing biological resources are discussed in Section 4.8.7.

5.8.7.2 *DCE Alternative (CPC)*

5.8.7.2.1 Terrestrial Resources

Construction. The area identified for construction of a CPC is located on a heavily wooded tract that is topographically flat and in an area that supports a wide diversity of birds, mammals, reptiles, amphibians, and aquatic species.

Approximately 140 acres of forest and associated wildlife habitat would be cleared or modified during CPC construction. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include stress and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. Approximately 110 acres of land would be modified or lost from operation of a CPC. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.8.7.2.2 Wetlands

Construction. Of the known 370 isolated upland Carolina bays and wetland depressions at SRS, none are located on the CPC site (SRS 2007). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

Operations. There are no adverse impacts predicted to wetlands from implementation of any of a CPC production capacities. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect any wetlands.

5.8.7.2.3 Aquatic Resources

This site is located on a topographic divide, so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch. Upper Three Runs is considered to be a valuable aquatic resource, not only to SRS, but also to regional ecosystem biodiversity (Wike, et al. 2006).

Construction. There are no perennial or seasonal aquatic habitats within the CPC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

5.8.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at SRS, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of any new facilities on any threatened and endangered species. There are no known threatened or endangered species or species proposed for listing present at the proposed CPC, CUC, and A/D/HE Center site (Wike, et al. 2006).

Construction. Approximately 140 acres of forest and associated wildlife habitat would be cleared or modified during CPC construction. Should SRS be selected for the construction and operation of a CPC, then DOE, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Approximately 110 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential impacts to any special-interest species population.

5.8.7.3 *CCE Alternative*

5.8.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.8.7.2 as well as the impacts discussed below.

***Terrestrial resources:* CUC construction.** The area identified for construction of a CUC is located on a heavily wooded tract that is topographically flat (Wike, et al. 2006) and in an area that supports a wide diversity of birds, mammals, reptiles, amphibians, and aquatic species. Approximately 50 acres of land would be modified during CUC construction. Impacts would be similar to those described for the construction of a CPC in Section 5.8.7.2.1.

***Terrestrial resources:* CNC operations.** An estimated 195 acres of land would be modified or lost. Of this, approximately 55 acres would be located within a PIDAS. Impacts would be similar to those described for a CPC in Section 5.8.7.2.1.

Wetlands: **CUC construction.** Of the known 300 isolated upland Carolina bays and wetland depressions at SRS, none are located on the CUC site (Wike, et al. 2006). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

Wetlands: **CNC operations.** There are no adverse impacts predicted to wetlands from operation of a CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect any wetlands.

Aquatic resources: **CUC construction.** There are no perennial or seasonal aquatic habitats within the proposed CUC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNC operations.** There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

Threatened and endangered species: **CUC construction.** Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. There are no known threatened or endangered species or species proposed for listing present at the proposed CUC site (Wike, et al. 2006).

Threatened and endangered species: **CNC operations.** Acreage permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest would be approximately 195 acres. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations would minimize the potential impacts to any special-interest species population.

5.8.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.8.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Terrestrial resources: **A/D/HE Center construction.** An estimated 300 acres of land would be required to construct the A/D/HE Center. Additional impacts would be similar to those described for a CPC in Section 5.8.7.2.1.

Terrestrial resources: **CNPC operations.** An estimated 545 acres of land would be required to support CNPC operations. Potential impacts would be similar to those described in Section 5.8.7.2.1.

Wetlands: **A/D/HE Center construction.** Of the known 300 isolated upland Carolina bays and wetland depressions at SRS, none are located on the A/D/HE Center site (Wike, et al. 2006). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

Wetlands: **CNPC operations.** There are no adverse impacts predicted to wetlands from implementation of any of the CNPC production capacities. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations are not expected to adversely affect any wetlands.

Aquatic resources: **A/D/HE Center construction.** There are no perennial or seasonal aquatic habitats within the proposed A/D/HE Center location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNPC operations.** There would be no direct discharge of untreated operational effluent from CNPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

Threatened and endangered species: **A/D/HE Center construction.** An estimated 300 acres of land would be modified or lost during construction activities for an A/D/HE Center. Additional impacts would be similar to those described for the construction of a CPC in Section 5.8.7.2.1.

Threatened and endangered species: **CNPC operations.** Acreage permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest would be approximately 545 acres. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations would minimize the potential impacts to any special-interest species population.

5.8.6.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact**.**

5.8.8 Cultural Resources

5.8.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to cultural and archeological resources beyond current and planned activities that are independent of this action. Construction of the MOX/PDCF facilities is not expected to impact any of the 800 recorded archeological sites at SRS. Prior to any soil disturbance, a thorough screening of all recorded sites and an on-site investigation for the presence of archeological sites or artifacts would be conducted. Existing cultural and paleontological resources are discussed in Section 4.8.8.

5.8.8.2 *DCE Alternative (CPC)*

5.8.8.2.1 Cultural Resources

Construction: **CPC.** Under this alternative, a block of land would be disturbed during construction. The size of the disturbed area would vary by the output of the facility, and would include SRS buildings and structures (inside the PIDAS fence), security fencing and perimeter roads, support buildings and parking, a retention basin, a concrete batch plant, a construction laydown area, and buffer zone surrounding the facility. For purposes of analyzing impacts to cultural resources, approximately 140 acres of land could be disturbed/affected.

The presence of cultural resources that would be impacted during construction of a CPC at the reference location or any other location at SRS is unknown. However, the reference location at SRS is located in Archaeological Zone 2 (moderate archaeological potential) and very close to Zone 1 (high archaeological potential). This location has not been previously disturbed by construction. Thus, there is a moderate probability that cultural resources are located within the reference location and would be impacted by the construction of a CPC. The probability that resources would be disturbed by construction of a CPC at another location within SRS is dependent on what archaeological zone the facility would be located in and whether that location has been previously disturbed. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CPC at SRS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here, but will be in the site-specific tiered EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the South Carolina SHPO and in accordance with the *Archaeological Resources Management Plan of the Savannah River Archaeological Research Program* (SRARP 1989). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the South Carolina SHPO.

Operations: **CPC.** Operation of the CPC would have no impact on cultural resources.

5.8.8.2.2 Paleontological Resources

Construction: **CPC.** Paleontological resources at SRS are comprised exclusively of marine invertebrate fossils. These types of fossils are relatively widespread and common, and have a relatively low research potential or scientific value, except for deposits containing giant oysters. Thus, it is probable that paleontological resources would be impacted due to construction of a CPC or the associated infrastructure at the reference location. This is also true for any other area at SRS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be treated appropriately, as determined by DOE.

Operations: **CPC.** Operation of a CPC would have no impact on paleontological resources.

5.8.8.3 *CCE Alternative*

5.8.8.3.1 CNC (CPC + CUC)

Cultural and archaeological resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.8.2 as well as the impacts discussed below.

Cultural resources: **CUC construction.** As described in Section 3.5.2, a CUC would be comprised of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, a CUC would be approximately 35 acres. All buildings would be either one or two stories.

The presence of cultural resources that would be impacted during construction of a CUC at the reference location or any other location at SRS is unknown. However, the reference location at SRS is located in Archaeological Zone 2 (moderate archaeological potential) and very close to Zone 1 (high archaeological potential). This location has not been previously disturbed by construction. Thus, there is a moderate probability that cultural resources are located within the reference location and would be impacted by the construction of a CUC. The probability that resources would be disturbed by construction of a CUC at another location within SRS is dependent on what archaeological zone the facility would be located in and whether that location has been previously disturbed. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CUC at SRS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here, but will be in the site-specific tiered EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by construction of a CUC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the South Carolina SHPO and in accordance with the *Archaeological Resources Management Plan of the Savannah River Archaeological Research Program* (SRARP 1989). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the South Carolina SHPO.

Cultural resources: **CNC operations.** Operation of a CNC would have no impact on cultural resources.

Paleontological resources: **CUC construction.** It is probable that paleontological resources would be impacted due to construction of a CUC or the associated infrastructure at the reference location. This is also true for any other area at SRS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be treated appropriately, as determined by DOE.

Paleontological resources: **CNC operations.** Operation of a CNC would have no impact on paleontological resources.

5.8.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural and archaeological resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.8.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Cultural resources: **A/D/HE Center construction.** Approximately 300 acres of land would be disturbed during construction activities of an A/D/HE Center. Additional impacts to cultural resources would be similar to those described for the construction of a CPC in Section 5.8.8.2.1

Cultural resources: **CNPC operations.** Operation of a CNPC would have no impact on cultural resources.

Paleontological resources: **A/D/HE Center construction.** Approximately 300 acres of land would be disturbed during construction activities of an A/D/HE Center. Additional impacts to paleontological resources would be similar to those described for the construction of the CPC in Section 5.8.8.2.2

Paleontological resources: **CNPC operations.** Operation of a CNPC would have no impact on paleontological resources.

5.8.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to cultural resources, reduced operations would have no impact**.**

5.8.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and Capability-Based Alternatives.

5.8.9.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. The current employment level at SRS is about 15,000 employees. The construction of the MOX/PDCF facilities would ad about 1,968 construction jobs to this level and the operation of these two facilities would require 1,120 additional employees. Existing socioeconomic characteristics at SRS are discussed in Section 4.8.9.

5.8.9.2 *DCE Alternative (CPC)*

5.8.9.2.1 Regional Economic Characteristics

Construction. Construction of a CPC would require approximately 2,900 worker-years of labor. During peak construction, about 850 workers would be employed at the site for a Greenfield CPC, and 770 workers for the MOX/PDCF option. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. For a Greenfield CPC, it is estimated that 611 indirect jobs would be created, for a total of 1,461 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $27.5 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $44.5 million ($27.5 million direct and $17 million indirect). Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.8.9-1—Socioeconomic Impacts from Construction of Greenfield CPC

Socioeconomic Resource	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	611
Total Jobs Created	1,461
ROI Average Earning	$32,300
Direct Income Increase	$27,455,000
Indirect Income Increase	$17,025,000
Total Impact to the ROI	$44,480,000

Source: NNSA 2007, BEA 2007a.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,573 indirect jobs would be created, for a total of 3,353 jobs. The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $40,600 for the government services industry, direct income would increase by $72.3 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $108.2 million ($72.3 million direct and $35.9 million indirect). Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.8.9.2.2 Population and Housing

Construction. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 new workers), 1,275 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.8.9.2.3 Community Services

Construction. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operation. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

Table 5.8.9-2—Socioeconomic Impacts from Operations, All Facilities/Alternatives

Socioeconomic Resource	CPC	CUC	CNC	AD/HE	CNPC
Peak Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,573	826	2,091	1,577	3,466
Total Jobs Created	3,353	1,761	4,806	3,362	7,966
ROI Average Earning	$40,600	$40,600	$40,600	$40,600	$40,600
Direct Income Increase	$72,268,000	$37,961,000	$110,229,000	$72,471,000	$182,700,000
Indirect Income Increase	$35,910,000	$18,863,000	$54,773,000	$36,011,000	$90,784,000
Total Impact to the ROI	$108,178,000	$56,824,000	$165,002,000	$108,482,000	$273,484,000

Source: NNSA 2007, BEA 2007a.

5.8.9.3 *CCE Alternative*

5.8.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.9.2 as well as the impacts discussed below.

***Regional economic characteristics:* CUC construction.** As shown in Table 5.8.9-3, construction of a CUC would require approximately 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 934 indirect jobs would be created, for a total of 2,234 jobs. This represents less than 1 percent of the total ROI labor force. Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $42 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $68 million ($42 million direct and $26 million indirect). Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.8.9-3—Socioeconomic Impacts from Construction of the CUC

Socioeconomic Resource	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	934
Total Jobs Created	2,234
ROI Average Earning	$32,300
Direct Income Increase	$41,990,000
Indirect Income Increase	$26,038,000
Total Impact to the ROI	$68,028,000

Source: NNSA 2007, BEA 2007a.

Regional economic characteristics: **CNC operations.** Operation of a CUC would require 935 workers. In addition to the direct jobs created by operations, additional jobs would be created in other supporting industries. It is estimated that 826 indirect jobs would be created, for a total of 1,761 jobs.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $40,600 for the government services industry, direct income would increase by approximately $38 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $56.8 million ($38 million direct and $18.8 million indirect). Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Population and housing: **CNC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (935 new workers), 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

Community services: **CUC construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Community services: **CNC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

5.8.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of a full CNPC would include the CPC and CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Regional economic characteristics: **A/D/HE Center construction.** Construction of an A/D/HE Center would require 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,745 indirect jobs would be created, for a total of 6,565 jobs. This represents less than 4 percent of the total ROI labor force. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $123.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $199.9 million ($123.4 million direct and $76.5 million indirect). Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of an A/D/HE Center.

Table 5.8.9-4—Socioeconomic Impacts from Construction of the A/D/HE Center

Socioeconomic Resource	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	2,745
Total Jobs Created	6,565
ROI Average Earning	$32,300
Direct Income Increase	$123,386,000
Indirect Income Increase	$76,512,000
Total Impact to the ROI	$199,898,000

Source: NNSA 2007, BEA 2007a.

Regional economic characteristics: **CNPC operations.** Operation of a CNPC would require 4,500 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 3,466 indirect jobs would be created, for a total of 7,966 jobs. Based on the ROI average earnings of $40,600 for the government services industry, direct income would increase by $182.7 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $273.5 million ($182.7 million direct and $90.8 million indirect). Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

Population and housing: **A/D/HE Center construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (3,820 new workers), 5,730 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1.5 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of an A/D/HE Center.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (4,500 new workers), 4,500 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

Community services: **A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Community services: **CNPC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

5.8.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced tritium operations would reduce the workforce by 25 workers. This reduction would be inconsequential relative to the total site workforce of approximately 15,000.

5.8.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.8.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly; as such, the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 39.3percent of the ROI populations surrounding SRS. In 2000, minorities comprised 30.9 percent of the population nationally, 37.4 percent of the population in Georgia, and 33.9 percent of the population in South Carolina. The percentage of persons below the poverty level in the ROI at the time of the 2000 Census was 16.4 percent, which is higher than the 2000 national average of 12.4 percent and the statewide figures of 13 percent and 14.1 percent for South Carolina and Georgia, respectively.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at SRS are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.8.11, there are no large adverse impacts to any populations.

5.8.11 Health and Safety

5.8.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. In 2005, the estimated dose from atmospheric releases to MEI, at SRS, was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem/year. Operation of the MOX/PDCF facilities are expected to add less than 1.8 person-rem to the 50-mile population surrounding SRS. Existing health and safety at SRS is discussed in Section 4.8.11.

5.8.11.2 *DCE Alternative (CPC)*

5.8.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.8.11-1.

Table 5.8.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, CUC, and A/D/HE Center–SRS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	Greenfield CPC/MOX	CUC	A/D/HE Center
Peak Annual Employment	850/770	1,300	3,820
Total Recordable Cases	81/73	112	329
Total Lost Workday Cases	38/35	54	159
Total Fatalities	0.2/0.2	0.3	0.8
Project Duration (6 years)			
Total Recordable Cases	276/251	384	1,128
Total Lost Workday Cases	143/121	184	541
Total Fatalities	0.7/0.6	0.9	2.6

Source: NNSA 2007, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with a CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of ISMS programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.8.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem/yr.

DOE expects minimal public health impacts from the radiological consequences of CPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4).

Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-15} per year (i.e., a risk of 1 in more than a billion). The projected number of fatal cancers to the population within 50 miles would be less than or equal to 4×10^{-10} per year (i.e., a risk of 1 in more than a billion).

Table 5.8.11-2—Annual Radiological Impacts on the Public from CPC, CNC, and CNPC Operations–SRS

Receptor	Projects Under Consideration		
	CPC	CNC	CNPC
Population within 50 miles			
Collective dose (person-rem)	1.5×10^{-4}	0.06	0.06
Percent of natural background radiation[a]	5×10^{-8}	2×10^{-5}	2×10^{-5}
LCFs[b]	9×10^{-7}	4×10^{-5}	4×10^{-5}
Offsite MEI			
Dose (mrem)	2.0×10^{-6}	8.2×10^{-4}	8.2×10^{-4}
Percent of regulatory dose limit	2.0×10^{-5}	8.2×10^{-3}	8.2×10^{-3}
Percent of natural background radiation[a]	6.7×10^{-7}	2.7×10^{-4}	2.7×10^{-4}
Cancer fatality risk[b]	1×10^{-12}	5×10^{-10}	5×10^{-10}

Source: Tetra Tech 2008.

[a] The average annual dose from background radiation at SRS is approximately 300 mrem; the 985,980 people living within 50 miles of SRS in the year 2030 would receive an annual dose of 295,800 person-rem .

[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.

[c] The offsite MEI is assumed to reside at the site boundary, approximately 6.7 miles away. An actual residence may not currently be present at this location.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.

- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard "weapons grade" isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem/yr) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in a CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to a CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.8.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at SRS–Operations

	CPC	**CNC**	**CNPC**
Number of Radiological Workers	1,150	1,640	2,040
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population			
Collective dose (person-rem)	333	344	386
Cancer fatality risk[c]	0.20	0.21	0.23

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 800-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at the CPC would be 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.8.11-4.

Table 5.8.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC–SRS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CNC	CNPC
Total Workers	1,780	2,715	4,500
Total Recordable Cases	77	117	195
Total Lost Workday Cases	40	61	101
Total Fatalities	0.07	0.11	0.18

Source: NNSA 2007, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of a CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.8.11.3 *CCE Alternative*

5.8.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.11.2 as well as the impacts discussed below.

***Construction:* CUC.** No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.8.11-1.

***Operations:* CNC.** DOE expects minimal public health impacts from the radiological consequences of CNC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4). Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-9} per year (i.e., a risk of 1 in approximately 500 million). The projected number of fatal cancers to the population within 50 miles would be approximately 3×10^{-4} (i.e., a risk of 1 in 3,333).

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, 1,640 radiological workers would be required to conduct CNC operations. Operations in a CNC would result in an average individual worker dose of 210 mrem annually. The total annual dose to workers associated with CNC operations would be 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to a CNC workforce.

During normal (accident-free) operations, total facility staffing would be 2,715. The potential risk of occupational injuries and fatalities to workers operating a CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.8.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.8.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of a CNPC would include the CNC impacts discussed above, as well as the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** No radiological risks would be incurred by members of the public from A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.8.11-1.

Operations: **CNPC.** DOE expects minimal public health impacts from the radiological consequences of CNPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4). Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-9} per year (i.e., a risk of 1 LCF approximately every 500 million years). The projected number of fatal cancers to the population within 50 miles would be approximately 3×10^{-4} (i.e., a risk of 1 LCF every 3,333 years).

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, 2,040 radiological workers would be required to conduct CNPC operations. Operations in a CNPC would result in an average individual worker dose of 189 mrem annually. The total annual dose to workers associated with CNPC operations would be 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be 4,500. The potential risk of occupational injuries and fatalities to workers operating a CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.8.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.8.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced tritium operations would reduce the total tritium worker dose from 4.1 person-rem to 3.1 person-rem. Statistically, the number of LCFs would be reduced from 2.5×10^{-3} to 1.9×10^{-3}, which would be an inconsequential change. Impacts to the surrounding population would also be inconsequential.

5.8.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of a CPC, CUC, and A/D/HE Center at SRS. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each DOE site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. DOE estimated radiological impacts to three receptors: (1) the MEI at the SRS boundary; (2) the offsite population within 50 miles of SRS; and (3) a non-involved worker 3,281 feet from the accident location. DOE did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.8.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in existing NEPA documents.

In order to provide a baseline for accidents related to the No Action Alternative at SRS, including operations involving waste management, tritium operations, and plutonium disposition, NNSA reviewed relevant NEPA documents, including the SRS Tank Closure EIS (DOE 2002a), the Tritium Extraction Facility EIS (DOE 1999i), and the Surplus Plutonium Disposition EIS (DOE 1996b). For the SRS Tank Closure EIS, the bounding accident analyzed would cause an MEI dose of less than 1 rem. The maximum population dose was 11,000 rem, which would equate to approximately 6.6 LCFs. For the Tritium Extraction Facility EIS, the bounding accident analyzed would cause less than 1 LCF to the surrounding population. For the Surplus Plutonium Disposition EIS, the bounding accident analyzed would cause an MEI dose of approximately 8.8 rem. The maximum population dose was 21,000 rem, which would equate to approximately 12.6 LCFs.

5.8.12.2 *Consolidated Plutonium Center*

5.8.12.2.1 Radiological Accidents

Table 5.8.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.8.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-1—CPC Radiological Accident Frequency and Consequences–SRS

Accident	Frequency	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	3.39	0.00203	17,500	10.5	1,580	1
Fire in a single building	1.0×10^{-4}	1.57	0.000942	7,890	4.73	1,070	1
Explosion in a feed casting furnace	1.0×10^{-2}	1.83	0.0011	9,250	5.55	1,260	1
Nuclear Criticality	1.0×10^{-2}	$3.42x10^{-6}$	$2.05x10^{-9}$	0.00728	$4.37x10^{-6}$	0.00146	$8.76x10^{-7}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.122	$7.32x10^{-5}$	617	0.37	83.7	0.1
Radioactive material spill	1×10^{-2}	0.00367	$2.20x10^{-6}$	18.5	0.0111	2.51	0.00151

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table 5.8.12-2—Annual Cancer Risks for CPC–SRS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Non-involved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	$2.03\mathrm{x}10^{-8}$	$1.05\mathrm{x}10^{-4}$	$1\mathrm{x}10^{-5}$
Fire in a Single Building	$9.42\mathrm{x}10^{-8}$	$4.73\mathrm{x}10^{-4}$	$1\mathrm{x}10^{-4}$
Explosion in a Feed Casting Furnace	$1.1\mathrm{x}10^{-5}$	$5.55\mathrm{x}10^{-2}$	$1\mathrm{x}10^{-2}$
Nuclear Criticality	$2.05\mathrm{x}10^{-11}$	$4.37\mathrm{x}10^{-8}$	$8.76\mathrm{x}10^{-9}$
Fire-induced Release in the CRT Storage Room	$7.32\mathrm{x}10^{-7}$	$0.37\ \mathrm{x}10^{-7}$	$1\mathrm{x}10^{-3}$
Radioactive Material Spill	$2.20\mathrm{x}10^{-8}$	$1.11\mathrm{x}10^{-4}$	$1.51\mathrm{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Table 5.8.12-1) is the beyond evaluation basis earthquake and fire. Approximately 10.5 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of approximately 3 rem. Statistically, the MEI would have a 0.002 chance of developing a LCF, or about 1 in 500. This accident has a probability of occurring once every 100,000 years.

When probabilities are taken into account (see Table 5.8.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be 1×0^{-5}, or approximately 1 in 100,000. For the population, the LCF risk would be approximately 6×10^{-2}, meaning that an LCF would statistically occur once every 18 years in the population.

5.8.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.8.12–3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting in calculated down-wind concentrations. Both Gaussian Plume and ALOHA methodologies were used to evaluate the potential consequences associated with a release of each chemical in an accident situation. Table 5.8.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.8.12-3—CPC Alternative Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary [a] (ppm)	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}
Hydrofluoric acid	550	20	0.12	0.21	<0.01	10^{-4}
Formic acid	1,500	10	0.1	0.02	0	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 6.7 miles.

5.8.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.3 *Consolidated Uranium Center*

5.8.12.3.1 Radiological Accidents

The accident scenarios, material at risk, and source term for a CUC are shown below:

Operation	Accident	Source Term	Notes/Assumptions
EU Metal Fabrication	Major fire	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hour
Assembly	Explosion	2 kg EU 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hour
EU Warehouse	Fire	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (the above all represent the sum of metals, oxides, and combustibles) Pu = 1.0×10^{-6} kg Np-237 = 1.6×10^{-5} kg	Release height = 4 m Release duration = 1 hour
HEUMF	Design-basis fires	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hour
EU Operations	Aircraft crash	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

Source: Tetra Tech 2008.

Table 5.8.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.8.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report — Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-4 —CUC Radiological Accident Frequency and Consequences at SRS

Accident	Frequency (per year)	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.00535	3.21×10^{-6}	27	0.0162	3.66	0.0022
Explosion	$10^{-4} – 10^{-6}$	0.000528	3.17×10^{-7}	2.67	0.0016	0.313	0.000188
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.00625	3.75×10^{-6}	31.5	0.0189	4.11	0.00247
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.000682	4.09×10^{-7}	3.45	0.00207	0.344	0.000206
Aircraft crash	$10^{-4} – 10^{-6}$	0.011	6.60×10^{-6}	47.3	0.0284	1.28	0.000768

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

Table 5.8.12-5—Annual Cancer Risks for CUC–SRS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	3.21×10^{-10}	1.62×10^{-6}	2.2×10^{-7}
Explosion	3.17×10^{-11}	1.6×10^{-7}	1.88×10^{-8}
Fire in EU Warehouse	3.75×10^{-10}	1.89×10^{-6}	2.47×10^{-6}
Design-basis fires for HEU Storage	4.09×10^{-9}	2.07×10^{-5}	2.06×10^{-6}
Aircraft crash	6.60×10^{-10}	2.84×10^{-6}	7.68×10^{-8}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Table 5.8.12-4) is the aircraft crash into the EU facilities. Approximately 0.03 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a maximum dose of 0.01 rem. Statistically, this MEI would have a 7×10^{-6} chance of developing a LCF, or about 1 in 150,000. This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.8.12-5), the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be 4×10^{-9}, or approximately 1 in 250 million. For the population, the LCF risk would be 2×10^{-5}, or approximately 1 in 50,000.

5.8.12.3.2 Hazardous Chemicals Impacts

The CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.8.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.8.12-6—CUC Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

5.8.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.4 *Assembly/Disassembly/High Explosives Center*

5.8.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms

Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.8.12-7 and 5.8.12-8 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of an A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table was selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-7—A/D/HE Center Radiological Accident Consequences–SRS

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities[b]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[c]**	**Dose (rem)**	**Latent Cancer Fatalities[c]**
Scenario 1	0.495	0.000297	2,490	1.49	339	0.407
Scenario 2	0.000354	2.12×10^{-7}	1.79	0.00107	0.243	0.000146
Scenario 3	2.96×10^{-8}	1.78×10^{-11}	0.000149	8.94×10^{-8}	2.03×10^{-5}	1.22×10^{-8}
Scenario 4	0.065	0.000039	368	0.221	12.1	0.00726
Scenario 5	0.068	4.08×10^{-5}	385	0.231	12.6	0.00756
Scenario 6	0.000504	3.02×10^{-7}	2.85	0.00171	0.0936	5.62×10^{-5}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table 5.8.12-8—Annual Cancer Risks for A/D/HE Center Accidents–SRS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	2.97×10^{-8}	1.49×10^{-4}	4.07×10^{-5}
Scenario 2	2.12×10^{-9}	1.07×10^{-5}	1.46×10^{-6}
Scenario 3	1.78×10^{-13}	8.94×10^{-10}	1.22×10^{-10}
Scenario 4	3.9×10^{-11}	2.21×10^{-7}	7.26×10^{-9}
Scenario 5	4.08×10^{-9}	2.31×10^{-5}	7.56×10^{-7}
Scenario 6	3.02×10^{-9}	1.71×10^{-5}	5.62×10^{-7}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

The results of the accident analysis indicate that potential consequences would not exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The accident with the highest potential consequences to the offsite population (see Table 5.8.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 1.49 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 0.5 rem. Statistically, this MEI would have a 0.0003 chance of developing a LCF, or about 1 in 3,300. The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.8.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be 3×10^{-8}, or approximately 1 in 33 million. For the population, the LCF risk would be 1×10^{-4}, or approximately 1 in 6,500.

5.8.12.4.2 Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemicals used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.8.12–9 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.8.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	1.8	15	<0.2	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

5.8.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accident probabilities are largely a function of the operation being conducted, rather than the number of times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.8.13 Transportation

5.8.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at SRS, and impacts would remain unchanged from the baseline presented in Section 4.8.12.

5.8.13.2 *DCE Alternative (CPC)*

5.8.13.2.1 Construction

Construction of a CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

5.8.13.2.2 Operations

Radiological transportation for a CPC would include transport of pits from Pantex to SRS, recycle of enriched uranium parts to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. Section 5.10 presents the impacts of transportation for the CPC at SRS. The addition of new employees for a CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.3 *CCE Alternative*

5.8.13.3.1 CUC Construction

Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

5.8.13.3.2 CNC Operations

Radiological transportation for a CNC would include the impacts associated with a CPC plus the impacts described in Section 5.10 for a CUC. The addition of new employees for a CUC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.3.3 CNPC (CPC + CUC + A/D/HE Center)

Construction: **A/D/HE Center.** Construction of an A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

Operations: **CNPC.** If an A/D/HE Center was located at SRS as part of a CNPC, the annual radiological transportation impacts associated with the CPC (Section 5.8.13.2) and the impacts associated with the CUC (Section 5.8.13.3.1) would not occur, with the exception of TRU waste transportation described for the CPC. There would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. The addition of new employees for a CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in total ROI workers by 25 would have an inconsequential impact on local transportation. A reduction in tritium operations would reduce both the transportation of tritium producing burnable absorber rods from the Watts Bar nuclear reactor in Tennessee to SRS, as well as the transportation of filled tritium reservoirs from SRS to Pantex. As explained in Section 5.10, the annual transportation impacts for tritium components, for both incident-free transportation and potential accidents, would be small (less than 1 death related to non-radiological impacts and less than 1 LCF for radiological impacts).

5.8.14 Waste Management

5.8.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. SRS currently manages high-level waste, LLW, mixed LLW, TRU waste, hazardous waste and sanitary waste. SRS has a RCRA licensed hazardous and mixed waste storage facility.

Table 5.8.14-1 presents annual waste generation volumes from SRS operations. For convenience, this table is shown again below, to facilitate comparisons of the additional alternatives presented.

Table 5.8.14-1—Annual Routine Waste Generation from SRS Operations (m^3)

Waste type	1996	1997	1998	1999	2000	2001
Transuranic (yd^3)	165	119	61.9	42.4	54	64.1
Low-level (yd^3)	5,780	6,620	6,520	4,970	5,220	4,610
Mixed (yd^3)	452	286	463	402	290	380
Hazardous[a] (yd^3)	57.0	55.0	177	26.5	30.8	45.3
Sanitary[b] (yd^3)	2,780	2,770	2,640	1,760	1,550	1,560

Source: DOE 2002o.

[a] Hazardous waste reported in metric tons.

[b] From DOE 2002o (1996 data) and DOE's Central Internet Database. Sanitary waste reported in metric tons.

5.8.14.2 *DCE Alternative (CPC)*

5.8.14.2.1 CPC Construction Impacts

Construction of a CPC would generate liquid hazardous waste and both liquid and solid non-hazardous waste. Table 5.8.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for a CPC.

Table 5.8.14-2—Total Waste Generation from CPC Construction–SRS

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Nonhazardous Solid (yd^3)	10,900
Nonhazardous Liquid (gal)	56,000

Source: NNSA 2007.

Although CPC construction activities would increase annual non-hazardous waste generation levels substantially, the infrastructure and available disposal capacity exists at SRS to adequately manage this waste stream on an ongoing basis. The waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE could also pursue a permit for an additional onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

CPC construction activities would increase the annual routine hazardous waste generation by approximately 50 percent of 2004 generation rates for SRS operations. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most SRS hazardous wastes.

Sanitary wastewater generated during CPC construction would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.8.14.2.2 CPC Operation Impacts

Normal operation of the CPC would generate LLW, hazardous waste, and sanitary waste. Table 5.8.14-3 summarizes the estimated waste generation rates for the operation of a CPC.

Table 5.8.14–3—Annual Waste Generation from Operations of the CPC–SRS

Waste Category	CPC
TRU Solid Waste (yd^3)	950
Mixed TRU Solid Waste (yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste, solid (tons)	4
Hazardous waste, liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

In 2002, SRS had a TRU waste inventory of 43,167 cubic yards of legacy TRU waste (WSRC 2002a). Since 2002 the TRU waste inventory at SRS has been dramatically reduced by shipments to WIPP. Currently, the inventory is about 5,200 cubic yards (Grainger 2008). The projected TRU waste volumes for a CPC represents an increase by a factor of about 2 percent in the annual routine TRU waste generation at SRS. TRU waste generated from plutonium pit manufacturing includes gloves, filters, and other operations/maintenance waste from the CPC gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The TRU waste would be transferred from the CPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 978 yd^3 of TRU waste). A drum loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

LLW from CPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. LLW generation for the CPC would almost double the annual LLW generation volumes presently being generated at SRS. The LLW would be transferred to E-Area for disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 yd^3 and the projected volumes for disposal are about 456,566 yd^3

(DOE 2000g). The remaining capacity would be adequate to dispose of all the projected LLW from CPC operations and still allow for the disposal of LLW generated by other operations at SRS.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CPC operations represent less than twenty-five percent of the annual routine volumes currently managed at SRS. Commercial treatment and disposal is readily available and currently used to treat most SRS hazardous wastes.

Operation of a CPC would increase annual routine mixed LLW generation at SRS by about seventeen percent relative to current site operations. Depending on the characteristics of the mixed LLW, it would be transferred to onsite treatment facilities or shipped to commercial or DOE treatment and disposal facilities.

Nonhazardous waste from CPC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CPC operations would increase annual sanitary waste generation, the combination of disposal facilities is expected to provide adequate disposal capacity.

Sanitary wastewater generated during CPC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process (NNSA 2007).

5.8.14.3 *CCE Alternative*

5.8.14.3.1 CNC (CPC + CUC)

Waste Management impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.14.2 as well as the impacts of a CUC, as discussed below.

Construction: **CUC.** Construction of a CUC would entail construction of a CPC, already discussed in Section 5.8.14.2.1, above, and construction of a CUC, discussed in this section.

Construction of a CUC would entail the generation of LLW, hazardous waste, and both solid and liquid sanitary waste. Table 5.8.14-4 summarizes the total volume of waste generated over the 6 years of construction activity for a CUC.

Table 5.8.14-4—CUC Construction Wastes at SRS

Waste Category	Quantity
Low-level Solid (yd³)	70
Mixed Low-level Solid (yd³)	0
Hazardous (tons)	6
Nonhazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

CUC construction activities would increase annual sanitary waste generation by less than five percent, relative to current SRS operations. The waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

CUC construction activities would more increase the annual routine hazardous waste currently generated by SRS operations by an additional 40 percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility along with the hazardous waste normally generated by SRS. Commercial treatment is readily available and currently used to treat most SRS hazardous wastes.

Sanitary wastewater generated during CUC construction would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

A retention pond would be constructed to manage stormwater runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CUC construction is completed.

Operations: **CNC.** Normal operation of a CNC would generate TRU waste, LLW, mixed LLW, mixed TRU waste, hazardous waste, and sanitary waste. Table 5.8.14-5 summarizes the estimated waste generation rates for a CNC**.**

Table 5.8.14-5—Annual CNC Operational Waste–SRS

	CPC	CUC	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3) `	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (tons)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Since 2002 the TRU waste inventory at SRS has been dramatically reduced by shipments to WIPP. Currently, the inventory is about 5,200 cubic yards (Grainger 2008). The projected TRU waste volumes which would be generated by the operation of a CNC at SRS would represent an increase of about two percent of the annual routine TRU waste SRS already processes. About a third of the TRU waste generated by a CNC would be mixed waste. The TRU waste would be transferred from the CNC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 978 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

LLW generation for the CNC would increase the annual LLW generation at SRS by more than three fold. The LLW would be transferred to E-Area for disposal. The estimated capacity of the E-Area facilities is 963,711 cubic yards and the projected volumes for disposal are about 456,566 cubic yards (DOE 2000g). The remaining capacity would be adequate to dispose of all the projected LLW from CNC operations and still allow for disposal of LLW generated by other activities at SRS. LLW from CNC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNC operations would be solidified prior to leaving the facility. Offsite disposal at another DOE site, such at NTS, or commercial facility could be used for LLW that is not technically or economically suitable for disposal at SRS."

The projected hazardous waste volumes from CNC operations would be large in comparison to the annual routine volumes of hazardous waste currently managed at SRS. Commercial treatment is readily available and currently used to treat and dispose of most SRS hazardous wastes. Sufficient hazardous waste transfer points exist, at SRS, for the collection of sufficient quantities to facilitate shipment.

Operation of a CNC would increase annual routine mixed LLW generation at SRS by less than five percent relative to current site operations. Depending on the characteristics of the mixed LLW, it would be treated at the RCRA-permitted mixed waste treatment facility, transferred to onsite treatment facilities at other facilities at SRS, or shipped to commercial or DOE treatment and disposal facilities. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents.

Non-hazardous waste from CNC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CNC operations would substantially increase the annual sanitary waste generation at SRS, the combination of disposal facilities is expected to provide more than adequate disposal capacity.

Sanitary wastewater generated during CNC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CNC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process (NNSA 2007).

5.8.14.3.2 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.8.14.5, the CUC impacts discussed above, and the A/D/HE Center. The expected waste impacts are discussed below.

***Construction:* A/D/HE Center.** The construction of an A/D/HE Center would generate low level waste, and solid and liquid sanitary waste. Table 5.8.14-6 summarizes the total volume of waste generated over the 6 years of construction of an A/D/HE Center.

Table 5.8.14-6—Total Waste Generation from Construction of the A/D/HE Center

Waste Category	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	7,100
Non-Hazardous Liquid Waste (gal)	45,000

Source: NNSA 2007.

A/D/HE Center construction activities would increase annual sanitary waste generation by less than ten percent relative to current SRS operations. The waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

The 45,000 gallons of liquid non-hazardous waste (sanitary wastewater) generated during the 6 year A/D/HE Center construction period would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary waste is well within the existing capacity and would not be expected to have any detrimental effects on the existing operations of the SRS sanitary sewer system.

LLW generation from the construction of an A/D/HE Center at SRS would generate substantial volumes of additional LLW to be managed by SRS. This waste, however would be generated over a multi-year timeframe (more like half of the 6 year construction period) making its volume less of a jolt to the system. The LLW would be transferred from the A/D/HE Center to E-Area for processing and disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 cubic yards and the projected volumes for disposal of waste normally generated at SRS are about 456,566 cubic yards (DOE 2000g). The remaining capacity would be more than adequate to dispose of all the projected LLW from A/D/HE Center operations and still allow for disposal of LLW generated by other activities not yet planned for at SRS. Any liquid LLW resulting from A/D/HE Center operations would be solidified prior to leaving the center.

A retention pond would be constructed to manage stormwater runoff from the entire A/D/HE Center site, including the construction laydown area and concrete batch plant. The basin of this retention pond would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at an A/D/HE Center site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once A/D/HE Center construction is completed.

***Operations:* CNPC.** Normal operation of a CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.8.14-7 summarizes the estimated waste generation rates for the operation of a CNPC at SRS.

SRS currently manages an inventory of 5,200 cubic yards of legacy TRU waste. The projected TRU waste volumes represent an increase by a factor of less than two percent of the annual routine TRU waste generation at SRS. About one third of the TRU waste would be mixed waste. The TRU waste would be transferred from the CNPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 326 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

Table 5.8.14-7—Annual Waste Generation from Operations at SRS–CNPC

Waste Type	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU) (yd^3)	950	0	0	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	40	12,040
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	70	0	782.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	15	.9	19.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	12,000	27,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility. LLW generation for the CNPC would substantially increase the annual LLW generation at SRS by a factor of about 4. The LLW would be transferred to E-Area for disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 yd^3 and the projected volumes for disposal are about 456,566 yd^3 (DOE 2000g). The remaining capacity would be more than adequate to dispose of all the projected LLW from CNPC operations and still allow for disposal of low level waste generated from other operations at SRS.

The projected hazardous waste volumes from CNPC operations would substantially increase the annual routine volumes currently managed at SRS. This waste would be collected at a hazardous waste transfer point until sufficient quantities are obtained for a shipment to an off-site, RCRA-permitted commercial treatment and disposal facility. Commercial treatment is readily available and currently used to treat and dispose of most of SRS hazardous wastes.

Non-hazardous waste from CNPC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CNPC operations would substantially increase the current annual sanitary waste generation at SRS, the combination of existing disposal facilities is expected to provide adequate disposal capacity.

Sanitary wastewater generated as a result of CNPC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge.

5.8.14.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to waste management, reduced tritium operations would reduce LLW by approximately 50 percent, from 138 cubic yards to 69 cubic yards. No other waste streams would be significantly affected. Because SRS has adequate facilities to manage LLW under either alternative, no major impacts to waste management are expected with a fifty percent reduction in volume.

5.9 Y-12 NATIONAL SECURITY COMPLEX (Y-12)

This section discusses the potential environmental impacts associated with the following programmatic alternatives at the Y-12 Complex:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. Y-12 would continue to perform its existing missions as described in Section 3.2.9.
- **DCE Alternative.** This alternative includes an analysis of adding a CPC to the existing enriched uranium mission at Y-12. It is noted that the combination of a CPC with the existing enriched uranium mission would constitute a Consolidated Nuclear Center (CNC). For the enriched uranium mission, this SPEIS also assesses the impacts of a UPF and an upgrade of existing Y-12 facilities, because NNSA is considering these options in the Y-12 SWEIS as potential replacements for facilities that currently perform enriched uranium operations.
- **CCE Alternative.** This alternative would be a full CNPC (which would consist of a CPC, the UPF, and an A/D/HE Center). By definition, there is no “CNC Alternative” at Y-12, because locating a CPC at Y-12 (in combination with the existing enriched uranium mission) would amount to a CNC. In general, CNPC alternatives would produce additive construction impacts because construction activities would occur in series as follows: UPF, 2010-2018; CPC, 2017-2022; A/D/HE Center, 2020-2025.
- **Capability-Based Alternatives.** Under these alternatives, HEU operations at Y-12 would be reduced to support stockpile requirements below levels established by the Moscow Treaty.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.9.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.9.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.9.1-1—Potential Effects on Land Use at the Proposed Sites

<table>
<tr><th colspan="4">CPC Alternatives</th></tr>
<tr><td rowspan="4">Greenfield Alternative</td><td>Construction (acres)</td><td colspan="2">Operation (acres)</td></tr>
<tr><td rowspan="3">140</td><td colspan="2">110[a]</td></tr>
<tr><td>PIDAS</td><td>Non-PIDAS</td></tr>
<tr><td>40</td><td>70</td></tr>
<tr><td>Upgrade Alternative</td><td>13</td><td colspan="2">6.5 (All within PIDAS)</td></tr>
<tr><td>50/80 Alternative</td><td>6.5</td><td colspan="2">2.5 (All within PIDAS)</td></tr>
<tr><th colspan="4">CUC</th></tr>
<tr><td>Construction (acres)</td><td colspan="3">50</td></tr>
<tr><td rowspan="3">Operation (acres)</td><td colspan="3">Total Area: 35[b]</td></tr>
<tr><td>PIDAS</td><td colspan="2">Non-PIDAS</td></tr>
<tr><td>15</td><td colspan="2">20</td></tr>
<tr><th colspan="4">A/D/HE CENTER [d]</th></tr>
<tr><td>Construction (acres)</td><td colspan="3">300</td></tr>
<tr><td rowspan="3">Operation (acres)</td><td colspan="3">Total Area: 300[e]</td></tr>
<tr><td>PIDAS</td><td colspan="2">Non-PIDAS</td></tr>
<tr><td>Weapons A/D/Pu Storage: 180</td><td colspan="2">Administrative and High Explosives Area: 120</td></tr>
<tr><th colspan="4">CNC</th></tr>
<tr><td></td><td colspan="3">Total Area: 195[f]</td></tr>
<tr><td rowspan="2">Operation (acres)</td><td>PIDAS</td><td colspan="2">Non-PIDAS</td></tr>
<tr><td>Total: 55
• CPC: 40
• CUC: 15</td><td colspan="2">Total: 140
• Non-SNM component production: 20
• Administrative Support: 70
• Buffer Area: 50</td></tr>
<tr><th colspan="4">CNPC</th></tr>
<tr><td></td><td colspan="3">Total Area: 545[g]</td></tr>
<tr><td rowspan="2">Operation (acres)</td><td>PIDAS</td><td colspan="2">Non-PIDAS</td></tr>
<tr><td>Total: 235
• CPC: 40
• CUC: 15
• A/D/Pu Storage: 180</td><td colspan="2">Total: 310
• Non-SNM component production: 20
• Administrative Support: 70
• Explosives Area: 120
• Buffer Area: 100</td></tr>
</table>

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.9.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. Table 5.9.1-2 provides an overview of major facilities at Y-12. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Y-12 beyond those of existing and future activities that are independent of this action. Additional information on land use resources for Y-12 may be found in Section 4.9.1.

Table 5.9.1-2—Y-12 Major Facility Overview

Facility	• Function	• Mission	Current Status
EU Complex	• Uranium Recovery Operations • Metallurgical Operations • In-Process Storage • X-ray density	• Recovery of EU to a form suitable for storage • Casting EU metal (for weapons, storage, reactors, or other uses) • EU down-blending • Accountability of EU from Y-12 activities • Nondestructive evaluation of parts • Packaging for Off-site Transportation	Operating
Intermediate Assay Building	• Chemical recovery of intermediate enrichments of EU (20% to 85% 235U) • In-Process Storage	• Recovery of EU to a form suitable for storage	Not Operating-EU materials will be transferred to other areas for processing or to a storage location. Operations in this building will not resume
EU By-Products Storage Building	• Storage of combustibles, residues and other solid by-product material contaminated by EU	• Storage of combustibles, residues, and other solid materials awaiting chemical recovery of EU	In use as a storage facility
Metalworking Building	• Storage • Fabrication (rolling, heat treating, forming, shearing, machining, inspection, etc.) of parts	• Storage and handling of EU and DU • Fabrication and inspection of metal parts	Operating
EU Storage Building	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-plant material transfers in SNM vehicle	Operating
Assembly and Special Materials Process Buildings	• Assembly • Product Certification • Disassembly • Storage • Quality Evaluation	• Assembly of new or replacement weapons components/assemblies • Quality operations for certification • Disassembly of retired weapons components/assemblies and part recovery • Storage of retired weapons assemblies, subassemblies, and components • LiH/LiD production • Shelf Life Program – Medium and Long Term Evaluations	Operating

Table 5.9.1-2—Y-12 Major Facility Overview (continued)

Facility	• Function	• Mission	Current Status
Quality Evaluation Building	• Quality Evaluation/Disassembly • DU Metalworking • Testing	• Quality Evaluation/Disassembly is conducted	Operating
Plant Laboratory Building	• Analytical Chemistry Organization	• Provides analytical support services for Y-12 and regulatory compliance	Operating
Special Materials Machining	• Metal machining	• Machining of metal parts	Not operating
DU Metalworking Building	• Machining • Dimensional Inspection • Electroplating • X-ray density	• Depleted uranium and stainless-steel machining • Dimensional inspection of parts • Electroplating of parts • Nondestructive evaluation of parts	Operating
Development Buildings	• Process Development • Beryllium Operations	• Development and refinement of manufacturing processes employed at Y-12 • Technology transfer support	Operating
Tooling Storage Building	• Storage	• Tooling and material storage	Operating
General Manufacturing Building	• Metal and graphite machining	• General machine shop • Machining and tooling • Work for others • Technology transfer	Operating
DU Processing Building	• Machining processes • Dimensional Inspection • Nondestructive Evaluation (X-ray density)	• DU operations • Dimensional inspection of parts • Nondestructive evaluation of parts	Operating
HEUMF	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-plant material transfers in SNM vehicle	Under Construction
Purification Facility	• Chemical Processing	• Special Material production	Operating

Source: ORNL 2002.
Note: SNM - special nuclear material, EU – enriched uranium, DU – depleted uranium, LiH – lithium hydride, LiD – lithium deuteride.

5.9.1.2 *DCE Alternative*

5.9.1.2.1 Construction

CPC. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a PIDAS. The area outside the PIDAS and buffer area would consist of a number of smaller support facilities, a

Waste Staging/TRU Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The UPF and HEUMF is located to the east of the CPC reference location. This site is outside of, but adjacent to the existing PIDAS.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for CPC construction would represent approximately 17.5 percent of Y-12's total land area of approximately 800 acres. The post-construction developed area would be approximately 110 acres. Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

UPF. A UPF would be compatible and consistent with the current land use at Y-12 and would not change the current industrial use classification that exists at the proposed location. Construction of and future operations at a UPF would be consistent with the Y-12 Ten Year Comprehensive Site Plan (TYCSP) and would be a significant contribution to achieving an optimum configuration of Y-12. A UPF would enable the EU operations to be consolidated into an area that would be approximately 10 percent of the current size of the Y-12 PIDAS high security area.

The UPF site is in the Pine Ridge and Bear Creek Parking Lots, located to the west of the Highly Enriched Uranium Materials Facility (HEUMF). This site is outside of, but adjacent to, the existing PIDAS. This site is close to the existing HEU processing complex and represents a large level site with minimal site preparation requirements.

Construction of a UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. The construction laydown area for the UPF would be developed on the west side of the proposed UPF site. This area would be finished with an 8-inch-thick compacted, stabilized base for the construction phase. Interim employee parking lots would be developed west of the proposed construction laydown area. The site would be sufficiently graded and developed to accommodate a number of temporary construction trailers, storage buildings, and materials storage yards.

Upgraded Y-12 facilities. Under this alternative, NNSA would upgrade the existing enriched uranium (EU) and non-nuclear processing facilities to contemporary environmental, safety, and security standards to the extent possible within the limitations of the existing structures and without prolonged interruptions of manufacturing operations. The Upgrade Alternative would be both compatible and consistent with the current land use at Y-12 and would not change the current industrial use classification that exists. Construction activities would consist of internal modifications to existing facilities.

5.9.1.2.2 Operations

CPC and UPF. An estimated 118 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC (110 acres) and UPF (8 acres). The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for CPC and UPF operations would represent approximately 15 percent of Y-12's total land area of approximately 800 acres. The UPF would allow the EU operations at Y-12 to be reduced from approximately 150 acres to 15 acres. Although there would be a change in land use, a CPC and UPF would be compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

Upgraded Y-12 facilities. Operation of the Upgraded EU and other processing facilities would have no impact on the current land use at Y-12 and would not change the current industrial use classification that exists at Y-12. Upgrading the existing facilities would not allow the EU operations to be reduced from approximately 150 acres to 15 acres.

5.9.1.3 *CCE Alternative*

5.9.1.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.1.3.2 CNPC (CPC + UPF + A/D/HE Center)

***Construction:* A/D/HE Center.** As described in Section 3.5.1.2, an A/D/HE Center would be consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for an A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. These functions would be located on the west end of Y-12. Located outside the PIDAS area would be a buffer area, administrative support buildings, and other non-nuclear support facilities, on approximately 63 acres. The high explosives (HE) fabrication would be located on approximately 120 acres of ORR, approximately 4.5 miles from the Y-12 industrialized area (see Figure 3.5.1-7).

The land required for an A/D/HE Center construction would represent approximately 37.5 percent of Y-12's total land area of approximately 800 acres. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, an A/D/HE Center is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

***Operations:* CNPC.** An estimated 518 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 398 acres would be located on Y-12, and 120 acres (HE fabrication) would be located on ORR, approximately 4.5 miles from the Y-12 industrialized area. The land required for CNPC operations at Y-12 (would represent approximately 50 percent of Y-12's total land area of approximately 800 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected. The HE fabrication would be located on approximately 120 acres of ORR, which would be less than 1 percent of the ORR (35,000 acres).

5.9.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Y-12. Reduced operations would not change land use at Y-12.

5.9.2 Visual Resources

5.9.2.1 *No Action Alternative*

The landscape at ORR is characterized by a series of ridges and valleys that trend in a northeast-to-southwest direction. Currently, there is no BLM classification for Y-12; however, the level of development at Y-12 is consistent with VRM Class IV which is used to describe a highly developed area. Most of the land surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes). Existing visual resources are discussed in Section 4.9.2.

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Y-12 that are independent of this action.

5.9.2.2 *DCE Alternative*

5.9.2.2.1 Construction

CPC and UPF. A CPC and UPF would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for a CPC and UPF would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust.

Cranes used during construction of a CPC and UPF could create short-term visual impacts, but would not be out of character for an industrial site such as Y-12. The construction laydown areas, temporary parking, and temporary construction office trailers would also be typical for an industrial site. After construction of the facilities are complete, cranes and temporary construction office trailers would be removed, and construction laydown areas would be regraded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel. Alternatively, the laydown areas could be used to provide for additional parking.

Upgraded Y-12 facilities. The Upgrade Alternative would consist mainly of internal upgrades to existing facilities, and would not change the current visual impact of Y-12. Y-12 would still remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

5.9.2.2.2 Operations

CPC and UPF. As described in Section 3.4.2, a CPC would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The UPF and HEUMF are located to the east of the CPC reference location.

Upon completion of UPF and CPC construction (approximately 2022), the PIDAS would be extended to surround the new facilities. When the new PIDAS is completed, the existing EU operations would be relocated to the UPF, the current EU facilities could be declared surplus, and evaluated for D&D. Although the ultimate disposition of these facilities would be determined by a separate NEPA review in the future, when such actions are ripe for decisionmaking, this SPEIS acknowledges that approximately 633,000 square feet of facilities could become excess if the UPF is constructed. Ultimately, this could improve the visual character of the site by reducing the density of industrial facilities. Nonetheless, Y-12 would remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected. The CPC placement would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas.

Upgraded Y-12 facilities. Operation of the Upgraded EU and other processing facilities would have no impact on the current visual impact of Y-12.

5.9.2.3 *CCE Alternative*

5.9.2.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.2.3.2 CNPC (CPC + UPF + A/D/HE Center)

***Construction:* A/D/HE Center.** Activities related to the construction of new buildings required for an A/D/HE Center would be similar in nature to the CPC. An A/D/HE Center would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for an A/D/HE Center would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Impacts on visual resources during construction would be minimal.

***Operations:* CNPC.** A CNPC would be a large complex of industrial facilities, parking lots, and a buffer zone encompassing approximately 518 acres. The CNPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The CNPC placement would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas. Y-12 would remain a highly developed area with an industrial appearance and no change to the VRM classification would be expected.

5.9.2.3.3 Capability-Based Alternative

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Y-12. Reduced operations would not change visual resource impacts at Y-12**.**

5.9.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.9.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.9.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this action. The baseline characteristics of these systems are presented in Table 4.9.3-1. Y-12 would be expected to continue using from 360 to 480 MWh of electricity per year.

5.9.3.2 *DCE Alternative*

5.9.3.2.1 Construction

CPC and UPF. The projected demands on electricity associated with construction activities for a CPC, UPF, and A/D/HE Center are shown in Table 5.9.3-1.

Table 5.9.3-1—Electrical Requirements for Construction of a CPC, UPF, and A/D/HE Center–Y-12

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	**Peak Load (MWe)**
Site capacity	**3,766,800**	**390**
No Action Alternative		
Total site requirement	349,251	40
Percent of site capacity	9.3%	9.3%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	<1%	1%
UPF		
UPF requirement	11,000	2.5

Table 5.9.3-1—Electrical Requirements for Construction of a CPC, UPF, and A/D/HE Center–Y-12 (continued)

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Percent of site capacity	<1%	<1%
A/D/HE Center		
A/D/HE Center requirement	55,000	12.7
Percent of site capacity	1.5%	3.3%

Source: NNSA 2007.

The existing electrical infrastructure at Y-12 would be adequate to support annual construction requirements. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources.

Upgraded Y-12 facilities. The Upgrade Alternative would involve internal upgrades to existing facilities and would have negligible energy and infrastructure requirements.

5.9.3.2.2 Operations

CPC and UPF. The estimated annual site electrical requirements for the programmatic alternatives are presented in Table 5.9.3-2. There would be negligible impacts to site infrastructure. Existing site infrastructure would be adequate to support operation of a CPC and UPF.

Table 5.9.3-2—Electrical Requirements for Operation of the CPC, UPF, and CNPC–Y-12

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity	**3,766,800**	**390**
No Action Alternative		
Total site requirement	349,251	40
Percent of site capacity	9.3%	9.3%
CPC		
CPC requirement	48,000	11
Percent of site capacity	1.3%	2.8%
CPC + UPF		
CPC + UPF requirement	168,000	29.4
Percent of site capacity	3.4%	7.5%
CNPC (CPC + UPF + A/D/HE Center)		
CNPC requirement	268,000	41.3
Percent of site capacity	7.1%	10.5%

Source: NNSA 2007.

Upgraded Y-12 facilities. The Upgrade Alternative would not change energy and infrastructure requirements compared to the No Action Alternative.

5.9.3.3 *CCE Alternative*

5.9.3.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. A CPC and UPF, discussed in Section 5.9.4.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.3.3.2 CNPC (CPC + UPF + A/D/HE Center)

Site infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.9.3.2 and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** The existing electrical infrastructure at Y-12 would be adequate to support annual construction requirements for an A/D/HE Center for the projected 6-year construction period. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources. The estimated site electrical requirements for construction of an A/D/HE Center are presented in Table 5.9.3-1.

Operations: **CNPC.** During operations, a CNPC would utilize approximately 10 percent of Y-12’s available peak electrical site capacity. The estimated annual site electrical requirements for operation of a CNPC are presented in Table 5.9.3-2. There would be negligible impacts to the site electrical infrastructure.

5.9.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use would be reduced by approximately 25 percent. Because there is currently adequate electrical capacity at the site, this reduction would not have any major impact on operations. Steam use, which is largely used for building heating, would be expected to decrease from approximately 1.5 billions of pounds per year to approximately 900 million pounds per year. The No Net Production/Capability-Based Alternative would reduce these quantities by approximately an additional 10 percent.

5.9.4 Air Quality and Noise

5.9.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. The ORR is located in Anderson and Roane Counties in the Eastern Tennessee-Southwestern Virginia AQCR 207, and Y-12 is completely within Anderson County. The EPA has designated Anderson County as a basic non-attainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (DOE 2007). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS. There would be no additional impacts to air quality beyond current and planned activities that are independent of this action.

Major noise emission sources within Y-12 include various industrial facilities, and equipment and machines (e.g., cooling systems, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Most Y-12 industrial facilities are at a sufficient distance from the site boundary so that noise levels at the boundary from these sources are not distinguishable from background noise levels. Within the Y-12 site boundary, noise levels from Y-12 mission operations are typical of industrial facilities, ranging from 50 to 70 dBA (DOE 2001a). Traffic is the primary source of noise at the Y-12 site boundary and at residences located near roads. During peak hours, the Y-12 worker traffic is a major contributor to traffic noise levels in the area (DOE 2001a). There would be no additional impacts to noise levels beyond current and planned activities that are independent of this action.

5.9.4.2 *DCE Alternative*

5.9.4.2.1 Air Quality

Construction: **Nonradiological air impacts from CPC and UPF.** Construction of new facilities would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, $PM_{10,}$ total suspended particulates, and carbon monoxide. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from CPC construction activities are presented in Table 5.9.4-1. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Y-12 site boundary, with the exception of PM-2.5 and PM-10 concentrations (which could be mitigated using dust suppression), and the 8-hour ozone concentration (see Table 5.9.4-2). The 8-hour ozone concentration exceedance is not a result of Y-12-specific activities. Instead, the EPA has designated Anderson County as a basic non-attainment area for the 8-hour ozone standard, as part of the Knoxville basic 8-hour ozone non-attainment area that encompasses several counties.

Table 5.9.4-1—Estimated Peak Nonradiological Air Emissions–CPC Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

Construction of the UPF would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Fugitive dust generated during the clearing, grading, and other earth moving operations would also cause short-term impacts to air quality, predominantly to particulate matter in the air. Construction impacts of the UPF would be similar to the construction impacts for the CPC (discussed above), as both facilities are similarly sized (approximately 400,000 square feet of floorspace for the UPF versus approximately 650,000 square feet of floorspace for the CPC) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.9.4-2 would be representative of the UPF construction nonradiological air impacts.

Table 5.9.4-2—Estimated NAAQs Concentrations at Y-12–CPC Construction

Pollutant	Averaging Time	Maximum standard ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Additional Contribution to Background from Releases During Construction ($\mu g/m^3$)
Sulfur dioxide	3-hr	1,300	398	22.15
	24-hr	365	47.1	5.03
	Annual	80	10.5	0.02
PM10	Annual	50	25.4	1.25
	24-hr	150	77	301.33
PM2.5	Annual	15	No Data	0.125*
	24-hr	35	48.2	30.1*
Carbon monoxide	1-hr	40,000	12,712	1184.9
	8-hr	10,000	4,466	391.03
Ozone	1-hr	235	225	No Data
	8-hr	157	188.4	No Data
Nitrogen dioxide	Annual	100	15.1	0.32
Lead	Calendar quarterly mean	1.5	0.009	No Data No Data

Source: Janke 2007.

* Assumes $PM_{2.5}$ is approximately 10 percent of the PM_{10} value due to the smaller quantity of particulates at the 2.5 micron size range. These estimates are based on Gaussian Plume modeling assuming emissions sources are approximated by a small area source relative to the down-wind distances. The modeling used conservative assumptions for wind speed and stability class to develop the estimates.

Upgraded Y-12 facilities. Negligible fugitive dust would be generated because no new land would be disturbed. Temporary decreases in air quality from construction equipment, trucks, and employee vehicles would be much less than the CPC and UPF, discussed above, due to the significantly smaller workforce required for the upgrades.

***Construction:* Radiological air impacts from construction of CPC, UPF, and Upgraded Y-12 facilities.** No radiological releases to the environment are expected in association with construction activities of a CPC or UPF. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures. No radiological releases to the environment are expected in association with construction activities related to the upgrade of Y-12 facilities.

***Operations:* Nonradiological air impacts from operation of CPC, UPF, and Upgraded Y-12 facilities.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.9.4-3. These emissions would be incremental to the Y-12 baseline.

Table 5.9.4-3—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

For a UPF, operations would not be expected to increase air emissions at Y-12 because a UPF would replace existing EU operations. No significant new quantities of criteria or toxic pollutants would be generated from the new facility itself. Any additional steam-generated heat required for a UPF would be off-set by the reduction in steam from the phase-out of operations in excess Enriched Uranium facilities. A UPF would not change the level of emissions estimated for the No Action Alternative. Any releases of nitrogen and argon, which are used to maintain inert atmospheres for glovebox operations, would be less than current releases from existing EU operations. No new hazardous air emissions would result from the facility operation. Additionally, 90 percent of emissions at Y-12 are from operation of the steam plant, which would be relatively unaffected by UPF operations.

As part of its evaluation of the impact of air emissions, NNSA consulted the Guidance on CAA Conformity requirements (DOE 2000a). NNSA determined that the General Conformity rule applies because Y-12 is located in a non-attainment area for one or more criteria pollutants (i.e., 8-hour ozone). However, because construction plans for the CPC and UPF are insufficiently developed to quantify emissions, they do not satisfy the Tennessee Code definition of reasonably foreseeable. For this reason, a complete General Conformity Review cannot be included in the SPEIS. When the construction plans are sufficiently developed to estimate NAAQS emissions, a General Conformity Review must be performed before future construction activities can proceed.

Operation of the Upgraded EU and other processing facilities would not change air quality impacts beyond those presented for the No Action Alternative because there would be no significant change in the operating requirements of the facilities.

Table 5.9.4-4 presents the results of conservative modeling for operations at Y-12, including the CPC and UPF. If Y-12 is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed under a project-specific tiered EIS.

Table 5.9.4-4—Criteria Pollutant Concentrations at Y-12 Boundary–CPC and UPF

Pollutant	Averaging Time	Maximum standard ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Modeled Concentration[3] ($\mu g/m^3$)	Background Concentration + Maximum Modeled Concentration (Percent of Standard)
SO2	3-hr	1,300	398[1]	523.8	71
	24-hr	365	47.1[2]	174.6	61
	Annual	80	10.5[2]	20.7	39
PM10	Annual[1]	50	25.4[2]	0.2	51
	24-hr[2]	150	77[1]	1.5	52
PM2.5	Annual[1]	15	No Data	No Data	No Data
	24-hr[2]	35	48.2[1]	No Data	74.1
CO	1-hr	40,000	12,712	4.30	32
	8-hr	10,000	4,466[2]	2.52	44
Ozone	1-hr	235	225[1]	No Data	96
	8-hr	157	188.4[1]	No Data	120
NO2	Annual	100	15.1[1]	9.1	24
Lead	Calendar quarterly mean	1.5	0.009[1]	No Data	0.6

N/A= Not Applicable.
[1]TDEC 2005c.
[2]DOE 2007.
[3]Janke 2007.

Operations: **Radiological air impacts from operation of CPC, UPF, and Upgraded Y-12 facilities.** Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. Sample transfers would occur using a vacuum tube transfer system from the Feed Preparation and Manufacturing Facilities to the Analytical Support Facility. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.9.4-5). Releases would be small. Total radionuclide emissions at Y-12 would be much less than 1 Curie of any radionuclide. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller. Operation of the UPF would result in some radiological airborne emissions. The current design calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from the existing EU facilities, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS analysis, the radiological airborne emissions and resulting impacts from the UPF would remain unchanged from the No Action Alternative, which are estimated to be 0.10 Curies of uranium, based on releases into the atmosphere in 2004 (DOE 2005a).

Table 5.9.4-5—Annual Radiological Air Emissions–CPC Operations

Isotope	**Baseline[a,b] (Ci/yr)**	**CPC Annual Emissions (Ci/yr)**
Americium-241	ND	3.12×10^{-7}
Plutonium-239	None	1.02×10^{-5}
Plutonium-240	None	2.66×10^{-6}
Plutonium-241	None	1.96×10^{-4}
Uranium-234	ND	5.02×10^{-9}
Uranium-235	ND	1.58×10^{-10}
Uranium-236	ND	2.56×10^{-11}
Uranium-238	ND	1.42×10^{-12}
Total Uranium	0.10	2.06×10^{-4}
Tritium	None	–
All Other	None	–
Total	**0.10**	**2.09×10^{-4}**

Source: NNSA 2007.
ND=No data for these radionuclides.
[a] Based on calendar year 2004 data.
[b] The No Action Alternative is represented by the baseline.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding Y-12. As shown in Table 5.9.4-6, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.9.11.

Table 5.9.4-6—Annual Doses Due to Radiological Air Emissions from CPC and UPF Operations–Y-12

Receptor	CPC	UPF
Offsite MEI[a] (mrem/yr)	4.5×10^{-4}	0.2
Population within 50 miles (person-rem per year)[a]	3.2×10^{-3}	1.2

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.9.4-5and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

Operation of the upgraded EU facilities would not change the radiological airborne emissions, and impacts would be the same as described for the No Action Alternative.

5.9.4.2.2 Noise

Construction: **CPC, UPF, and Upgraded Y-12 facilities.** Construction of new buildings or upgrade of existing facilities would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Although noise levels in construction areas could be as high as 110 dBA, these noise levels would not extend far beyond the boundaries of the construction site. Table 5.9.4-7 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Given the distance to the site boundary (approximately 1.3 miles) there would be no major change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels.

Table 5.9.4-7—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations: **CPC, UPF, and Upgraded Y-12 facilities.** The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 1.3 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.9.4.3 *CCE Alternative*

5.9.4.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.4.3.2 CNPC (CPC + UPF + A/D/HE Center)

Air quality and noise impacts from the construction and operation of the CNPC would include the CPC and UPF impacts discussed in Section 5.9.11.2 as well as the impacts discussed below for the A/D/HE Center.

5.9.4.3.2.1 Air Quality

Construction: **A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for the CPC and UPF. However, due to the potential to disturb approximately 300 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.9.4–7a. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.9.4-7a—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	2.62
24-hour	150	638

Source: Janke 2007.

The results presented above represent a conservative estimate of PM_{10} emissions at the site boundary. The source strength was assumed to come from a relatively concentrated area for application to the Gaussian Plume equation. Use of an area source would not reduce the emissions by an order of magnitude. Therefore, the results in the table potentially overestimate the impact by about a factor of 5. Based on this analysis, a more detailed site-specific analysis would need to be performed, using project-specific information, if Y-12 is selected for a CNPC. If that analysis shows that regulatory limits would be exceeded, then mitigation measures would need to be developed.

Construction: **A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. CPC and UPF nonradiological emissions are discussed in Sections 5.9.4.2 and are not repeated here. The total nonradiological air impacts of the CNPC would be additive of a CPC, UPF, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities presented in Table 5.9.4-8. These emissions would be incremental to the Y-12 baseline.

Table 5.9.4-8—Annual Nonradiological Air Emissions–A/D/HE Center Operations

NAAQS emissions	(tons/year)
Oxides of Nitrogen	91
Carbon Monoxide	31
Volatile Organic Compounds	31
Particulate Matter	18
Sulfur Dioxide	5
Hazardous Air Pollutants and Effluents	22

Source: NNSA 2007.

The maximum concentrations (µg/m^3) at the Y-12 site boundary that would be associated with the release of criteria pollutants presented in Table 5.9.4-9. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.9.4-9—Criteria Pollutant Concentrations at Y-12 Boundary–CNPC Operations

Pollutant	Averaging Time	Maximum standard (µg/m^3)	Background Concentration (µg/m^3)	Maximum Modeled Concentration for CPC and UPF (µg/m^3)	A/D/HE Center Maximum Incremental Concentration (µg/m^3)	CNPC Concentration (µg/m^3)
Sulfur dioxide	3-hr	1,300	398	523.8	9.6	533.4
	24-hr	365	47.1	174.6	2.2	176.8
	Annual	80	10.5	20.7	0.01	20.7
PM10	Annual[1]	50	25.4	0.2	0.03	25.6
	24-hr[2]	150	77	1.5	7.8	9.3
PM2.5	Annual[1]	15	No Data	No Data	0.03	No Data
	24-hr[2]	35	48.2	No Data	7.8	56.0
Carbon monoxide	1-hr	40,000	12,712	4.30	89.7	91.9
	8-hr	10,000	4,466	2.52	29.6	4498.1
Ozone	1-hr	235	225	No Data	No Data	No Data
	8-hr	157	188.4	No Data	No Data	No Data
Nitrogen dioxide	Annual	100	15.1	9.1	0.2	24.4
Lead	Calendar quarterly mean	1.5	0.009	N/A	N/A	N/A

Source: Janke 2007.

As part of its evaluation of the impact of air emissions, NNSA consulted the Guidance on CAA Conformity requirements (DOE 2000a). NNSA determined that the General Conformity rule applies because Y-12 is located in a non-attainment area for one or more criteria pollutants (i.e., 8-hour ozone). However, because construction plans for the A/D/HE Center are insufficiently developed to quantify emissions, they do not satisfy the Tennessee Code definition of reasonably foreseeable. For this reason, a complete General Conformity Review cannot be included in the SPEIS. When the construction plans are sufficiently developed to estimate NAAQS emissions, a General Conformity Review must be performed before future planned construction activities can proceed.

***Operations:* A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. The total radiological air impacts of a CNPC would be additive of a CPC, UPF, and an A/D/HE Center. During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.9.4-10.

Table 5.9.4-10—Annual Radiological Air Emissions for A/D/HE Center Operations

Radiological Air Emissions	Emissions
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the maximally exposed individual (MEI) and the population surrounding Y-12 from an A/D/HE Center. As shown in Table 5.9.4-10, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA

(40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the A/D/HE Center resulting from radiological air emissions are presented in Section 5.9.11. Table 5.9.4-11 also shows the total annual doses from a CNPC. As can be seen, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity.

Table 5.9.4-11—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations and a CNPC–Y-12

Receptor	A/D/HE Center	CNPC
Offsite MEI[a] (mrem/yr)	1.3×10^{-4}	0.2
Population within 50 miles (person-rem per year)	9.2×10^{-4}	1.2

Source: Tetra Tech 2008.

[a] The offsite MEI is assumed to reside at the site boundary.

5.9.4.3.2.2 Noise

Construction: **A/D/HE Center.** *Anticipated noise impacts from the construction of the A/D/HE Center would be similar to those described for the CPC and UPF.*

Operations: **A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of a CNPC would be similar to those described for a CPC and UPF.

5.9.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to air quality, Y-12 is located in the Eastern Tennessee-Southwestern Virginia AQCR 207. The EPA has designated this area as a basic non-attainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (EPA 2005a). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS. Reduced operations could reduce the emissions from the steam plant boilers and emissions from onsite vehicles. Because 90 percent of emissions at Y-12 are from operation of the steam plant, this represents the most significant factor in any air quality changes. Reduced operations would reduce the basic needs for steam by approximately 40-50 percent, which would improve nonradiological impacts to air quality associated with Y-12 operations. With respect to radiological emissions, the total 2004 dose to the MEI from the Y-12 activities was 0.4 mrem, which is 4 percent of the regulatory limit. If radiological emissions decreased from 0.01 Curies to 0.006 Curies (per Table 3.6.1-2) (or 0.005 Curies per Table 3.6.3.7-1 for the No Net Production/Capability-Based Alternative), the MEI dose would decrease to approximately 0.24 mrem (0.20 mrem for the No Net Production/Capability-Based Alternative), which would be an inconsequential change.

5.9.5 Water Resources

Environmental impacts associated with the proposed alternatives at Y-12 could affect water resources. No impacts to groundwater are expected. At Y-12, surface water resources would likely be used to meet all construction and operations water requirements. Table 5.9.5-1 summarizes potential changes to water resources at Y-12 resulting from the construction of a CPC, UPF, and an A/D/HE Center. Table 5.9.5-2 summarizes potential changes to water resources at Y-12 resulting from the operation of a CPC, UPF, and CNPC.

5.9.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. Y-12 uses approximately 2,000 million gallons per year of water while the ORR uses approximately twice as much. The ORR water supply system, which includes the city of Oak Ridge treatment facility and the ETTP treatment facility, has a capacity of 11,715 million gallons per year (DOE 2005b).

Under this alternative no additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on surface water or groundwater resources would be expected to occur at Y-12 that are independent of this action. Baseline water resources are discussed in Section 4.9.5.

5.9.5.2 *DCE Alternative*

5.9.5.2.1 Surface Water

Construction: **CPC.** Construction requirements for the CPC are described in Section 3.4.1. Y-12 surface water withdrawals and discharges would not increase during construction of the CPC. Construction water requirements for a CPC would not raise the average annual water use for Y-12. Approximately 20,900,000 gallons of water would be needed for construction of the CPC; this is less than 1 percent of the average annual water use at Y-12. No impact from flooding would be expected. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits and minimized.

Table 5.9.5-1—Potential Changes to Water Resources from Construction of a CPC, UPF, and A/D/HE Center–Y-12

Proposed Alternatives	Water Use
Water Use (gal/yr)	**2,000,000,000**
CPC	
Water Requirement (gal)	20,900,000
Percent of Average Annual Water Use	1%
UPF	
Water Requirement (gal)	4,000,000
Percent of Average Annual Water Use	<1%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent of Average Annual Water Use	<1%

Source: NNSA 2007.

Table 5.9.5-2—Potential Changes to Water Resources from Operation of the CPC, UPF, and CNPC–Y-12

Proposed Alternatives	Water Use
Average Annual Water Use	**2,000,000,000**
CPC	
Water Requirement (gal/yr)	88,500,000
Percent of Average Annual Water Use	4.4%
UPF	
Water Requirement (gal/yr)	105,000,000
Percent of Available Site Capacity	5.2%
CPC + UPF	
Water Requirement (gal/yr)	193,500,000
Percent of Average Annual Water Use	9.7%
A/D/HE Center	
Water Requirement (gal/yr)	130,000,000
Percent of Available Site Capacity	6.5%
CNPC (CPC + UPF + A/D/HE Center)	
Water Requirement (gal/yr)	403,500,000
Percent of Average Annual Water Use	20.1%

Source: NNSA 2007.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Y-12 would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. The CPC reference location at Y-12 is not within the 100-year or 500- year floodplains. Therefore, no impact on the floodplain is anticipated.

Construction: **UPF**. Y-12 surface water withdrawals and discharges would not increase substantially during construction of the UPF. Construction water requirements for a UPF (approximately 4 million gallons per year) would not raise the average annual water use for Y-12 (approximately 2,000 million gallons per year). The proposed UPF site is not located within either the 100-year or 500-year floodplains.

***Construction:* Upgrade Y-12 facilities.** Construction activities associated with upgrading existing Y-12 facilities would require approximately 4 million gallons/year of water. This would represent an increase of less than 1 percent compared to existing water uses at Y-12.

***Operations:* CPC.** Operation of a CPC would require an estimated 88,500,000 gallons, less than 4.4 percent of the average annual water usage at Y-12. Operation of a CPC would not increase water demands at Y-12. It is not anticipated that operation of a CPC would impact surface water quality.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures.

***Operations:* UPF**. UPF operation would require an estimated 105,000,000 gallons per year, approximately 5.2 percent of the water usage under the No Action Alternative (approximately 2,000 million gallons per year). A UPF would not increase water demands at the site because EU operations would be phased out in existing facilities once the UPF becomes operational. It is not anticipated that operation of a UPF would impact surface water quality beyond impacts described for the No Action Alternative. EU operations would be phased out in existing facilities once a UPF becomes operational. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits.

***Operations:* Upgraded Y-12 facilities**. No significant change in water requirements would result from upgrading Y-12 facilities.

5.9.5.2.2 Groundwater

***Construction:* CPC, UPF, and Upgraded Y-12 facilities.** Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Operations:* CPC, UPF, and Upgraded Y-12 facilities.** Minimal amounts of groundwater would be used. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.9.5.3 *CCE Alternative*

5.9.5.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. A CPC and UPF, discussed in Section 5.9.5.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.5.3.2 CNPC (CPC + UPF + A/D/HE Center)

A CNPC would be made up of CPC, UPF and A/D/HE Center. A CPC and UPF are discussed in Section 5.9.5.2, and an A/D/HE Center is discussed below.

Surface water: **A/D/HE Center construction.** Y-12 surface water withdrawals and discharges would not increase during construction of an A/D/HE Center. Approximately 2,022,000 gallons of water would be needed for construction of an A/D/HE Center; this is less than 1 percent of the average annual water use at Y-12. No impact from flooding would be expected. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with permit limits and minimized.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Y-12 would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The A/D/HE Center reference location at Y-12 is not within the 100-year or 500-year floodplains. Therefore, no impact on the floodplain is anticipated.

Surface water: **CNPC operations.** Operation of a CNPC would require an estimated 403.5 million gallons, approximately 20.1 percent of the average annual water usage at Y-12. Operation of a CNPC would not increase water demands at Y-12. It is not anticipated that operation of a CNPC would impact surface water quality.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid process waste facilities for the plutonium purification process.

Groundwater: **A/D/HE Center construction.** Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNPC operations.** Minimal amounts of groundwater would be used. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.9.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in water use would be inconsequential, as Y-12 has plentiful water supplies. Reduced operations could continue to improve the water quality in surface waters. Of all the parameters measured in the surface water as a best management practice, mercury is the only demonstrated contaminant of concern.

5.9.6 Geology and Soils

5.9.6.1 *No Action Alternative*

ORR lies in the Valley and Ridge Physiographic Province of eastern Tennessee. The topography consists of alternating valleys and ridges that have a northeast-southwest trend, with most ORR facilities occupying the valleys. In general, the ridges consist of resistant siltstone, sandstone, and dolomite units, and the valleys, which resulted from stream erosion along fault traces, consist of less-resistant shales and shale-rich carbonates (DOE 2001a). Soil erosion from past land uses has ranged from slight to severe. Erosion potential is very high in those areas that have been eroded in the past with slopes greater than 25 percent. Erosion potential is lowest in the nearly flat-lying permeable soils that have a loamy texture. Additionally, shrink-swell potential is low to moderate and the soils are generally acceptable for standard construction techniques (DOE 2001a). Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no expected impacts to geology and soil resources beyond current and planned activities that are independent of this action.

5.9.6.2 *DCE Alternative*

5.9.6.2.1 Construction

CPC and UPF. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The UPF and HEUMF are located to the east of the CPC reference location. This site is outside of, but adjacent to the existing PIDAS.

Construction of a CPC and UPF would have no impact on geological resources, and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other non-tectonic events are unlikely to affect the CPC and UPF site. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for a CPC and UPF.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not impact the construction and operation of a CPC and UPF. The foundation soils are not susceptible to liquefaction during or after seismic events. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines.

During construction activities, excavation of soil, limestone, and shale bedrock would occur. There is sufficient capacity either to stockpile these materials or dispose of them during the construction at CPC and UPF sites. Soil disturbance from new construction would occur at building, parking, and construction laydown areas, and lead to a possible temporary increase in erosion as a result of storm water runoff and wind action. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of ground disturbance; and the duration of time the soil is bare. A small volume of soil, limestone, and shale bedrock may be excavated during the construction process. However, this material could be stockpiled for use as fill.

The potential for additional soil contamination from project activities at the CPC and UPF sites would be minimized by current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate the hazardous material releases that could impact soil resources.

Upgraded Y-12 facilities. The current authorization basis for many of the EU buildings has been designated as Performance Category (PC)[1] 2, which means these buildings must maintain occupant safety and continued operations with minimum interruption. An assessment of the structural adequacy of the buildings indicates they do not meet current codes and standards related to natural phenomena (NP) events (e.g., tornados and earthquakes) required for a PC 2 designation. If the buildings are intended to operate an additional 50 years, they would require structural upgrades to bring the buildings into compliance (BWXT 2004a).

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[1] Performance Categories classify the performance goals of a facility in terms of facility's structural ability to withstand natural phenomena hazards (i.e., earthquakes, winds, and floods). In general, facilities that are classified as: PC 0 do not consider safety, mission, or cost considerations; PC 1 must maintain occupant safety; PC 2 must maintain occupant safety and continued operations with minimum interruption; PC 3 must maintain occupant safety, continued operations, and hazard materials confinement; and PC 4 must meet occupant safety, continued operations, and confidence of hazard confinement.

5.9.6.2.2 Operations

During operation, minor soil erosion impacts could occur, but retention basins, runoff control ditches, and cell design components would minimize impacts. The CPC, UPF, or Upgraded Y-12 Facilities would have no added impact on geology or soils during operation because of site design and engineered control measures.

5.9.6.3 *CCE Alternative*

5.9.6.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. A CPC and UPF, discussed in Section 5.9.6.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.6.3.2 CNPC (CPC + UPF + A/D/HE Center)

A CNPC would be made up of a CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.6.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** As described in Section 3.5.1.2, an A/D/HE Center would consist of multiple aboveground facilities. The A/D reference location at Y-12 is along Bear Creek Road on the western side of the Y-12 Complex, with the HE fabrication facilities located approximately 4.5 miles west. An estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the A/D/HE Center. Construction of the A/D/HE Center would have no impact on geological resources and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12 and ORR. Landslides or other non-tectonic events are unlikely to affect the construction sites. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the construction of the A/D/HE Center project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for the project.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. Past earthquake events in this area have not resulted in the liquefaction of foundation soils. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines.

***Operations:* CNPC.** An estimated 518 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. During operation, minor soil erosion impacts are expected, but retention basins, runoff control ditches, and cell design components would minimize impacts. The CNPC and other new facilities would have no added impact on geology or soils during operation because of site design and engineered control measures.

5.9.6.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact.

5.9.7 Biological Resources

5.9.7.1 *No Action Alternative*

Within the fenced, developed portion of Y-12, grassy and unvegetated areas surround the entire facility. Building and parking lots dominate the landscape at Y-12, with limited vegetation present. A wetlands survey of the Y-12 area found palustrine, scrub/shrub, and emergent wetlands. Sixty-four fish species have been collected on or adjacent to the ORR. Forty-five Federal- or state-listed threatened, endangered, and other special status species have been identified on the ORR; however none have been observed at Y-12.

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.9.7.

5.9.7.2 *DCE Alternative*

5.9.7.2.1 Terrestrial Resources

Construction. Short-term impacts to terrestrial resources could occur during construction activities. The CPC (140 acres) and UPF (35 acres) would be constructed on approximately 175 acres of land, which includes laydown areas and a temporary parking lot. There would be some disturbance to terrestrial biotic resources due to construction, construction vehicle traffic, and associated utility and parking relocation. Some dislocation of small urban type species (i.e., rodents) could be expected. Because the areas on which these facilities would be constructed are largely developed and paved, terrestrial biotic impacts would be few. The upgrade of Y-12 facilities would not involve any new land disturbance and would not impact terrestrial resources.

Because appropriate stormwater management techniques would be used to prevent pollutants from entering local waterways, aquatic resources should not be negatively impacted. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

Operations. Operational impacts to terrestrial resources from the operation of the CPC, UPF, or upgrades would not be expected. The facilities would be located in a developed area. Additionally, the Biological Monitoring and Abatement Program (BMAP) would continue and would be used to ascertain any impacts from the CPC, UPF, or upgraded facilities on local biota. However, if required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

5.9.7.2.2 Wetlands

Construction. There are wetlands along the East Fork Poplar Creek (EFPC), located to the southeast of the sites for the CPC, UPF, and existing facilities, but the stormwater management measures would help protect them from any impacts. The BMAP would continue to monitor effects in both wetlands and waterways from the construction of UPF and other Y-12 activities. Although wetlands have been identified on the Oak Ridge Reservation (ORR), no wetlands have been observed in close proximity to the project area.

Operations. There are no adverse impacts anticipated from the operation of the CPC, UPF, or upgraded facilities. Although wetlands have been identified on the ORR, no wetlands have been observed in close proximity to the project area.

5.9.7.2.3 Aquatic Resources

Construction. There are wetlands along EFPC, located to the southeast of the sites for the new and existing facilities, but the stormwater management measures would help protect them from any impacts. The BMAP would continue to monitor effects in both wetlands and waterways from the construction of the CPC and UPF. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

Operations. There are no adverse impacts anticipated from the operation of the CPC, UPF, or facilities that would be upgraded. There would be no direct untreated effluent discharges to the environment. Although wetlands have been identified on the ORR, no wetlands have been observed in close proximity to the project area. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

5.9.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at Y-12, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of any new facilities on any threatened and endangered species.

Construction. Approximately 175 acres would be cleared or modified during CPC and UPF construction. Because any acreage modified from construction would be in previous developed areas, impacts to threatened and endangered species would not be expected. The upgrade of Y-12 facilities would not involve any new land disturbance.

Operations. Approximately 118 acres of land would be permanently modified. The land to be used for the CPC and UPF is already developed and is accessible via existing roads. Monitoring to assure that threatened and endangered species and other special status species, such as the gray bat *(Myotis grisescens)*, which is present in other parts of the ORR but not Y-12, would continue. On January 19, 2007, the NNSA conducted consultations with the USFWS to discuss the potential impacts of the UPF on the Indiana bat and gray bat. As a result of that consultation, NNSA agreed to prepare a biological assessment (BA) to specifically address the potential impacts to the habitats of these bats. That BA is currently being prepared. The upgrade of Y-12 facilities would not involve any new land disturbance.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations of the CPC, UPF, or upgraded facilities would minimize the potential impacts to any special-interest species population.

5.9.7.3 *CCE Alternative*

5.9.7.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. The CPC and UPF, discussed in Section 5.9.7.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.7.3.2 CNPC (CPC + UPF + A/D/HE Center)

The CNPC would be made up of CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.7.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** Approximately 300 acres of land would be permanently modified or lost as habitat, foraging area, or as a prey base during construction activities for the A/D/HE Center. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of the A/D/HE Center.

***Operations:* CNPC.** Approximately 518 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest during operation of the CNPC. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of the CPC and UPF.

5.9.7.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact.

5.9.8 Cultural and Paleontological Resources

5.9.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9, and no additional impacts to cultural and paleontological resources are expected.

5.9.8.2 *DCE Alternative*

5.9.8.2.1 Cultural and Paleontological Resources

Construction. Construction of the CPC, UPF, or upgrades would take place in areas outside of the proposed historic district and there would be no appreciable impacts or changes.

Operations. Operation of the CPC, UPF, or upgraded facilities would have no impact on the cultural or paleontological resources at Y-12.

5.9.8.3 *CCE Alternative*

5.9.8.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.8.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.8.3.2 CNPC (CPC + UPF + A/D/HE Center)

The CNPC would be made up of CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.8.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** Construction of the A/D/HE Center, as described in Section 3.5.1.2, would take place in areas outside of the proposed historic district and there would be no appreciable impacts or changes.

***Operations:* CNPC.** Operation of the CNPC and other new facilities would have no impact on the current cultural and paleontological resources at Y-12.

5.9.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to cultural and paleontological resources, reduced operations would have no impact.

5.9.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, and the CNPC Alternative.

5.9.9.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Y-12 has a total site employment of about 6,500 contract and federal employees. Labor force statistics for the ROI are summarized in Table 4.9.9-1. Existing socioeconomic characteristics for the ROI are described in Section 4.9.9.

5.9.9.2 *DCE Alternative*

5.9.9.2.1 Regional Economic Characteristics

Construction: **CPC.** Construction of the CPC would require 2,900 worker-years of labor. During peak construction, 850 workers would be employed at the site. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 3,570 indirect jobs would be created, for a total of 4,420 jobs.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $26,100 for the construction industry, direct income would increase by $22.2 million annually. This would also generate additional indirect income in supporting industries (the analysis uses the average ROI earnings of $29,986 for other indirect jobs). The total impact to the ROI income would be approximately $129 million ($22 million direct and $107 million indirect). Table 5.9.9-1 illustrates the impacts to socioeconomic resources from construction of the CPC.

Table 5.9.9-1—Socioeconomic Impacts: Construction of the CPC, UPF, or Y-12 Upgrade

Socioeconomic Factor	CPC	UPF	Upgrade
Worker Years	2,900	2,900	1,000
Peak Workers	850	900	300
Indirect Jobs Created	3,570	3,780	1,260
Total Jobs Created	4,420	4,680	1,560
ROI Average Earning (direct)	$26,100	$26,100	$26,100
ROI Average Earning (indirect)	$29,986	$29,986	$29,986
Direct Income Increase	$22,185,000	$23,490,000	$7,830,000
Indirect Income Increase	$107,050,020	$113,347,080	$37,782,360
Total Impact to the ROI	$129,235,020	$136,837,080	$45,612,36

Source: NNSA 2007, BEA 2007.

***Construction:* UPF.** The construction of the UPF would require 900 workers during the peak year of construction. A total of 4,680 additional jobs (900 direct and 3,780 indirect) would be created in the ROI during the peak year of construction. The total new jobs would represent an increase of less than 2 percent in ROI employment. Income increases would be comparable to those expected for construction of the CPC at Y-12. Overall, these changes would be temporary, lasting only the duration of the 6-year construction period, and would be similar in magnitude to the socioeconomic impacts that are currently being experienced at Y-12 with construction of the HEUMF.

***Construction:* Upgraded Y-12 facilities.** The upgrade would require approximately 300 workers, generating a total of 1,560 jobs (300 direct and 1,260 indirect) in the ROI during the peak year of construction. The total jobs would represent an increase of approximately 0.5 percent in ROI employment, while the direct jobs would increase the employment at Y-12 by approximately 4 Percent. These changes would be temporary, lasting only the duration of the 10-year construction period, and would be much less in magnitude than the socioeconomic impacts that are currently being experienced at Y-12 with construction of the HEUMF. The existing ROI labor force could likely fill all of the jobs generated by the increased employment and expenditures. Therefore, there would be no impacts to the ROI's population or housing sector. Because there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI.

***Operations:* CPC.** Operation of the CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 7,476 indirect jobs would be created, for a total of 9,256 jobs. The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries (based on average ROI income of $29,986). The total impact to the ROI income would be approximately $311 million ($87 million direct and $224 million indirect). Table 5.9.9-2 describes the impacts to socioeconomic resources from operation of the facilities considered in this SPEIS.

Table 5.9.9-2—Socioeconomic Impacts from Operation of Facilities

Socioeconomic Resource	CPC	UPF [a]	A/D/HE Center	CNPC
Workers	1,780	600	1,785	4,165
Indirect Jobs Created	7,476	2,520	7,497	17,493
Total Jobs Created	9,256	3,120	9,282	21,658
ROI Average Earning (direct)	$49,200	$49,200	$49,200	$49,200
ROI Average Earning (indirect)	$29,986	$29,986	$29,986	$29,986
Direct Income Increase	$87,576,000	$29,520,000	$87,822,000	$204,918,000
Indirect Income Increase	$224,175,000	$75,565,000	$224,805,000	$524,545,000
Total Impact to the ROI	$311,351,000	$105,085,000	$312,627,000	$729,463,000

Source: NNSA 2007, BEA 2007.

[a] For UPF, the numbers in the table reflect the absolute impacts of that facility. In terms of incremental impacts, once operational, the UPF would actually result in a decrease in employment of 550 direct workers, due to more efficient operations than the current EU operations at Y-12.

Operations: **UPF.** Upon completion of construction, the operational workforce for the UPF is expected to be smaller than the existing EU workforce due to efficiencies associated with the new facility. NNSA estimates that the total number of EU workers should decrease by approximately 35 percent, to 600, which is a reduction of 350 workers. The consolidation of the Protected Area from 150 acres to 15 acres is also expected to reduce the security forces at Y-12 by 200 workers. Coupled together, the total workforce reduction should be 550 workers. Coupled together with efficiency gains in remaining plant operations, the total workforce reduction would be approximately 20-30 percent of the total Y-12 workforce. These reductions are expected to be met through normal attrition/retirements, as about 50 percent of the work force at Y-12 is eligible to retire within the next 5 years.

Operations: **Upgraded Y-12 facilities.** Upon completion of the upgrades (approximately 2015), operation of the EU facilities would not result in any significant change in Y-12 workforce requirements and the facilities would be staffed by the existing Y-12 workforce. Therefore, there would be no change from the baseline Y-12 employment and no impacts to ROI employment, income, population, housing, or community services. Upgrading the existing facilities would not allow the EU operations at Y-12 to be reduced from approximately 150 acres to 15 acres, and would not reduce security force requirements

5.9.9.2.2 Population and Housing

Construction: **CPC.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 workers), a total of 1,275 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Construction: **UPF.** The influx of new workers would increase the ROI population and could create new housing demand. For construction (900 new workers), 1,350 new residents would be expected in the ROI, including workers and their families. This is an increase of less than

1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Construction: **Upgrade Y-12 facilities**. The influx of new workers would increase the ROI population and create new housing demand. For construction (300 new workers), 450 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Operations: **CPC.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operations jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 workers), a total of 1,780 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-2 presents the impacts to socioeconomic resources from operation of the CPC.

Operations: **UPF.** The total workforce reduction should be 550 workers, which is approximately 8 percent of the total Y-12 workforce. These reductions are expected to be met through normal attrition/retirements, as about 50 percent of the work force at Y-12 is eligible to retire within the next 5 years. As such, UPF should have a minimal impact on the ROI's population or housing sector.

5.9.9.2.3 Community Services

Construction and operations: **CPC.** There would be no impact to ROI community services because increases in the ROI population would be less than 1 percent.

Construction and operations: **UPF.** There would be no impact to ROI community services because increases in the ROI population during construction would be less than 1 percent. Once operational, there would be no impact to ROI community services because any jobs lost from more efficient operations in the UPF would likely be met through normal attrition.

5.9.9.3 *CCE Alternative*

5.9.9.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.9.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.9.3.2 CNPC (CPC + UPF + A/D/HE Center)

Regional economic characteristics: **A/D/HE Center construction.** Construction of the A/D/HE Center would require 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that

16,044 indirect jobs would be created, for a total of 19,864 jobs. This represents approximately 10 percent of the total ROI labor force. Income within the ROI would increase as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $171.5 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $700.5 million ($171.5 million direct and $529 million indirect). Table 5.9.9-3 describes the impacts to socioeconomic resources from construction of the AD/HE Center.

Table 5.9.9-3—Socioeconomic Impacts from Construction of A/D/HE Center

Socioeconomic Factor	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	16,044
Total Jobs Created	19,864
ROI Average Earning (direct)	$44,900
Direct Income Increase	$171,518,000
Indirect Income Increase	$529,019,000
Total Impact to the ROI	$700,537,000

Source: NNSA 2007, BEA 2007.

Regional economic characteristics: **CNPC operations.** Operation of the CNPC would require 4,165 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 17,493 indirect jobs would be created, for a total of 21,658 jobs. The ROI income would increase as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $204.9 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $729 million ($205 million direct and $524 million indirect).

Population and housing: **A/D/HE Center construction.** The influx of new workers would increase the ROI population and create new housing demand. For the peak year of construction (3,820 workers), a total of 5,730 new residents would be expected in the ROI. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-3 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and create new housing demand. For operations (4,165 workers), a total of 4,500 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-2 presents the impacts to socioeconomic resources from operation of the facilities that would comprise a CNPC.

Community services: **A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.9.9-3 describes the impacts to socioeconomic resources from construction of the A/D/HE Center.

Community services: **CNPC operations.** There would be no significant impact to the ROI community services from a 5 percent increase over the current population.

5.9.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced operations would reduce the workforce from 6,500 to 3,900. This workforce, which currently represents approximately 3.1 percent of the ROI employment, would fall to 1.9 percent. DOE has a significant impact on the economies both of the ROI and of Tennessee. The loss of 2,600 direct jobs could result in the loss of up to 10,920 indirect jobs. The total job loss in the ROI (13,520 jobs) would represent 6.5 percent of the total ROI employment. The No Net Production/Capability-Based Alternative would reduce the workforce from 6,500 to 3,400.

5.9.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.9.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 7.4 percent of the ROI population surrounding Y-12. In 2000, minorities comprised 30.9 percent of the population nationally and 20.8 percent of the population in Tennessee. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 13.4 percent, which is higher than the 2000 national average of 12.4 percent, but slightly lower than the statewide figure of 13.5 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at Y-12 are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.9.11, Human Health and Safety, there are no large adverse impacts to any populations.

5.9.11 Health and Safety

5.9.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that total dose to the MEI for continued Y-12 activities would be about 0.4 mrem per year. Existing health and safety at Y-12 is discussed in Section 4.9.11.

5.9.11.2 *DCE Alternative*

Construction: **CPC, UPF, and Upgraded Y-12 facilities.** No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC and UPF reference sites are "Greenfield" sites, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA. Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC, UPF, or upgrading Y-12 facilities would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.9.11-1.

Table 5.9.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, UPF, and A/D/HE Center–Y-12

Injury, Illness, and Fatality Categories	Projects Under Consideration			
	CPC	UPF	Upgrade Y-12	A/D/HE Center
Peak Annual Employment	850	900	300	3,820
Total Recordable Cases	81	85	28	329
Total Lost Workday Cases	38	41	14	159
Total Fatalities	0.2	0.2	0.1	0.8
Project Duration				
Total Recordable Cases	276	292	97	1,128
Total Lost Workday Cases	143	141	47	541
Total Fatalities	0.7	0.7	0.2	2.6

Source: NNSA 2007, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

Operations. The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC and UPF operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.9.11-2—Annual Radiological Impacts on the Public from CPC, UPF, Y-12 Upgrade, and A/D/HE Center Operations–Y-12

Receptor	**Projects Under Consideration**		
	CPC	**UPF or Y-12 Upgrade**	**A/D/HE Center**
Population within 50 miles			
Collective dose (person-rem)	3.2×10^{-3}	1.2	9.2×10^{-4}
Percent of natural background radiation[a]	6.2×10^{-7}	2.3×10^{-4}	1.8×10^{-7}
LCFs[b]	2×10^{-6}	7×10^{-4}	6×10^{-7}
Offsite MEI			
Dose (mrem)	4.5×10^{-4}	0.2	1.3×10^{-4}
Percent of regulatory dose limit	4.5×10^{3}	2	1.3×10^{-3}
Percent of natural background radiation[a]	1.3×10^{-4}	0.06	3.9×10^{-5}
Cancer fatality risk[b]	3×10^{-10}	1×10^{-7}	8×10^{-10}

Source: Tetra Tech 2008.

[a] The average annual dose from background radiation at Y-12 is 335 mrem; the 1,548,207 people living within 50 miles of Y-12 in the year 2030 would receive an annual dose of 518,650 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0006 Latent Cancer Fatalities per rem or person-rem.

[c] The offsite MEI is assumed to reside at the site boundary, 1.3 miles from facilities. An actual residence may not currently be present at this location..

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from CPC operations would be approximately 3×10^{-10} per year (i.e., about 3 chances in 100 billion years of operation) for the CPC and approximately 1×10^{-7} per year (i.e., about 1 chance in 10 million years of operation) for the UPF.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE/NNSA has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct “hands-in-gloves” labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.9.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR Part 835) and the DOE-recommended control level of 1,000 mrem (10 CFR Part 835). Operations in the CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.9.11-3—Annual Radiological Impacts on CPC, UPF, and A/D/HE Center Workers at Y-12 from Operations

	CPC	UPF or Y-12 Upgrade	A/D/HE Center
Number of Radiological Workers	1,150	600[d]	400
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	21	103
Average worker cancer fatality risk[c]	2×10^{-4}	1.3×10^{-5}	6.2×10^{-5}
Worker Population			
Collective dose (person-rem)	333	12.6	41.2
Cancer fatality risk[c]	0.20	0.008	0.025

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR Part 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR Part 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

[d] Total workforce for UPF is 600., of which 315 are considered “radiatiological workers”. For purposes of assessing UPF worker impacts, it is assumed all 600 workers receive radiation dose.

Operations in the UPF or upgraded facilities would result in a total dose to workers of approximately 12.6 person-rem. Statistically, a total dose of 12.6 person-rem would result in 0.008 annual LCFs to the Y-12 workforce.

During normal (accident-free) operations, total facility staffing at the CPC and UPF (or upgraded facilities) would be approximately 1,780 and 600, respectively. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are presented below in Table 5.9.11-4.

Table 5.9.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, UPF, and CNPC–Y-12

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	UPF or Y-12 Upgrade	CNPC
Total Workers	1,780	600	4,500
Total Recordable Cases	77	26	195
Total Lost Workday Cases	40	14	101
Total Fatalities	0.07	0.02	0.18

Source: NNSA 2007, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.9.11.3 *CCE Alternative*

5.9.11.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. The CPC and UPF, discussed in Section 5.9.11.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.11.3.2 CNPC (CPC + UPF + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNPC would include the CPC and UPF impacts discussed in Section 5.9.11.2 as well as the impacts discussed below.

Construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable. The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.9.11-1.

Operations. DOE expects minimal public health impacts from the radiological consequences of A/D/HE Center operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity.

The estimates of annual radiological doses to workers are provided in Table 5.9.11-3. As shown in the table, approximately 400 radiological workers would be required to conduct A/D/HE Center operations. Operations in the A/D/HE Center would result in an average individual worker dose of approximately 103 mrem annually. The total annual dose to workers associated with the CNPC operations would be approximately 41.2 person-rem. Statistically, an annual dose of 41.2 person-rem would result in 0.025 LCFs to the A/D/HE Center workforce.

The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.9.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.9.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced operations would reduce the number of workers involved in radiological operations from approximately 839 to 500. This would reduce the total worker dose to 24.3 person-rem. The No Net Production/Capability-Based Alternative would reduce the number of workers involved in radiological operations from approximately 839 to 450. This would reduce the total worker dose to 21.6 person-rem. Statistically, the number of LCFs would be less than 0.015 for either of the Capability-Based Alternatives. This means that 1 LCF would be expected to workers every 68 years of operations.

5.9.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, UPF, and the A/D/HE Center at Y-12. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident’s progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, NNSA predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the Y-12 boundary; 2) the offsite population within 50 miles of Y-12; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the non-involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.9.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.3. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in existing documentation included by reference (DOE 2001a). Section 4.9.11.1 includes an analysis of accidents associated with existing enriched uranium operations, which would be applicable to the No Action Alternative.

5.9.12.2 *Consolidated Plutonium Center*

5.9.12.2.1 Radiological Accidents

Table 5.9.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of a CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to

0.0012. Table 5.9.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur.

The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.9.12-1—CPC Radiological Accident Frequency and Consequences–Y-12

		Maximally Exposed Individual[a]		**Offsite Population[b]**		**Noninvolved Worker[c]**	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	219	0.263	295,000	177	857	1
Fire in a single building	1.0×10^{-4}	173	0.208	152,000	91.2	4,760	1
Explosion in a feed casting furnace	1.0×10^{-2}	203	0.244	178,000	107	5,580	1
Nuclear Criticality	1.0×10^{-2}	0.000301	$1.81x10^{-7}$	0.117	$7.02x10^{-5}$	0.00544	$3.26x10^{-6}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	13.5	0.0081	11,900	7.14	372	0.446
Radioactive material spill	1×10^{-2}	0.406	0.000244	357	0.214	11.2	0.00672

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-2—Annual Cancer Risks for CPC–Y-12

Accident	**Maximally Exposed Individual[a]**	**Offsite Population[b]**	**Noninvolved Worker[c]**
Beyond Evaluation Basis Earthquake with Fire	$2.63x10^{-6}$	$1.77x10^{-3}$	$1x10^{-5}$
Fire in a Single Building	$2.08x10^{-5}$	$9.12x10^{-3}$	$1x10^{-4}$
Explosion in a Feed Casting Furnace	$2.44x10^{-3}$	1.07	$1x10^{-2}$
Nuclear Criticality	$1.81x10^{-9}$	$7.02x10^{-7}$	$3.26x10^{-8}$
Fire-induced Release in the CRT Storage Room	$8.1x10^{-5}$	$7.14x10^{-2}$	$4.46x10^{-3}$
Radioactive Material Spill	$2.44x10^{-6}$	$2.14x10^{-3}$	$6.72x10^{-5}$

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The results of the accident analysis indicate potential consequences that exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for a CPC. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in a CPC design to ensure compliance with exposure guidelines if NNSA were to decide to build a CPC at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[2] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into a CPC design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-1) is the beyond evaluation basis earthquake and fire. Approximately 177 LCFs in the offsite population could result from this accident in the absence of mitigation. An offsite MEI would receive a dose of 219 rem. Statistically, the MEI would have a 0.1 chance of developing a LCF, or about 1 in 10. This accident has a probability of occurring once every 100,000 years.

When probabilities are taken into account (see Table 5.9.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be 2×10^{-3}, or approximately 1 in 500. For the population, the LCF risk would be 1.07, meaning that approximately 1 LCF would statistically occur once every year in the population.

5.9.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor***.**

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

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[2] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.9.12-3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Both Gaussian Plume and ALOHA methodologies were used to evaluate the potential consequences associated with a release of each chemical in an accident situation. Table 5.9.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.9.12-3—CPC Chemical Accident Frequency and Consequences–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}
Hydrofluoric acid	550	20	0.35	2.0	0.016	10^{-4}
Formic acid	1,500	10	0.08	0.07	0	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.3 *Uranium Processing Facility or Upgrade of Y-12 Facilities*

5.9.12.3.1 Radiological Accidents

Table 5.9.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the UPF or upgraded facilities) and a hypothetical non-involved worker, as well as the accident risks (Table 5.9.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the UPF or upgraded facilities.

Table 5.9.12-4—UPF or Upgraded Facilities, Radiological Accident Frequency and Consequences–Y-12

		Maximally Exposed Individual[a]		**Offsite Population[b]**		**Noninvolved Worker[c]**	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	$10^{-4} – 10^{-6}$	0.592	0.000355	520	0.312	16.3	0.00978
Explosion	$10^{-4} – 10^{-6}$	0.0577	0.0000346	51.2	0.0307	1.18	0.000708
Fire in UPF Warehouse	$10^{-4} – 10^{-6}$	0.689	0.000413	608	0.365	17.4	0.0104
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0734	0.000044	66.1	0.0397	1.08	0.000648
Aircraft crash	$10^{-4} – 10^{-6}$	0.259	0.000155	665	0.399	0.388	0.000233

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-5—Annual Cancer Risks for UPF or Upgraded Facilities–Y-12

Accident	**Maximally Exposed Individual[a]**	**Offsite Population[b]**	**Noninvolved Worker[c]**
Major fire	3.55×10^{-8}	3.12×10^{-5}	9.78×10^{-7}
Explosion	3.46×10^{-9}	3.07×10^{-6}	7.08×10^{-8}
Fire in UPF Warehouse	4.13×10^{-8}	3.65×10^{-5}	1.04×10^{-6}
Design-basis fires for HEU Storage	4.4×10^{-7}	3.97×10^{-4}	6.48×10^{-6}
Aircraft crash	1.55×10^{-8}	3.99×10^{-5}	2.33×10^{-8}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-4) is the aircraft crash into the EU facilities. Approximately 0.4 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a maximum dose of 0.3 rem. Statistically, this MEI would have a $2x10^{-4}$ chance of developing a LCF, or about 1 in 5,000. This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.9.12-5), the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be $5x10^{-7}$, or about 1 in 2 million. For the population, the LCF risk would be $4x10^{-4}$, or about 1 in 2,500.

The UPF Alternative would decrease the overall Y-12 facility accident risks presented above. This is because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into the UPF, reducing the accident risks associated with those older facilities. However, detailed design descriptions for the UPF are not available. Without these detailed descriptions, this reduction in accident risks cannot be quantified. New facilities such as the UPF would be constructed to current building design standards and would be designed and built to withstand higher seismic accelerations and thus would be more resistant to earthquake damage. These new facilities would experience damage from earthquakes and other external initiators less frequently. Also, controls would be incorporated into the design of new Y-12 facilities to reduce the frequency and consequence of internally initiated accidents. Therefore, the risks presented above for the current Y-12 facilities (both individually and additive) would be bounding for the UPF; but not overly bounding given that the risks presented above are small.

5.9.12.3.2 Hazardous Chemicals Impacts

The UPF or upgraded facilities would store and use a variety of hazardous chemicals. The quantities of chemicals vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. NNSA estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.9.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.9.12-6—Chemical Accident Frequency and Consequences of UPF or Upgraded Facilities–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.4 *Assembly/Disassembly/High Explosives Center*

5.9.12.4.1 Radiological Accidents at Y-12

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.9.12-7 and 5.9.12-8 shows the consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table was selected from a wide spectrum of accidents described in the *Topical Repor—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center.

Table 5.9.12-7—A/D/HE Center Radiological Accident Consequences–Y-12

	Maximally Exposed Individual[a]		**Offsite Population[b]**		**Noninvolved Worker[c]**	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	54.7	0.0656	48,100	28.9	1,500	1
Scenario 2	0.0392	2.35×10^{-5}	34.4	0.0206	1.08	0.000648
Scenario 3	3.28×10^{-6}	1.97×10^{-9}	0.00288	1.73×10^{-6}	9.02×10^{-5}	5.41×10^{-8}
Scenario 4	2.3	0.00138	5,390	3.23	4.11	0.00247
Scenario 5	2.41	0.00145	5,630	3.38	4.3	0.00258
Scenario 6	0.0179	1.07×10^{-5}	41.8	0.0251	0.0319	1.91×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-8—Annual Cancer Risks for A/D/HE Center Accidents–Y-12

Accident	**Maximally Exposed Individual[a]**	**Offsite Population[b]**	**Noninvolved Worker[c]**
Scenario 1	6.56×10^{-6}	2.89×10^{-3}	1×10^{-4}
Scenario 2	2.35×10^{-7}	2.06×10^{-4}	6.48×10^{-6}
Scenario 3	1.97×10^{-11}	1.73×10^{-8}	5.41×10^{-10}
Scenario 4	1.38×10^{-9}	3.23×10^{-6}	2.47×10^{-9}
Scenario 5	1.45×10^{-7}	3.38×10^{-4}	2.58×10^{-7}
Scenario 6	1.07×10^{-7}	2.51×10^{-4}	1.91×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The results of the accident analysis indicate potential consequences that exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for an A/D/HE Center. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in an A/D/HE Center design to ensure compliance with exposure guidelines if NNSA were to decide to build an A/D/HE Center at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[3] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into an A/D/HE Center design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-8) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 28.9 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 55 rem. Statistically, this MEI would have a 0.03 chance of developing a LCF, or about 1 in 30. The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.9.12-9), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be $7\text{x}10^{-6}$, or about 1 in 150,000. For the population, the LCF risk would be $3\text{x}10^{-3}$, or about 1 in 350.

5.9.12.4.2 Hazardous Chemicals Impacts

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Additional information on the evaporation and dispersion of each chemical is provided in Appendix C. Table 5.9.12–9 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. The distance to the nearest site boundary is 5.4 miles. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

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[3] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

Table 5.9.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	2.3	16	4.5	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accident probabilities are largely a function of the operation being conducted, rather than the number of times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.9.13 Transportation

5.9.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at Y-12, and impacts would remain unchanged from the baseline presented in Section 4.9.12.

5.9.13.2 *DCE Alternative*

5.9.13.2.1 Construction

CPC, UPF, and Upgrade to Y-12 facilities. Construction of the CPC, UPF, or upgrades would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12 and would be temporary.

5.9.13.2.2 Operations

Radiological transportation for the CPC, UPF, or upgraded facilities would include transport of pits from Pantex to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. Section 5.10 presents the impacts of radiological transportation.

The addition of new employees for the CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.9.12.

5.9.13.3 *CCE Alternative*

5.9.13.3.1 CNC (CPC + UPF)

By definition, the DCE Alternatives at Y-12 would amount to a CNC.

5.9.13.3.2 CNPC (CPC + UPF + A/D/HE Center)

Construction: **A/D/HE Center.** Construction of the A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12 and would be temporary.

Operations: **CNPC.** If the A/D/HE Center were located at Y-12 as part of a CNPC, the annual radiological transportation impacts associated with the CPC and UPF would not occur, with the exception of TRU waste transportation for the CPC. There would be a one-time transport of SNM from Pantex to the CNPC, as described in Section 5.10. The addition of new employees for the CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.9.12.

5.9.13.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in total ROI workers by 13,520, which would represent 6.5 percent of the total ROI employment, could cause a short-term decrease in road congestion, although it is acknowledged that these employees could seek and find other employment in the ROI. Regarding the radiological transportation of secondaries and cases between Y-12 and Pantex, reduced operations would reduce these transportation requirements by approximately 25 percent. As discussed in Section 5.10, the annual transportation impacts for secondaries and cases, for both incident-free transportation and potential accidents, would be small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts).

5.9.14 Waste Management

5.9.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities a Y-12 would continue as required to support the missions described in Section 3.2.9. Y-12 presently manages LLW, hazardous waste, mixed LLW, high-level waste, and sanitary waste. here would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 4.9.13-1, in Chapter 4, shows annual waste generation volumes from Y-12 operations for 2003. For convenience, this table is shown again, below, as Table 5.9.14-1 to facilitate comparisons of the additional alternatives presented.

Table 5.9.14-1—Waste Generation Totals by Waste Type for Routine Operations–Y-12

Waste Type	Waste Volume (FY-2003)
Low-Level Waste (Liquid) (yd^3)	17.42
Low-Level Waste (Solid) (yd^3)	7,796.69
Mixed Low Level Waste (Liquid) (yd^3)	17.87
Mixed Low Level Waste (Solid) (yd^3)	21.12
RCRA (hazardous)Waste (tons)	14.37
TSCA Waste (tons)	14.84
Mixed TSCA (tons)	32.04
Non-hazardous Sanitary Waste (tons)	7923.71

Source: NNSA 2007.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Y-12 does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed-LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective, exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW waste where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted, where necessary, to address changes in the options available to DOE/NNSA for disposition of these specific waste streams.

5.9.14.2 *DCE Alternative*

5.9.14.2.1 CPC Construction Impacts

Construction of a CPC would generate liquid hazardous waste and both liquid and solid non-hazardous waste. Table 5.9.14–2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the proposed CPC.

Table 5.9.14-2—Total Waste Generation from CPC Construction–Y-12

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Non-hazardous Solid (yd^3)	10,900
Non-hazardous Liquid (gal)	56,000

Source: NNSA 2007.

Hazardous waste generated by the construction of the CPC would amount to less than 30 percent of the normal annual hazardous waste generation at Y-12. Y-12 collects, packages, and ships hazardous waste, off-site, to either another DOE site or a commercial facility for treatment and disposal. The hazardous waste generated from construction of the CPC at Y-12 would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The total amount of solid non-hazardous waste generated over the entire construction period for the CPC at Y-12 is a fraction of the amount of non-hazardous waste Y-12 currently generates in a year. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

Non-hazardous liquid wastewater at Y-12 is collected, commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. At 56,000 cubic yards, the total amount generated throughout the entire construction process amounts to a very small percentage of the amount of wastewater treated and discharged by Y-12 in a year of routine operation. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the construction of the CPC at Y-12.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate a CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction was completed.

Waste generation impacts associated with operation of s CPC at Y-12 are discussed in Section 5.9.14.2.3, together with the operation of a UPF.

5.9.14.2.2 UPF Construction Impacts

Construction of an UPF at Y-12 would generate small levels of LLW, Low Level Mixed Waste, hazardous waste, and non-hazardous solid waste. Table 5.9.14-3 shows the expected wastes to be generated from the construction of the UPF at Y-12.

Table 5.9.14-3—Waste Generation from Construction of the UPF

Waste Category	Volume
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	70
Low Level Mixed Solid Waste (yd^3)	4
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	4
Non-Hazardous Solid Waste (tons)	800

Source: NNSA 2007.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Construction of the UPF is expected to generate 70 cubic feet of solid LLW over the entire construction period. This amounts to less than one percent of annual amount of solid LLW generated by routine operations at Y-12. There is more than sufficient capacity to collect this waste ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12. Once packaged, this waste will either be sent to NTS or a commercial facility for treatment and disposal.

Mixed LLW waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW waste. The 4 cubic yards of mixed LLW waste expected to be generated throughout the entire construction process of the UPF amounts to about ten percent of the annual amount of mixed LLW waste generated by routine operations at Y-12. There is more than sufficient capacity to collect this waste transport it to the West End Treatment Facility where it would be treated, packaged for storage and ultimate disposal along with quantities of this type of waste generated on a routine basis at Y-12.

At four tons, the amount of hazardous waste expected to be generated by the construction of the UPF at Y-12 is comparable to the normal annual generation of 14 tons. Y-12 collects, packages, and ships hazardous waste off-site, either to another DOE site or to a commercial facility for treatment and disposal. The hazardous waste generated from construction of the UPF, at Y-12, would be collected and would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in a construction/demolition landfill. At 800 tons, the total amount of solid non-hazardous waste generated over the entire construction period for the UPF at Y-12 is a little more than ten percent of the amount of non-hazardous waste Y-12 currently generates in a year. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the UPF at Y-12.

A retention pond would be constructed to manage stormwater runoff from the entire UPF site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the UPF site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once UPF construction is completed.

The upgrade of existing facilities would generate minimal wastes compared to existing waste quantities shown on Table 5.9.14-1.

5.9.14.2.3 CPC and UPF Operation Impacts

Normal operation of the CPC and UPF, at Y-12, would generate LLW, hazardous waste, and sanitary waste. Table 5.9.14-4 summarizes the estimated waste generation rates for the operation of the CPC and UPF, at Y-12.

Table 5.9.14-4—Waste Generation from Operations of CPC and UPF–Y-12

	CPC	UPF	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	7,800	11,700
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (yd^3)	0.6	0	0.6
Non-Hazardous Solid Waste (tons)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Y-12 does not now generate or manage any TRU waste. Quantities of TRU waste generated through the operation of the CPC (the UPF does not generate TRU waste) would be collected at the CPC, packaged in accordance with the WIPP WAC, placed in TRUPACT containers and transported to the WIPP for disposal. If needed, this waste could be collected, transported to the West End Treatment Facility for any treatment required to meet the WIPP WAC, and then packaged, placed in TRUPACTs and transported to the WIPP for disposal.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Operation of the DCE Alternative (CPC and UPF) would generate just a little under 11,700 cubic yards of solid LLW. Although this amount is more than double the amount of LLW routinely generated at Y-12, there is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed, the liquid waste solidified, and packaged with the LLW generated by normal operational activities at Y-12. It would then be shipped off-site, either to the NTS or a commercial facility, for treatment and disposal.

Mixed LLW waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW. The amount of mixed LLW expected to be generated by the operation of the DCE Alternative (CPC and UPF) represents an 86 percent increase. A CPC, however, would incorporate a waste handling module sufficient to accumulate, treat and package this LL-mixed waste and either dispose of this waste onsite, if acceptable to the regulators, or have it shipped to a commercial LLW disposal site, or NTS.

Like TRU waste, Y-12 does not now generate mixed TRU waste. Quantities of TRU mixed waste generated through the operation of the CPC (the UPF does not generate TRU waste) would be collected at the CPC, transported to the West End Treatment Facility where it would be treated, packaged in accordance with the WIPP Waste Acceptance Criteria, placed in TRUPACT containers and transported to the WIPP for disposal.

The 19 tons of hazardous waste generated by the operation of the DCE Alternative (CPC and UPF) would amount to substantially more hazardous waste than is presently generated, on a routine basis, by Y-12. Y-12 collects, packages, and ships hazardous waste off-site to either another DOE site or a commercial facility for treatment and disposal. The hazardous waste generated from operation of the DCA Alternative would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The 15,225 cubic yards of solid non-hazardous waste which would be generated from the operation of the DCE Alternative (CPC and UPF) at Y-12 would amount to more than the amount presently generated at Y-12. Sufficient on-site capacity; however exists to accommodate the projected volumes of non-hazardous waste generated by the operation of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized. Metal and other recyclable materials would be removed from this waste stream, to the extent practicable, prior to disposal.

Non-hazardous liquid wastewater at Y-12 is collected commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. The amount of wastewater generated by the CPC would be well within the capacity of the wastewater treatment and discharge capability of Y-12. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the operation of the DCA Alternative (CPC and UPF) at Y-12.

5.9.14.3 *CCE Alternative (CPC + UPF)*

For Y-12, by definition, there is no CNC Alternative. The CPC and UPF, as already discussed in Section 5.9.14.2, would constitute a "CNC" if both projects were to be implemented at Y-12.

5.9.14.4 *CNPC Alternative (CPC + UPF + A/D/HE Center)*

Waste management impacts from the construction and operation of the full CNPC would include the CPC and UPF impacts, already discussed in DCE Alternative, in Section 5.9.14.2, above, and the A/D/HE Center, the impacts of which will be presented in this section. The expected waste impacts of construction and operation of the CNPC at Y-12 are discussed below.

5.9.14.4.1 CNPC Construction Impacts

Construction of CNPC would entail the construction of the DCE Alternative, discussed in Section 5.9.14.5, above, and the construction of an A/D/HE Center, discussed in this section. The additional construction of the A/D/HE Center would generate low level waste (LLW), and solid and liquid sanitary waste. Table 5.9.14-5 summarizes the total volume of waste generated over the construction period for an A/D/HE Center.

Table 5.9.14-5—Annual Waste Generation from Construction of the A/D/HE Center–Y-12

Waste Category	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	7,100
Non-Hazardous Liquid Waste (gal)	45,000

Source: NNSA 2007.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is routinely generated at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Construction of the A/D/HE Center would generate an expected 9,900 cubic yards over the entire construction period. This is about thirty percent more than Y-12 routinely generates in a year. There is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12, and shipped off-site, either to the NTS, or a commercial facility, for treatment and disposal.

Non-hazardous solid waste at Y-12 is disposed of on-site in a construction/demolition landfill. Construction of an A/D/HE Center at Y-12 is expected to generate 7,100 cubic yards of non-hazardous solid waste over the entire construction period. This amounts to about the same amount Y-12 generates in a year of normal operation. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the A/D/HE Center at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

The 45,000 gallons of non-hazardous liquid waste could easily be handled by the existing infrastructure and wastewater treatment facilities at Y-12.

5.9.14.4.2 CNPC Operation Impacts

Normal operation of the CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.9.14-6 summarizes the estimated waste generation rates for the operation of a CNPC at Y-12.

Table 5.9.14-6—Annual Waste Generation from Operations of the CNPC–Y-12

Waste Type	CPC	UPF	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU) (yd^3)	950	0	0	950
Mixed TRU Solid Waste(included in TRU, above)(yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	7,800	40	11,740
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	21	0	23.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	14	.9	18.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,125	12,000	27,225
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

Y-12 does not now generate or manage any TRU waste. Quantities of TRU waste generated through the operation of the CNPC would be collected at the CNPC, packaged in accordance with the WIPP WAC, placed in TRUPACT containers and transported to the WIPP for disposal. If treatment of this waste needed to meet the WIPP WAC, this waste could be collected, transported to the West End Treatment Facility for any required treatment, and then packaged, placed in TRU PACS and transported to the WIPP for disposal.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid low level waste. Operation of the CNPC would generate an expected 11,740 cubic yards of LLW. Although this amount is more than the amount of LLW routinely generated at Y-12, there is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12, and shipped off-site, either to the NTS or a commercial facility, for treatment and disposal.

Low level mixed waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW. The LLW expected to be generated by the operation of the CNPC (18 cubic yards solidified liquid, 21 cubic yards solid) is about equal to the amount routinely generated by Y-12. There is sufficient capacity to collect this waste, transport it to the West End Treatment Facility where it would be treated, packaged for storage and ultimate disposal along with quantities of this type of waste generated on a routine basis at Y-12.

Like TRU waste, Y-12 does not now generate mixed TRU waste. Quantities of TRU mixed waste generated through the operation of the CNPC would be collected at the CNPC, transported to the West End Treatment Facility where it would be treated, packaged in accordance with the WIPP WAC, placed in TRUPAC containers and transported to the WIPP for disposal. Hazardous waste generated by the CNPC would exceed levels generated at Y-12. These wastes would be captured at the CNPC, packaged, and shipped off-site, either to another DOE facility or a commercial facility for treatment and disposal. Sufficient infrastructure at Y-12 and off-site disposal capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The total amount of solid non-hazardous waste which would be generated from the operation of the CNPC at Y-12 would amount to just under fifty percent more than the normal amount generated at Y-12. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

Non-hazardous liquid wastewater at Y-12 is collected commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. At a little more than 120,000 gallons, the amount generated by the operation of the CNPC is a little less than a sixth of the amount of industrial wastewater treated and discharged by Y-12 in a year of routine operation. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the operation of the CNPC at Y-12.

5.9.14.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to waste management, reduced operations would have a direct impact reduction on wastes generated as shown in Table 5.9.14-7.

Table 5.9.14-7—Annual Radiological Wastes Generated by Y-12 for the No Action Alternative and the Capability-Based Alternatives

Waste Category	No Action Alternative	Capability-Based Alternative	No Net Production/Capability-Based Alternative
Low-level Waste			
Liquid (yd^3)	17.4	10.4	9.6
Solid (yd^3)	7,800	4,700	4,400
Mixed Low-level Waste			
Liquid (yd^3)	17.9	10.7	9.9
Solid (yd^3)	21.1	12.7	11.7

Source: NNSA 2007, NNSA 2008.

Because Y-12 has adequate facilities to manage the wastes under either alternative, no major impacts to waste management are expected. Reductions in LLW generation would reduce the transportation of LLW to NTS. As discussed in Section 5.10, these impacts are small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts) under the No Action Alternative.

5.9.15 Closure and D&D of the Production Facilities at Y-12

The closing of the Y-12 production facilities would entail a substantial D&D and remediation effort. Although it is not possible without specific and extensive site characterization to give a precise estimate of what this would entail, it is possible to look at known contamination issues, to look at other sites at which DOE has closed facilities and performed D&D, and to develop general estimates of what the D&D effort associated with the closure of the Y-12 production facilities might be. The Rocky Flats Plant has completed extensive D&D activities and closure. For nearly 40 years, the plant, located about 16 miles northwest of Denver, served as a nuclear weapons production facility. Over the years in which this site manufactured plutonium parts for nuclear weapons, the site developed both chemical and radioactive contamination issues affecting the soil, groundwater, surface water, and many of the buildings at the site. Contaminants included radionuclides, such as plutonium and uranium; toxic metals, such as beryllium; and hazardous chemicals, such as cleaning solvents and degreasers. While the site comprises approximately 6,300 acres, the majority of that land was a buffer zone with the industrialized area concentrated in the center of the site on about 385 acres. About one-fourth of the sites more than 800 original structures (buildings and storage tanks) were radioactively or chemically contaminated.

Although not on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) NPL, Rocky Flats was cleaned-up pursuant to CERCLA requirements (as well as RCRA) through a Federal Facilities Compliance agreement developed and signed by EPA, the State of Colorado and DOE. The D&D of the plant identified 360 separate clean-up areas. D&D activities started in 1995 and were completed (except for some groundwater treatment activities which will continue) in 2006, with about 90 percent of the work being accomplished from 2001 to 2005. Remediation included the removal of more than 15,000 cubic meters of transuranic and other radioactive waste, more than 800,000 cubic meters of sanitary waste and more than 4,300 cubic meters of hazardous waste. A substrata of shale minimized contamination of deeper aquifers. More than 11 million gallons of contaminated groundwater had to be treated. In addition, 5 million gallons of seep water was collected and treated. Between 1995 and 2005, 6,616 employees (including salaried employees, hourly employees, and security policy officers) were involved in the clean-up activities at a cost of more than $10 billion.

The Y-12 site is similar to Rocky Flats, but at 811 acres is twice the size. Although Y-12 has about 450 buildings they are all much larger than the structures at Rocky Flats. For the past 65 years, Y-12 has been involved in, the enrichment of uranium for use in weapons, and in the design and manufacture of the HEU secondary components for nuclear weapons. Environmental issues include known releases of mercury, beryllium, uranium, cesium, PCPs and degreasing chemicals. In November 1989 the Oak Ridge Reservation, on which Y-12 is located, was placed on the CERCLA National Priority List. Closure of the production facilities on Y-12 would require compliance with the CERCLA clean-up standards, and approval of EPA.

Using this comparison it is possible to get a general idea of the costs and the effort involved in the closure and cleanup of the production facilities at Y-12. Table 5.9.15-1 provides a summary of the Rock Flats actions and multiplies them by a factor of two giving an idea of what the D&D of the production facilities at Y-12 might entail:

Table 5.9.15-1—Y-12 Plant D&D Estimates

	Rocky Flats	**Y-12**
Time for clean-up	6 Years	12 Years
TRU Waste Removed	15,000 m^3	0[a]
LLW Removed	500,000 m^3	1,000,000 m^3
Sanitary Waste Removed	800,000 m^3	1,600,000 m^3
Hazardous Waste Removed	4,300 m^3	8,600 m^3
Groundwater Treated	11 million gal	22 million gal
Seep Water Treated	5 million gal	10 million gal
Shipped to other DOE sites	21 tons SNM	247 tons HEU to CNPC
Employment	40,000 worker-years	80,000 worker-years
Cost	$10 billion	$20 billion

Source: NNSA 2007.

[a] Y-12 has never handled plutonium, so it is not expected that any TRU waste would be involved.

5.10 COMPLEX-WIDE TRANSPORTATION IMPACTS

This section presents the environmental impacts of transporting Category I/II SNM for the programmatic alternatives.

5.10.1 No Action Alternative

Since the 1940s, NNSA and its predecessor agencies have moved nuclear weapons, nuclear weapons components, and SNM by a variety of commercial and Government transportation modes. In the late 1960s, worldwide terrorism and acts of violence prompted a review of procedures for safeguarding these materials. As a result, a comprehensive new series of regulations and equipment was developed to enhance the safety and security of these materials in transit.

The Transportation Safeguards Division (TSD) subsequently was established in 1975 at the Albuquerque Operations Office. That office is now referred to as the Office of Secure Transportation (OST), which will be the name used here. OST modified and redesigned transport equipment to incorporate features that more effectively enhance protection and deny unauthorized access to the materials. During that time, OST curtailed the use of commercial transportation systems and moved to a total federal operation.

5.10.1.1 *OST Management*

Management, control, and direction of OST is centralized at Albuquerque, New Mexico. The federal agents who drive the transportation vehicles, as well as the escorts, are Nuclear Materials Couriers or Couriers for short. There are three federal agent operations centers located at Amarillo, Texas; Oak Ridge, Tennessee; and Albuquerque. Approximately 100 shippers and receivers of SNM and other sensitive materials are served at approximately 33 locations throughout the continental United States.

5.10.1.2 *Transportation Safety*

Since its establishment in 1975, OST has accumulated over 100 million miles of experience transporting DOE cargo with no accidents causing a fatality or release of radioactive material. This is due largely to the OST philosophy that safety and security are of equal and paramount importance in the accomplishment of DOE's transportation safeguards mission.

5.10.1.3 *Transportation & Emergency Control Center (TECC)*

Transportation and Emergency Control Center (TECC) is a nationwide communications system operated by the OST and located in Albuquerque. This system provides a capability to monitor the status, location and maintain real-time communications 24 hours a day, 365 days a year, with every convoy. The control center maintains an emergency contact directory of federal, state, and local response organizations located throughout the contiguous U.S. This capability is available to OST 24 hours a day, 365 days a year.

5.10.1.4 *Transportation Vehicles*

The Safeguards Transporter (SGT) is a specially designed trailer for an 18-wheel rig that incorporates various deterrents to prevent unauthorized removal of cargo. The trailer has been designed to afford the cargo protection against damage in the event of an accident. This is accomplished through superior structural characteristics and a highly reliable cargo tie-down system similar to that used aboard aircraft. The tractors are standard production units which have been modified to provide protection against attack. The thermal characteristics of the SGT would allow the trailer to be totally engulfed in a fire without incurring damage to the cargo. These vehicles are equipped with communications, electronic, radiological monitoring, and other equipment that further enhance safety and security.

The vehicles used by OST must meet maintenance standards significantly more stringent than those for similar commercial transport equipment. All vehicles undergo an extensive maintenance check prior to every trip, as well as periodic preventative maintenance inspections. In addition, these vehicles are replaced more frequently than commercial shippers. As a result, OST experiences few en route breakdowns and has had no accidents due to equipment malfunction.

5.10.1.5 *Travel Precautions*

OST convoys do not travel during periods of inclement weather (ice, fog, etc.). Should the convoys encounter adverse weather, provisions exist for the convoys to seek secure shelter at previously identified facilities. Although OST provides sleeper berths in all vehicles, couriers accompanying OST shipments do not exceed 32 hours of continuous travel without being afforded the opportunity for eight hours of uninterrupted, stationary bed rest. OST has also imposed a maximum 65 mile/hour speed limit on its convoys, even if the posted limit is greater.

5.10.1.6 *Law Enforcement Liaison*

OST has a liaison program through which it communicates with law enforcement and public safety agencies throughout the country, making them aware of these shipments. OST has established procedures should a Safeguards Transporter be stopped by an officer. The liaison program provides law enforcement officers information to assist them in recognizing one of these vehicles should it be involved in an accident, and what actions to take in conjunction with the actions of the couriers in the rig and escort vehicles. Through the liaison program OST offers in-depth briefings at the state level.

5.10.1.7 *Armed Couriers*

Armed nuclear materials couriers accompany each shipment containing special nuclear material. They also drive the highway tractors and escort vehicles while operating the communications and other convoy equipment. Couriers are non-uniformed federal agents and are authorized by the *Atomic Energy Act* to make arrests and carry firearms in the performance of their duties. They carry both a photo identification card and a shield that certify their federal status. Couriers are required to obey all traffic laws and to cooperate with law enforcement officers.

After careful screening and selection, courier trainees undergo a 16-week basic training course, during which they receive instruction in tractor-trailer driving, electronic and communications systems operation, and firearms. Tests in operating procedures, physical fitness, driving, firearms, and other job-related subjects must be passed in order to pass the training and be certified as a courier. Following basic training, the courier spends the balance of the first year in on-the-job training. The first year of employment is probationary, which the courier must successfully complete to be retained. Couriers are given in-service training throughout their careers. These classes are designed to refresh and update the training taught during basic training, in addition to preparing couriers for demonstrations or armed attacks. Subjects such as team tactics, terrorist tactics, and new adversary technology are taught. Additionally, physical and firearm proficiencies are tested.

Couriers must continue to meet periodic qualification requirements relative to firearms, physical fitness and driving proficiency. They must also undergo and pass an annual medical examination for continued certification under the DOE Human Reliability Program. In addition, couriers are subject to the DOE's randomized drug and alcohol testing program. If a courier fails to meet any of the minimum requirements necessary for courier certification, the individual is temporarily removed from active status and provided additional training until demonstrated performance reaches an acceptable level.

OST operations are in compliance with the requirements of 49 CFR Part 177 for selecting, notifying drivers of, and adhering to preferred routes. The majority of OST travel (90 percent) is over interstate highway; the remaining 10 percent is over routes that meet the conditions for deviating from the preferred route. Regulations permit deviation from the preferred route when safety or security requirements dictate such deviation. Regulations permit OST deviation from the requirements regarding notification of the routes used. Routes used are classified, compartmented information that may not be disseminated except to persons with appropriate security clearance and a need to know.

All SGT couriers wear radiation dosimeters. Because of the nature of the material and the design of the containers, the transport of both nuclear explosives and plutonium/uranium weapons components has led to ionizing radiation doses to SGT couriers. SGT couriers are required to inspect the cargo within the trailer prior to shipment. This action is the primary contributor to dose for the crew.

Under the No Action Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 20 pits per year) would continue to be shipped between Pantex and LANL;
- Canned subassemblies (CSAs) (assume approximately 200 units per year) would continue to be shipped between Pantex and Y-12; and
- Removal of SNM from LLNL.

CSAs that may contain HEU and depleted uranium (DU) are shipped between Pantex and Y-12. CSAs are transported intersite by SGTs in DOT-criteria Type B packages. The actual number of CSAs shipped to and from Pantex is classified. When a shipment of CSAs is made from Pantex, the containers, staged in an approved storage facility, are loaded onto a pallet and driven by electric forklift to a loading dock. These containers are loaded and secured into an SGT that is then driven to Y-12. Arriving containers are unloaded and brought into a facility where a transfer check is performed. The transfer check confirms the identity and quantity of the shipment and verifies the integrity of the tamper-indicating devices on the containers.

Pits shipped between Pantex to LANL are transported intersite by SGTs in approved Type B packages. When a shipment of pits to LANL is required, the pits are repacked into Type B containers and sealed with a tamper-indicating device. The containers are loaded onto a pallet and driven by electric forklift to a loading dock. The containers are loaded and secured into an SGT and driven to LANL. The actual number of pit shipments to and from Pantex is classified.

Table 5.10-1 presents the estimated radiological impacts of the annual transportation activities associated with the A/D/HE mission at Pantex, a 20 pits per year capacity at LANL, and a 200 unit capacity for CSAs at Y-12. The radiological incident-free impacts provided in the following sections are an estimate of LCFs due to exposure of radiation from the radioactive materials payloads proposed in the SPEIS alternatives. The RADTRAN 5.6 computer analyzes the exposure within a half-mile zone surrounding the transportation routes.

Table 5.10-1—Annual Radiological Transportation Impacts–No Action Alternative

Movement Description	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
Pits	Handling	Note 1	0.00559	0.00559
	Intersite Transportation	3.58×10^{-12}	3.6×10^{-5}	3.6×10^{-5}
	Stops		2.7×10^{-10}	2.7×10^{-10}
	MEI		1.4×10^{-10}	1.4×10^{-10}
CSAs	Handling	Note 2	0.0224	0.0224
	Intersite Transportation	1.51×10^{-19}	0.00145	0.00145
	Stops		2.73×10^{-9}	2.73×10^{-9}
	MEI		1.51×10^{-9}	1.51×10^{-9}

Source: Dimsha 2007.
Note 1: accident impacts associated with handling accidents are included in the accident analyses for the No Action pit production at LANL.
Note 2: accident impacts associated with handling accidents are included in the accident analyses for the Y-12 No Action Alternative.
Assumptions: All materials in metal form
ES-3100 or similar container used
Release and aerosol fractions based on West Valley Demonstration Project (WVDP) Waste Management EIS (DOE 2004g) values, which were determined to bound release fractions for pits and secondaries.

With respect to accident impacts, RADTRAN calculates risks and consequences of potential accidents based a number of input parameters including:

- Probability and severity fraction of accident types;
- Deposition velocity of the material;
- Release fraction from the container;
- Aerosol and respirable factors for the material; and
- Weather conditions.

The inputs for the materials, containers, and vehicles were adopted from industry standards. The probability and severity fractions were taken from DOE-accepted studies and reports. The weather conditions were based on Pasquill weather stability classes. Analyses were conducted in Stability Class D (most frequently occurring weather conditions) and Class F (most stable weather conditions). All results presented in this chapter are for Stability Class F, which yields the most conservative case.

The maximally-exposed individual (MEI) results represent health impacts to a theoretical person that would receive the maximum exposure due to the proposed transportation. Often the MEI represents personnel associated with the material transport, such as a vehicle escort.

Handling impacts reflect the sum total exposure impacts to crews involved in the storage, packaging, and loading/unloading of the material to be transported. The number of personnel, time spent handling the material, and distance to the material are dependant on the individual transportation campaigns.

The impact results at stops are presented for two theoretical receptor groups: the worker at the truck stop and residents that live within a half-mile radius of the truck stop. An average suburban population density is assumed for the area residents results. Table 5.10-2 presents the estimated nonradiological impacts for the No Action Alternative.

Table 5.10-2—Annual Nonradiological Transportation Impacts–No Action Alternative

Origin/ Destination Pair	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
Pantex/LANL	Pits	1,500	5.64×10^{-4}	2.70×10^{-5}	6.9×10^{-7}
Pantex/Y-12	CSAs	17,700	6.06×10^{-3}	2.93×10^{-4}	3.41×10^{-5}

Source: Dimsha 2007.

5.10.2 Distributed Centers of Excellence Alternative

Under the DCE Alternative, the major radiological transportation actions involving Category I/II SNM would be as shown in Table 5.10-3. Table 5.10-3 provides the estimated radiological health impacts of proposed transportation 200 pits between Pantex and the four other CPC candidate sites. For incident-free transportation, impacts are presented for both the transport crew and the population along the routes. The MEI would receive an additional dose of 2.51×10^{-6} rem from the transport of the pits, translating to 1.51×10^{-9} additional LCFs. For accidents, impacts are presented in terms of risk (probability times consequence). Appendix C, Section C.7 presents additional information related to transportation accidents. The transportation impacts of CSAs would be the same as under the No Action Alternative.

Table 5.10-3—Annual Radiological Transportation Impacts–DCE Alternative

CPC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	200 ppy	1.43×10^{-11}	3.58×10^{-4}	3.58×10^{-4}
NTS	200 ppy	2.20×10^{-11}	1.08×10^{-3}	1.08×10^{-3}
SRS	200 ppy	1.18×10^{-10}	1.99×10^{-3}	1.99×10^{-3}
Y-12	200 ppy	2.85×10^{-11}	1.45×10^{-3}	1.45×10^{-3}

Source: Dimsha 2007.
Assumptions: All materials in metal form
ES-3100 or similar container used
Release and aerosol fractions based on WVDP Waste EIS values

Table 5.10-4 provides estimated exposure due to handling of the materials transported in this alternative and the estimated exposure at stops (inspections, refueling, others).

Table 5.10-4—Annual Estimated Impacts Due to Handling and Stops–DCE Alternative

	Per Shipment Dose (person-rem)	Total Dose (person-rem)	Total LCFs
Movement of pits from Pantex to CPC Sites			
Handling		37.3	0.0224
Person at truck stop	2.10×10^{-9}	3.36×10^{-8}	2.02×10^{-11}
Residents in vicinity of stop	2.82×10^{-7}	4.51×10^{-6}	2.71×10^{-9}

Source: Dimsha 2007.

Table 5.10-5 presents the estimated nonradiological transportation impacts for the DCE Alternative.

Table 5.10-5—Annual Nonradiological Transportation Impacts–DCE Alternative

CPC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	5,800	0.00226	0.000108	6.96×10^{-6}
NTS	Pits	14,200	0.00323	0.000206	1.30×10^{-5}
SRS	Pits	21,700	0.0109	0.000432	6.46×10^{-5}
Y-12	Pits	17,700	0.0606	0.000293	3.41×10^{-5}

Source: Dimsha 2007.

Additionally, if the CPC is located at a site other than LANL, as described in Section 3.4.1.4, all Category I/II inventories of radioactive material would be transferred from LANL to sites within the NNSA Complex. For purposes of this analysis, the radioactive materials have been categorized as *Programmatic*, *Surplus*, and *Excess*. The subsections below describe potential impacts for each material category.

5.10.2.1 *Programmatic Material*

Category I/II inventories of nuclear material essential to the programmatic mission of NNSA would be transferred to the eventual CPC/CNPC Site. This would represent 4 shipments of material. Shipments to the candidate sites (NTS, Pantex, SRS, and Y-12) were modeled and analyzed. A summary is provided in Table 5.10-6.

Table 5.10-6—Impacts of Transporting LANL Programmatic Materials

Candidate Recipient	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
NTS	4	0.294	1.76×10^{-4}	0.0680	4.08×10^{-5}	2.04×10^{-9}	1.22×10^{-12}
Pantex	4	0.120	7.20×10^{-5}	0.0291	1.75×10^{-5}	3.65×10^{-7}	2.19×10^{-10}
SRS	4	0.684	4.10×10^{-4}	0.285	1.71×10^{-4}	3.37×10^{-8}	2.02×10^{-11}
Y-12	4	0.552	3.31×10^{-4}	0.192	1.15×10^{-4}	1.09×10^{-8}	6.54×10^{-12}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.2.2 *Surplus Material*[1]

Surplus materials held at LANL are assigned to the Office of Fissile Material Disposition. This material has not been declared waste, but may potentially be added to waste streams at SRS. Table 5.10-7 presents the transportation impacts associated with disposition of all surplus HEU and plutonium from LANL to SRS. A second option is to transport surplus HEU to Y-12 and plutonium to SRS. Impacts associated with this option are provided in Table 5.10-8.

Table 5.10-7—Impacts of Transporting LANL Surplus Materials to SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	6.17×10^{-12}	3.70×10^{-15}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-8—Impacts of Transporting LANL Surplus Materials to Y-12 & SRS (Option 2)

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU to Y-12	1	0.138	8.28×10^{-5}	0.0481	2.88×10^{-5}	1.50×10^{-16}	9.00×10^{-20}
Pu to SRS	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	6.15×10^{-12}	3.69×10^{-15}
Total	**2**	**0.309**	**1.86×10^{-4}**	**0.119**	**7.15×10^{-5}**	**6.15×10^{-12}**	**3.69×10^{-15}**

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.2.3 *Excess Material*

Three scenarios have been analyzed for disposition of materials designated as *Excess* at LANL:

- Shipping excess HEU to Y-12 and excess plutonium to SRS;
- Shipping all excess materials to SRS; and
- Shipping all excess materials to Y-12.

Tables 5.10-9, 5.10-10, and 5.10-11 summarize these impacts.

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[1] In 2007, the DOE prepared a SA, which determined that the potential environmental impacts associated with the consolidation at SRS of surplus, non-pit, weapons-usable plutonium from Hanford, LLNL and LANL would not be a significant change from the potential environmental impacts associated with the alternatives analyzed in previous NEPA reviews (DOE 2007b). As a result of this SA, DOE does not need to conduct additional NEPA review prior to transferring surplus non-pit weapons-usable plutonium materials from LANL to SRS for consolidated storage. Nonetheless, for completeness, this SPEIS includes an analysis of the transportation risk associated with disposition of all surplus plutonium from LANL to SRS.

Table 5.10-9—Impacts of Transporting LANL Excess Materials to Y-12 & SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU to Y-12	1	0.138	8.28 x 10^{-5}	0.0481	2.88 x 10^{-5}	6.50 x 10^{-16}	3.90 x 10^{-19}
Pu to SRS	1	0.171	1.03 x 10^{-4}	0.0712	4.27 x 10^{-5}	1.91 x 10^{-11}	1.15 x 10^{-14}
Total	**2**	**0.309**	**1.86 x 10^{-4}**	**0.119**	**7.15 x 10^{-5}**	**1.91 x 10^{-11}**	**1.15 x 10^{-14}**

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-10—Impacts of Transporting LANL Excess Materials to SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.171	1.03 x 10^{-4}	0.0712	4.27 x 10^{-5}	1.91 x 10^{-11}	1.15 x 10^{-14}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-11—Impacts of Transporting LANL Excess Materials to Y-12

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.138	8.28 x 10^{-5}	0.0481	2.88 x 10^{-5}	6.18 x 10^{-12}	3.71 x 10^{-15}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.3 Consolidated Centers of Excellence Alternative

5.10.3.1 *CNPC (CPC + CUC + A/D/HE Center at one site)*

Under the CNPC Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits currently stored at Pantex would be transported to the CNPC site;
- HEU currently stored at Y-12 would be transported to the CNPC site.

After these one-time shipments are completed, there would be no annual shipment of pits and CSAs.

Table 5.10-12 provides the estimated radiological health impacts of the one-time in-transit transportation of pits from Pantex, and HEU from Y-12, to the CNPC site alternatives. The MEI would receive an additional dose of 7.38 x 10^{-5} and 8.48 x 10^{-5} person-rem from the transport of the pits and secondaries respectively. These respective doses translate to 4.43 x 10^{-8} and 5.09 x 10^{-8} additional LCFs. Table 5.10-13 provides estimated exposure due to handling of the materials transported in this alternative and the estimated exposure at stops (inspections, refueling, others).

Table 5.10-12—Radiological Transportation Impacts Associated with the One-Time Transportation of Pits and HEU to the CNPC Site

CNPC Site	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	Pits	4.20×10^{-10}	0.0105	0.0105
	HEU	2.70×10^{-9}	0.0603	0.0603
	Total	***3.12×10^{-9}***	***0.0708***	***0.0708***
NTS	Pits	6.39×10^{-10}	0.0316	0.0316
	HEU	2.89×10^{-9}	0.0846	0.0846
	Total	***9.28×10^{-9}***	***0.116***	***0.116***
Pantex	Pits[a]	0	0	0
	HEU	1.86×10^{-9}	0.0489	0.0489
	Total	***1.86×10^{-9}***	***0.0489***	***0.0489***
SRS	Pits	3.46×10^{-9}	0.0584	0.0584
	HEU	5.89×10^{-9}	0.0251	0.0251
	Total	***9.35×10^{-9}***	***0.0835***	***0.0835***
Y-12	Pits	8.36×10^{-10}	0.0426	0.0426
	HEU[b]	0	0	0
	Total	***8.36×10^{-10}***	***0.0426***	***0.0426***

Source: Dimsha 2007.

[a] Pits are currently stored at Pantex. No pits would be transported from other sites.

[b] HEU is currently stored at Y-12. No HEU would be transported from other sites.

Assumptions:

- All materials in metal form
- ES-3100 or similar container used
- Shipments of Pu from Pantex to the CNPC would require 470 shipments
- Shipment of HEU from Y-12 to the CNPC would require 540 shipments
- Release and aerosol fractions based on WVDP Waste EIS values

Table 5.10-13—Estimated Impacts Due to Handling and Stops–CNPC Alternative

	per shipment dose (person-rem)	total dose for campaign (person-rem)	Total LCFs
Movement of pits from Pantex to CNPC Sites			
Handling		1,100	0.657
Person at truck stop	2.10×10^{-9}	9.87×10^{-7}	5.92×10^{-10}
Residents in vicinity of stop	2.82×10^{-7}	1.34×10^{-4}	7.95×10^{-8}
Movement of HEU from Y-12 to CNPC Sites			
Handling	8.18	4,420	2.65
Person at truck stop	2.10×10^{-8}	1.13×10^{-5}	6.80×10^{-9}
Residents in vicinity of stop	2.82×10^{-7}	1.52×10^{-4}	9.14×10^{-8}

Source: Dimsha 2007.

Table 5.10-14 presents the estimated nonradiological transportation impacts for the CNPC Alternative.

Table 5.10-14—Nonradiological Transportation Impacts–CNPC Alternative

CNPC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	170,000	0.00663	0.00317	0.000204
	HEU	782,000	0.270	0.0133	0.00138
	Total	953,000	0.277	0.0165	0.00158
NTS	Pits	416,000	0.0663	0.00317	0.000381
	HEU	1,180,000	0.364	0.0188	0.00182
	Total	1,596,000	0.430	0.0220	0.00220
Pantex	Pits	No transportation assessed (materials onsite)			
	HEU	597,000	0.205	0.00988	0.0115
	Total	597,000	0.205	0.00988	0.0115
SRS	Pits	637,000	0.319	0.0127	0.00190
	HEU	212,000	0.175	0.00589	0.00101
	Total	849,000	0.494	0.01859	0.00291
Y-12	Pits	520,000	0.178	0.00860	0.00100
	HEU	No transportation assessed (materials onsite)			
	Total	520,000	0.178	0.00860	0.00100

Source: Dimsha 2007.

Additionally, if the CNPC is located at a site other than LANL, all Category I/II inventories of radioactive material would be transferred from LANL to the CNPC, as discussed in Section 5.10.2.

5.10.3.2 *CNC (CPC + CUC at one site, A/D/HE Center at Pantex or NTS)*

For the CNC Option (the CCE Alternative that does not include the A/D/HE Center), pit production and CSA production would be consolidated at one of the candidate CNC sites (NTS, LANL, Pantex, Y-12, or SRS), and the A/D/HE activities would continue to be conducted at Pantex or transferred to NTS. Pit storage would be located with the A/D/HE Center. Table 5.10-15 provides the annual estimated radiological impacts of transporting pits and CSAs between the A/D/HE at Pantex and the four other CNC candidate sites. Tables 5.10-12 and 5.10-13 (located in Section 5.10.3.1) provide the estimated radiological health impacts of the one-time transportation of HEU from Y-12 to the CNC site alternatives.

Table 5.10-15—Annual Radiological Impacts for CNC (A/D/HE Center at Pantex)

CNC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	200 pits	4.20×10^{-10}	0.0105	0.0105
	200 CSAs	7.57×10^{-17}	3.58×10^{-4}	3.58×10^{-4}
NTS	200 pits	6.39×10^{-10}	0.0316	0.0316
	200 CSAs	1.16×10^{-16}	1.08×10^{-3}	1.08×10^{-3}
SRS	200 pits	3.46×10^{-9}	0.0584	0.0584
	200 CSAs	6.25×10^{-16}	1.99×10^{-3}	1.99×10^{-3}
Y-12	200 pits	8.36×10^{-10}	0.0426	0.0426
	200 CSAs	1.82×10^{-16}	$1.92\ 10^{-3}$	$1.92\ 10^{-3}$

Table 5.10-15—Annual Radiological Impacts for CNC (A/D/HE Center at Pantex) (continued)

Associated Impacts Common to both Pit and CSA Transportation Activities				
Handling	**Truck Stop**	**Impacts to Residents in Vicinity of Stop**	**In-Transit MEI Impacts**	
0.0224	2.02 x 10^{-11}	2.71 10 x 10^{-9}	1.51 x 10^{-9}	

Source: Dimsha 2007.
Assumptions:

- All materials in metal form
- ES-3100 or similar container used
- Release and aerosol fractions based on WVDP Waste Management EIS values

Table 5.10-16 presents the annual impacts of transporting pits and CSAs between the A/D/HE Center at NTS and the CNC candidate sites.

Table 5.10-16—Annual Radiological Impacts for CNC (A/D/HE Center at NTS)

CNC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	200 pits	7.98 x 10^{-12}	8.69 x 10^{-4}	8.69 x 10^{-4}
	200 CSAs	4.23 x 10^{-17}	8.69 x 10^{-4}	8.69 x 10^{-4}
SRS	200 pits	1.36 x 10^{-10}	2.76 x 10^{-3}	2.76 x 10^{-3}
	200 CSAs	7.20 x 10^{-16}	2.76 x 10^{-3}	2.76 x 10^{-3}
Y-12	200 pits	5.18 x 10^{-11}	2.48 x 10^{-3}	2.48 x 10^{-3}
	200 CSAs	2.74 x 10^{-16}	2.48 x 10^{-3}	2.48 x 10^{-3}

Associated Impacts Common to both Pit and CSA Transportation Activities			
Handling	**Truck Stop**	**Impacts to Residents in Vicinity of Stop**	**In-Transit MEI Impacts**
0.0224	2.02 x 10^{-11}	2.71 10 x 10^{-9}	1.51 x 10^{-9}

Source: Dimsha 2007.
Assumptions:

- All materials in metal form
- ES-3100 or similar container used
- Release and aerosol fractions based on WVDP Waste Management EIS values

Tables 5.10-17 and 5.10-18 present the estimated nonradiological transportation impacts for the CNC Options.

Table 5.10-17—Annual Nonradiological Transportation Impacts–CNC Option (Pantex as A/D/HE)

CNC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	5,800	0.00226	0.000108	6.96 x 10^{-6}
	CSAs	23,200	0.008	0.000394	4.20 x 10^{-5}
	Total	29,000	0.0103	0.000502	4.90 x 10^{-5}
NTS	Pits	14,200	0.00323	0.000206	1.30 x 10^{-5}
	CSAs	35,000	0.0108	0.000558	5.38 x 10^{-5}
	Total	49,200	0.0140	0.000764	6.68 x 10^{-5}
Pantex	CSAs	17,700	0.00606	0.000293	3.41 x 10^{-5}
	Total	17,700	0.00606	0.000293	3.41 x 10^{-5}
SRS	Pits	21,700	0.0109	0.000432	6.46 x 10^{-5}
	CSAs	6,300	0.00518	0.000174	2.98 x 10^{-5}
	Total	28,000	0.0161	0.000606	9.44 x 10^{-5}
Y-12	Pits	17,700	0.0606	0.000293	3.41 x 10^{-5}
	Total	17,700	0.0606	0.000293	3.41 x 10^{-5}

Source: Dimsha 2007.

Table 5.10-18—Annual Nonradiological Transportation Impacts–CNC Option (NTS as A/D/HE)

CNC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	10,600	0.00323	0.000206	1.30×10^{-5}
	CSAs	23,200	0.008	0.000394	4.20×10^{-5}
	Total	33,800	0.0112	0.000600	5.50×10^{-5}
NTS	CSAs	35,000	0.0108	0.000558	5.38×10^{-5}
	Total	35,000	0.0108	0.000558	5.38×10^{-5}
SRS	Pits	39,000	0.0156	0.000698	8.42×10^{-5}
	CSAs	6,300	0.00518	0.000174	2.98×10^{-5}
	Total	45,300	0.0208	0.000872	1.15×10^{-4}
Y-12	Pits	35,000	0.0108	0.000558	5.39×10^{-5}
	Total	35,000	0.0108	0.000558	5.39×10^{-5}

Source: Dimsha 2007.

5.10.4 Capability-Based Alternatives

Under the Capability-Based Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 50 pits per year) would continue to be shipped between Pantex and LANL; and
- CSAs (assume 50 units per year) would continue to be shipped between Pantex and Y-12.

The impacts of transportation for this Alternative would be approximately 2.5 times larger than the No Action Alternative for pits and 25 percent as much as the impacts for the No Action Alternative for CSAs (see Section 5.10.1).

Under the No Net Production/Capability-Based Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 10 pits per year) would continue to be shipped between Pantex and LANL; and
- CSAs (assume 15 units per year) would continue to be shipped between Pantex and Y-12.

The impacts of transportation for this Alternative would be approximately one-half as much as the No Action Alternative for pits and approximately 7.5 percent as much as the impacts for the No Action Alternative for CSAs (see Section 5.10.1).

5.10.5 Waste Shipments

5.10.5.1 *Low-level Waste (Y-12 to NTS)*

The radiological health impacts due to transportation of LLW from Y-12 to NTS were estimated for three different annual waste generation levels; 7,800 cubic yards, 12,300 cubic yards, and 24,000 cubic yards. It is assumed that Class A 55-gallon drums would be used to transport this waste. Considering this, the number of containers and shipments of LLW provided in Table 5.10-19 would be required to meet the generation levels.

Table 5.10-19—Number of LLW Drums and Shipments

Annual Waste Generation (yd^3)	Number of Drums	Number of Shipments
7,800	30,620	383
12,300	48,300	604
24,000	94,200	1178

Source: Dimsha 2007.

For this analysis, waste inventories were assumed to be similar to those provided in the West Valley Demonstration Project Waste Management (WVDP WM) EIS (DOE 2003c). Accident conditional probabilities and release fractions were also used based on WVDP WM EIS values for Class A LLW and drum containers. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided in Table 5.10-20. Non-radiological impacts are summarized in Table 5.10-21.

Table 5.10-20—Health Impacts Due to LLW Transportation (in LCF)

	Annual Waste Generation (yd^3)		
	7,800	**12,300**	**24,000**
Handling	0.662	0.826	1.61
Incident-Free In-Transit Exposure	0.05680599	0.09456	0.184
Truck Stop Personnel	4.57 82 x 10^{-9}	7.21 60 x 10^{-9}	1.40 48 x 10^{-8}
Resident Near Stop	6.14 48 x 10^{-8}	1.029.68 x 10^{-7}	1.89 99 x 10^{-7}
Accident Exposure	4.122.69 x 10^{-8}	6.504.24 x 10^{-8}	1.278.27 x 10^{-8}

Source: Dimsha 2007.

Table 5.10-21—Nonradiological Health Impacts Due to LLW Transportation

Annual Waste Generation (yd^3)	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
7,800	837,000	0.258	0.01340152	0.00129
12,300	1,320,000	0.408	0.02110240	0.00204
24,000	2,572,000	0.0794	0.04110467	0.00397

Source: Dimsha 2007.

5.10.5.2 *Low-level Waste (Pantex to NTS)*

The radiological health impacts due to transportation of LLW from Pantex to NTS were estimated for three different annual waste generation levels; 7,800 cubic yards, 12,300 cubic yards, and 24,000 cubic yards. It is assumed that Class A 55-gallon drums would be used to transport this waste. Considering this, the number of containers and shipments of LLW provided in Table 5.10-21 would be required to meet the generation levels.

For this analysis, waste inventories were assumed to be similar to those provided in the West Valley Demonstration Project Waste Management (WVDP WM) EIS (DOE 2004g). Accident conditional probabilities and release fractions were also used based on WVDP WM EIS values for Class A LLW and drum containers. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided in Table 5.10-22. Non-radiological impacts are summarized in Table 5.10-23.

Table 5.10-22—Health Impacts Due to LLW Transportation (in LCF)

	Annual Waste Generation (yd^3)		
	7,800	**12,300**	**24,000**
Handling	0.662	0.826	1.61
Incident-Free In-Transit Exposure	0.0258	0.0407	0.0794
Truck Stop Personnel	4.82×10^{-9}	7.60×10^{-9}	1.48×10^{-8}
Resident Near Stop	6.48×10^{-8}	1.02×10^{-7}	1.99×10^{-7}
Accident Exposure	1.18×10^{-8}	1.86×10^{-8}	3.63×10^{-8}

Source: Dimsha 2007.

Table 5.10-23—Nonradiological Health Impacts due to LLW Transportation

Annual Waste Generation (yd^3)	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
7,800	421,000	0.121	0.00670	4.77×10^{-4}
12,300	664,000	0.191	0.0106	7.52×10^{-4}
24,000	1,295,000	0.372	0.0206	0.00147

Source: Dimsha 2007.

5.10.5.2 *TRU Waste*

The radiological health impacts due to transportation of TRU waste from a CPC to WIPP were calculated as shown in Table 5.10-24. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided.

Table 5.10-24—Health Impacts Due to TRU Waste Transportation

CPC Site	Estimated Health Impacts (LCFs)		
	Accident	**Incident-Free**	**Total**
LANL	1.3×10^{-7}	6.6×10^{-4}	6.6×10^{-4}
NTS	6.6×10^{-7}	2.2×10^{-3}	2.2×10^{-3}
Pantex	3.2×10^{-7}	7.8×10^{-4}	7.8×10^{-4}
SRS	7.2×10^{-6}	3.7×10^{-3}	3.7×10^{-3}
Y-12	3.7×10^{-6}	3.3×10^{-3}	3.3×10^{-3}

Source: Dimsha 2007.

5.11 NOT USED

5.12 CONSOLIDATING CATEGORY I/II SPECIAL NUCLEAR MATERIAL

This section analyzes the environmental impacts of consolidating Category I/II SNM as described in Section 3.7. The analysis focuses on the resources that are most likely to be affected. For removal of Category I/II SNM from LLNL, the analysis focuses on the: (1) transportation impacts of moving the Category I/II SNM from LLNL to receiver sites (SRS, LANL, NTS [as an interim storage location], and SNM (TRU) to WIPP [via the Idaho National Laboratory [INL]]); and (2) the impacts of phasing out Category I/II SNM operations from the LLNL Superblock**.** This SPEIS discusses the storage of LLNL materials at the potential receiver sites, as appropriate. For Category I/II SNM consolidation actions at Pantex, the analysis focuses on the potential construction impacts in Zone 12, the handling operations associated with the transfer of the Category I/II SNM on-site, and the decontamination and decommissioning impacts for vacated facilities in Zone 4.

5.12.1 Remove Category I/II SNM from LLNL

Although the exact quantities of Category I/II SNM are classified, the Category I/II SNM at LLNL can be divided up into three basic categories, in the approximate percentages indicated in Table 3.7-1. The LLNL SWEIS (DOE 2005a) assesses the environmental impacts of transporting SNM to and from LLNL and other NNSA sites, SRS, and the WIPP. That analysis includes consideration of transportation actions involving greater quantities of SNM and more shipments than are identified in Table 3.7-1 (see DOE 2005a, Appendix J, Section J.5.3). The Record of Decision for the LLNL SWEIS (70 FR 71491) authorized operations for the Proposed Action Alternative, which allows approximately 538 shipments annually of hazardous and radioactive materials and wastes. As such, the transportation activities identified in Table 3.7-1 are included in the existing No Action Alternative. For completeness, however, this SPEIS assesses the environmental impacts associated with:

- Packaging and Unpackaging Category I/II SNM
- Transporting Category I/II SNM from LLNL to Receiver Sites
- Storage of Category I/II SNM at Receiver Sites
- Phasing out Category I/II SNM Operations from LLNL

The maximum number of containers per shipment would be 75, the maximum number of shipments per year would be approximately 4, and all shipments would be made by truck.

- All oxide and non-weapon component metal would be packaged to meet the DOT 9975 Type B shipping container requirements.

- All weapon components would be packaged to meet DPP-1 Type B shipping container requirements. Mass in containers is dependent on weapon type.
- All Enriched Uranium oxide would be packaged to meet Type B shipping container requirements.
- Enriched Uranium excess metal would be packaged to meet DOT 6M, ES3100, or DPP-2 Type B Shipping container requirements.
- All TRU would be shipped in TRUPAC-II containers.
- All TRU shipped to WIPP would meet the WIPP waste acceptance criteria (WAC).

Transferring the LLNL Category I/II SNM would also mean that the Category I/II SNM operations from the Superblock would be phased out. This SPEIS describes the impacts from this phase-out in Section 5.12.2. As described in Section 3.7.1, all Category I/II SNM inventories at LLNL that are not waste would be transferred to LANL (or NTS for interim storage) and SRS as programmatic and surplus material respectively. Packaging used by NNSA for hazardous materials shipments are either certified to meet specific performance requirements or built to specifications described in DOT hazardous materials regulations (49 CFR Subchapter C). Plutonium and HEU are unique hazardous materials that require special protection. In addition to meeting the stringent Type B containment and confinement requirements of the NRC's 10 CFR Part 71 and DOT's 49 CFR, packaging for nuclear weapons and components must be certified separately by DOE/NNSA. NNSA employs a closed Transportation Safeguards System for the intersite transport of nuclear weapons and components, including Pu and HEU. Specially designed SGTs are utilized to ensure high levels of safety and physical protection.

Materials would be placed into packages for shipment. These packages would be loaded at LLNL, shipped to the receiving site, unpacked and placed into storage. The collective dose due to normal operational exposure to cargo handlers and other workers for each loading operation is estimated to be 0.06 person-rem and 0.004 person-rem, respectively (Dimsha 2008). Because the loading would take place at LLNL in a secure area, there would be no exposure to the public. Table 5.12-1 provides a summary of the impacts of the 19 radioactive material shipments. The total dose to workers for shipments of all Category I/II materials would be 3.1 person-rem (0.49 + 2.58), resulting in 0.002 LCF. The incident-free dose to the public from these shipments would be 1.05 person-rem (0.11 + 0.94), resulting in a potential increase of 6.3×10^{-4} LCFs. The total exposure due to potential accidents is estimated to be 9.6×10^{-7} person-rem, resulting in less than 1×10^{-10} LCFs to the general population. As a point of reference, LLNL is authorized to transport approximately 538 shipments annually under the LLNL ROD (70 FR 71491). These SNM shipments would represent approximately 3 percent of the 538 shipments.

Table 5.12-2 provides a summary of the impacts of transporting the LLNL Category I/II SNM to NTS for interim storage at the Device Assembly Facility (DAF) followed by transportation to LANL. The total dose to workers for shipments of all Category I/II materials would be approximately 0.64 person-rem, resulting in approximately 3.8×10^{-4} LCFs. The incident-free dose to the public from these shipments would be 0.14 person-rem, resulting in a potential increase of 8.2×10^{-5} LCFs.

Table 5.12-1—Risks of Transporting LLNL Non-Waste Category I/II Materials

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
Programmatic Material to LANL	5	0.49	2.9×10^{-4}	0.11	7.04×10^{-5}	2.21×10^{-9}	1.33×10^{-12}
Surplus Material to SRS	10	2.58	1.55×10^{-3}	0.94	5.62×10^{-4}	9.57×10^{-7}	5.74×10^{-11}

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

Table 5.12-2—Risks of Transporting LLNL Programmatic Category I/II Materials to NTS for Interim Storage Followed by Transportation to LANL

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose	LCFs	Dose	LCFs	Dose	LCFs
LLNL-NTS	3	0.279	1.68×10^{-4}	0.195	1.17×10^{-4}	2.70×10^{-10}	1.62×10^{-13}
NTS-LANL	3	0.366	2.20×10^{-4}	0.161	9.67×10^{-5}	3.12×10^{-10}	1.87×10^{-13}
Total for LLNL-WIPP	**6**	**0.645**	$\mathbf{3.88 \times 10^{-4}}$	**0.356**	$\mathbf{2.14 \times 10^{-4}}$	$\mathbf{5.82 \times 10^{-10}}$	$\mathbf{3.49 \times 10^{-13}}$

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

Materials considered wastes currently held at the Superblock facility would be packaged and transported to INL. At INL, the material would be repackaged to meet waste acceptance criteria for transuranic waste disposal specified by the Waste Isolation Pilot Project (WIPP), located in southern New Mexico. Table 5.12-3 provides the estimated radiological impacts associated with the transportation of these materials. As a point of reference, LLNL is authorized to transport approximately 538 shipments annually of hazardous and radioactive materials and waste, based on the analysis in the LLNL SWEIS (70 FR 71491).

Table 5.12-3—Risks of Transporting TRU Wastes from LLNL to INL and INL to WIPP

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose	LCFs	Dose	LCFs	Dose	LCFs
LLNL-INL	3	0.279	1.68×10^{-4}	0.509	3.05×10^{-4}	1.33×10^{-9}	7.97×10^{-13}
INL-WIPP	3	0.366	2.20×10^{-4}	0.161	9.67×10^{-5}	1.03×10^{-9}	6.18×10^{-13}
Total for LLNL-WIPP	**6**	**0.645**	$\mathbf{3.88 \times 10^{-4}}$	**0.670**	$\mathbf{4.02 \times 10^{-4}}$	$\mathbf{2.36 \times 10^{-9}}$	$\mathbf{1.42 \times 10^{-12}}$

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

The impacts of storage of Category I/II SNM at receiver sites would be as follows:

LANL: Category I/II SNM is stored at the TA-55 Plutonium Facility Complex, which provides storage, shipping, and receiving activities for the majority of the LANL SNM inventory (up to approximately 7.3 metric tons), which is mainly plutonium. The Category I/II SNM from LLNL would add less than 10 percent to the LANL inventory. No additional emissions, effluents, workers, or wastes would be associated with this increased storage.

NTS: The DAF stores approximately 2.8 metric tons of Category I/II SNM that was previously associated with the TA-18 criticality program at LANL. Storing this material at DAF requires minimal infrastructure support (less than 1 percent of the electricity and water used at NTS); requires approximately 20 workers; causes minimal doses to the public (less than 0.00007 person-rem); causes approximately 10 person-rem dose to workers; and would result in less than 1 LCF annually from accidents (DOE 2002). The Category I/II SNM from LLNL would add less than 20 percent to the existing DAF inventory. No additional emissions, effluents, workers, or wastes would be associated with this increased storage at DAF.

INL: INL would conduct a certification inspection of the TRU prior to shipment to WIPP. This would include real time radiography and analysis of any gases in the container to ensure the contents meet the WIPP WAC. There are no plans for drums to be repacaged at INL because they would be compliant when they leave LLNL. The impacts of conducting these certification inspections would be minimal.

SRS: In 2007, DOE prepared a Supplement Analysis (SA) that evaluated the potential environmental impacts of consolidation at SRS of surplus, non-pit, weapons-usable plutonium from Hanford, LLNL and LANL. The SA concluded that this consolidation would not produce a significant change to the potential environmental impacts identified in previous NEPA reviews (DOE 2007b).

5.12.2 Impacts of Phasing Out Category I/II SNM Operations from LLNL Superblock

Phasing out the Category I/II SNM operations from the Superblock would reduce the material-at-risk (MAR) for plutonium in the Superblock from 40 kg to lower limits associated with Category III SNM quantities (either 400g high purity Pu metal, 2000g Pu in high purity oxide, or 16 kg Pu in low grade materials). A reduction in the MAR would reduce the source term associated with potential accidents, thereby reducing potential accident impacts.

The bounding accident analyzed in the LLNL SWEIS for the Superblock was an evaluation-basis room fire of sufficient magnitude that the entire room is threatened, that all of the radioactive MAR within the room is engulfed in the fire, and the fire burns long enough to release the material from storage containers to the glovebox, room, and the environment (see LLNL SWEIS, DOE 2005, Appendix D, Section D.2.4.9). Table 5.12-4 lists consequences of this accident if the MAR in Superblock were reduced by approximately 60 percent.

Table 5.12-4—Consequences of Bounding Accident at Superblock with MAR of 40 kg and MAR of 16kg

Accident	Frequency (per year)	MEI		Offsite Population[b]		Individual Noninvolved Worker	
		Dose (rem)	LCFs[c]	Dose (person-rem)	LCFs[d]	Dose (rem)	LCFs[c]
Room Fire Unfiltered In Building 332 (Superblock) with MAR of 40 kg	3.90×10^{-7}	5.60	3.36×10^{-3}	2.17×10^{3}	1.30	29.8	0.0178
Room Fire Unfiltered in Building 332 (Superblock) with MAR of 16 kg	3.90×10^{-7}	2.24	1.34×10^{-3}	868	0.52	11.9	7.1×10^{-3}

Source: Tetra Tech 2007.

Once Category I/II SNM is phased out of Superblock, it is expected that several pieces of equipment and hardware that would not be needed for remaining Category III missions would undergo D&D. In the short term, this could increase the wastes from the Superblock. Because a study has not been conducted for these D&D activities, this SPEIS uses conservative assumptions. Based on the analysis in the LLNL SWEIS (DOE 2005a), LLNL is expected to generate approximately 50 cubic meters per year of routine TRU waste (equivalent to approx. 240 drums per year) and an additional 60 cubic meters per year of non-routine TRU waste. Similarly, LLNL is expected to generate 330 cubic meters per year of routine LLW (equivalent to approximately 1,600 drums per year) and an additional 710 cubic meters per year of non-routine LLW (DOE 2005a). In this SPEIS, it is expected that an additional 100 drums of TRU waste and 400 drums of LLW would be generated per year for several years due to D&D activities (NNSA 2007).

Initially, employment at the Superblock would be expected to increase because of the D&D work; however, this would likely not be significant and would be offset by the transfer of some personnel to LANL. It is also expected that scientists and engineers would travel back and forth between LLNL and LANL. After the D&D work is completed, it is expected that there would be some decrease in personnel at LLNL because of the Category I/II SNM component of LLNL's plutonium mission would be located at LANL. However, personnel required to conduct R&D activities involving Category III quantities of SNM and maintaining the Superblock in a safe operating mode would be expected to be the same. It has been estimated that there would be a decrease of approximately 165 security personnel (NNSA 2008). A reduction of 165 employees would represent a 2 percent decrease in LLNL employment.

Because there are no emissions of radionuclides from Superblock, phasing out Category I/II SNM would have no effect on population doses to the surrounding population. There would be no major impacts on the amount of utilities when missions involving Category I/II SNM operations have been eliminated because the ventilation systems, lighting, heat and cooling would still be required.

The Plutonium Facility (Building 332) in the Superblock has been determined eligible for listing on the National Register of Historic Places (NRHP) as a historic property by the California State Historic Preservation Officer (SHPO) (DOE 2005a). Prior to D&D activities, the building would be recorded and photo-documented to accepted standards.

After phase-out of Category I/II SNM the Superblock facilities would continue to operate with Category III quantities of SNM. During Complex Transformation the Superblock facilities would continue to perform machining, foundry operations, analytical chemistry, and materials characterization on SNM originating from LANL facilities. These activities would produce impacts smaller than those analyzed for Superblock facilities in the LLNL SWEIS (see DOE 2005a).

5.12.3 Impacts of Transferring Category I/II SNM from Pantex Zone 4 to Zone 12

Consolidation of SNM at Pantex would entail the construction of a new storage facility in Zone 12, moving up to 60 metric tons of pits from Zone 4 to Zone 12, and the demolition of the old storage facilities in Zone 4 (Figure 5.12-1).

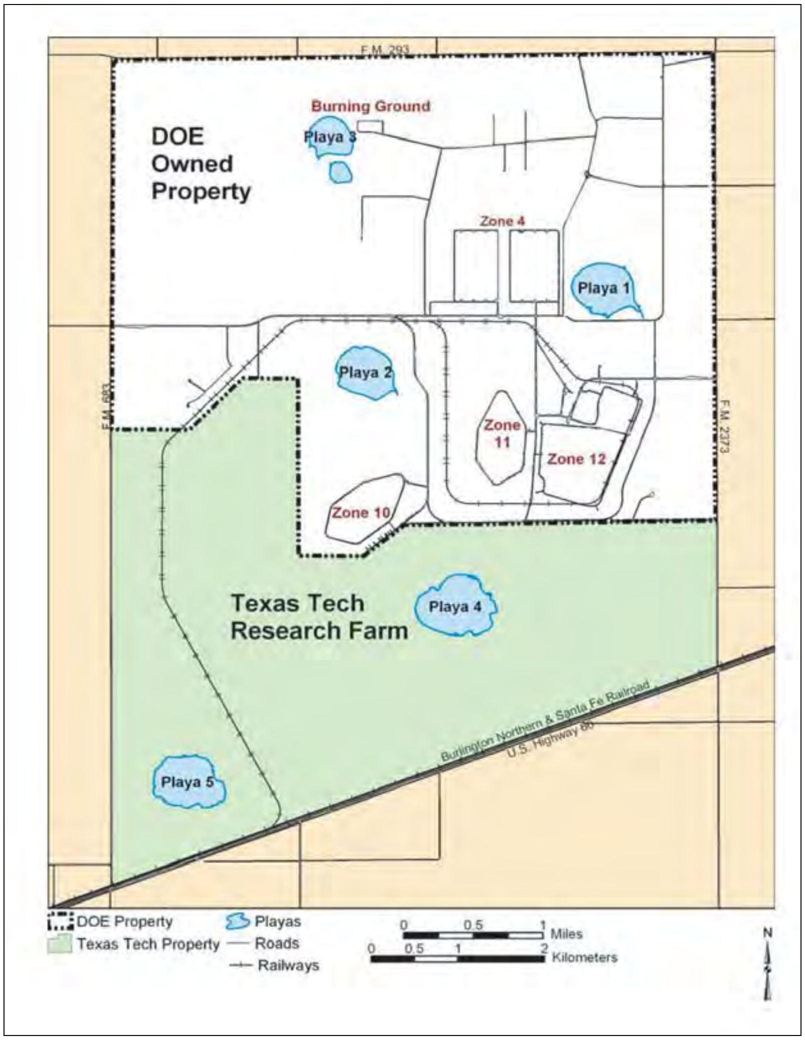

Figure 5.12-1—Zone 4 and Zone 12–Pantex

5.12.3.1 *Construction Impacts*

As shown in Table 3.7-3, the new SNM storage facility would be a steel-reinforced, concrete, underground structure of 95,900 square feet (for the minimum-sized storage facility) and up to 142,800 square feet (for the maximum-sized storage facility). The minimum-sized storage facility would disturb approximately 42 acres and the maximum-sized storage facility would disturb approximately 57 acres. The construction period would take 5 years for the either sized facility and the peak workforce during construction is estimated at 60 for the minimum-sized facility and 120 for the maximum-sized storage facility. The construction water requirement would be 1,500,000 gallons (minimum-sized storage facility) or 2,950,000 gallons (maximum-sized storage facility) over the construction period.

Zone 12 is a highly developed area of Pantex which contains gravel gerties atop the assembly/disassembly bays and cells. The new storage facility would be similar in size to existing structures in Zone 12, and being underground, would not change the visual character of this area. During the construction phase, a little more than two and a half acres of temporary laydown area would be required. After construction, this area would be used to site a 1.5 acre parking lot.

Pantex has known contamination of soils surrounding a cooling tower and a drainage ditch flowing into Playa 1. The soil surrounding the cooling tower contains chromates and other heavy metals associated with algae treatment. The drainage ditch and immediate perched groundwater surrounding this ditch is contaminated with VOCs, metals and explosives. There is a known gasoline spill from a motor pool maintenance facility. In addition several old landfills have been identified in Zone 12 as being contaminated with VOCs, pesticides, PCBs, and radionuclides. Because there are known areas of contamination in Zone 12, the construction or post-construction landscaping has the potential to disturb potential release sites (PRSs). Where possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until the Pantex project staff could review the site and identify appropriate procedures for working within that site area.

Construction of a new underground SNM storage facility in Zone 12 is not expected to have an appreciable negative impact on water resources at or near the Pantex Plant. The new facility is not proposed for construction within the delineated floodplains of the four onsite playas; thus, there would be no direct impacts to surface water features at Pantex or vicinity.

Facility construction could generate storm water runoff, but all construction activities would be conducted in accordance with best management practices for soil erosion and sediment control, and in accordance with applicable permit requirements. Although the new facility would increase site storm water runoff due to the creation of additional impervious surface area, the disturbed land (57 acres for the maximum-sized facility and 42 acres for the minimum-sized facility) would constitute less than 0.1 percent of the DOE-owned land at the site. The new facilities would be located primarily in previously developed areas of the site. Storm water runoff from the facilities would be routed to existing storm water discharge outfalls that are monitored and regulated in accordance with permit requirements. Engineering best management practices would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These best management practices may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

The proposed storage facility would not require large volumes of water. After construction, where water would be used for dust suppression, water demands (approximately 70,000 gallons per year) would primarily be those needed to meet the sanitary and domestic needs of facility personnel. As a result, water use would not increase significantly over existing water uses (currently approximately 130,000,000 gallons/year are used at Pantex [Section 4.5.3.3]).

Clearing or excavation activities during site construction and during the D&D of the closed facility would have the potential to generate dust. Dust suppression would be conducted as necessary using best available control measures (BACMs), such as water spraying, to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. Noise from the construction would be audible primarily to the involved workers. Involved site workers would be required to wear appropriate personal protective equipment (PPE), including hearing protection.

Foot and vehicular traffic would be minimally affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 60 construction workers for the minimum-sized facility or 120 construction workers for the maximum-sized facility would be onsite during the peak construction period, adding an estimated additional 40-80 personal vehicles to local roadways during the construction period and another 10-20 construction vehicles (such as dump trucks, bulldozers, drill rigs, cranes, and cement mixer trucks). These vehicles would operate primarily during the daylight hours and could be left onsite over night. Temporary construction lighting would be directed toward the work area.

Because Zone 12 is highly developed, no adverse effects to cultural resources, or biological resources (specifically animal and plant species) would result from construction activities. Small animals and birds at the construction site could be temporarily displaced. The black-tailed prairie dog and the snowy plover have been recently added to the site listing at Pantex. The black-tailed prairie dog was designated a Federal candidate species in February 2000 (65 FR 5476); surveys of the Pantex Plant site in 2000 estimated a population of 1,426 black-tailed prairie dogs. This is a considerably lower population than estimates made in 1997 (10,000) and 1998 (13,000) that were based on burrows, rather than actual counts of prairie dogs (Pantex 2006). There are no prairie dog colonies in Zone 4 or Zone 12 at Pantex (Pantex 2007).

Construction of a new storage facility in Zone 12 could result in the loss of some vegetation and less mobile animals (i.e., reptiles, small mammals). Because the construction would occur in previously disturbed areas and would affect less than 1 percent of the DOE-owned land at the site, potential impacts on biological resources would be negligible. A biological assessment of the Pantex Plant completed in 1996 for the Pantex SWEIS which included planned, new construction, addressed the impacts of continuing operations on listed species and species of concern that may occur in or migrate through the area. The assessment was approved in 1996, and the Fish and Wildlife Service (FWS) concurred with the conclusion that continued Pantex Plant operations, including new construction, are not likely to adversely affect any federally listed threatened or endangered species (DOE 1996b, Pantex 2007).

During the construction, there would be no increase in the number of Pantex employees as a result of this project. The estimated additional 60-120 peak construction jobs would be easily filled by the existing employees in the regional work force. Because these temporary jobs would be filled by the construction contractor and subcontractors with workers from the existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in the Pantex ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in the immediate area.

Construction activities would not be expected to have any adverse health effects on Pantex workers or the public. NNSA and Pantex workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 120 peak-period construction workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for the construction industry. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). For the maximum-sized storage facility, if the peak construction period lasts for the entire five year construction period, no deaths (0.005) would be expected for the estimated 120 construction workers from construction or demolition-related activities that include falls, exposure to harmful substances, fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles. These numbers would be proportionally smaller for the smaller-sized storage facility.

Outside of the Amarillo metropolitan area, most of the minority and low-income population continue to be located at the outer reaches of the ROI. Therefore, the minority and low-income populations have not experienced any disproportionately high or adverse human health, social, economic, or environmental effects from Pantex activities. The construction of a new storage facility at Pantex would not result in any new environmental impacts that could give rise to any environmental justice impacts.

5.12.3.2 *Movement of Category I/II SNM from Pantex Zone 4 to Zone 12*

Section 5.10.3.1 of this SPEIS estimates the impacts, including handling, of moving Category I/II SNM (pits) from Pantex to the various CNPC alternative sites. Moving this same material from Zone 4 to Zone 12, within the Pantex site, would have similar health effects related to the handling portion of this analysis. Table 5.12-5 presents the handling (loading and offloading) impacts associated with the Category I/II SNM (pits). These handling impacts are associated with the total amount of pits that would be moved and would not be expected to be greater for a smaller Zone 12 storage facility because the shipment of excess pits to SRS directly from Zone 4 would actually involve less overall handling than if these pits were first moved from Zone 4 to Zone 12 prior to their move to SRS. As shown in Table 5.12-4, the total handling doses would be 1,100 person-rem, which would translate into approximately 0.657 LCFs. Because the actual transportation would be within the Pantex sites, no doses to the public would result from transportation. Worker doses, which would be a fraction of the doses for moving the Category I/II SNM (pits) from Pantex to the various CNPC alternative sites, would result in much less than 1 LCF (see Table 5.10-12). The impacts of moving any excess pits to SRS have been addressed in previous NEPA documents (see DOE 1996d and DOE 1996e).

Table 5.12-5—Radiological Impacts of Handling Zone 4 Pits

	per shipment dose (person-rem)	total dose for campaign (person-rem)	Total LCFs
Movement of pits from Pantex Zone 4 to Zone 12			
Handling		1,100	0.657

Source: Dimsha 2007.

5.12.3.3 *Operation of New Storage Facility*

Once placed in the new storage facility, the material would be stored in a manner similar to the current storage in Zone 4, with the exception that it would be underground. The number of workers associated with storage operations would not change, although there would be a reduction in security force requirements, due to the consolidation of storage into an already secure area. The number of workers associated with storage operations would be small (approximately 40 workers, 10 of whom would be considered “radiation workers”). This is considered a minimum workforce for storage operations, and would not tend to vary with differing quantities of stored materials. As such, this workforce and is expected to be the same for both the minimum- and maximum-sized storage facility.

Because the new storage facility would be located underground, the risks associated with external hazards would be expected to be reduced compared to the existing, above ground Zone 4 storage. Risks associated with internal hazards should not change. Likewise, risks associated with a minimum-sized storage facility would be expected to be similar to those for the maximum-sized storage facility. Because water use would be used to meet the sanitary and domestic needs of facility personnel, the use would be small and the same for either sized facility. No radioactive wastes or emissions would occur due to storage operations. Table 5.12-6 displays the operational requirements associated with the operation of the new storage facility.

Table 5.12-6—Operational Requirements for Zone 12 Storage Facility

	Maximum Sized Storage Facility Consumption/Use	Minimum-Sized Storage Facility Consumption/Use
Data		
Plant footprint (acres)	11	8
Employment (no. of workers)		
Total	40	40
Radiation Workers	10	10
Average Dose to Radiation Worker(mrem)	12	12
Water Use (gallons/year)	70,000	70,000
Waste Generation		
TRU (yd^3)	0	0
Low Level(yd^3)	0	0
Emissions		
Radionuclide emissions (Ci/yr)	0	0

Source: NNSA 2008.

5.12.3.4 *D&D of Zone 4 Facilities*

Once all Category I/II SNM is removed from Zone 4, these storage facilities would be demolished and facilities in Zone 4 would undergo D&D. Table 5.12-7 displays the relevant information associated with the D&D of these Zone 4 facilities. As shown on that table, approximately 700 cubic yards of LLW would result over the 2-year D&D period. This LLW would be packaged for shipment and transported to NTS for disposal. The annual LLW from this D&D would represent an increase of approximately 350 percent compared to the 96.8 cubic yards of LLW generated by Pantex in 2005. These wastes would be transported to NTS for disposal. The impacts of such transportation would be approximately one-tenth as much as the impacts presented in Table 5.10-22 (7,800 cubic yards) for the shipment of LLW from Pantex to NTS. These impacts would be approximately 0.068 person-rem.

Table 5.12-7—Demolition and D&D of Existing Storage Facilities

Requirements	Wastes and Employment
Solid D&D (yd^3)	12,300
LLW generated (yd^3)	700
Hazardous Waste (yd^3)	0
D&D Related Employment	15
Peak workers	15
Total worker hours	62,400

Source: NNSA 2008.

Steel and other non-hazardous debris would be disposed of on-site at one of the Pantex landfills. This material could also be used for backfill at other Pantex construction sites. An additional 15 construction workers with an additional 10 personal vehicles would be added to the local roadways for the D&D activities. There would also be an additional 5 construction vehicles to enable the D&D activities to be conducted.

5.13 PROJECT-SPECIFIC ANALYSIS OF HE R&D

This section analyzes the environmental impacts of the reasonable alternatives, described in Section 3.8, for HE R&D. For each alternative, the analysis focuses on the resources that are most likely to be affected. For example, for alternatives that do not involve new construction, and no associated land disturbance, the following resources would not be affected: land use, visual resources, air and noise, water resources, geology and soils, biotic resources, and cultural resources. As such, this analysis does not discuss these resources any further. Rather, the analysis focuses on the following resources: emissions and exposures, which affect human health, socioeconomic impacts, and wastes. For alternatives that do involve new construction, and associated land disturbance, this analysis discusses impacts to all relevant resources.

As explained in Section 3.8.1, HE R&D activity is currently distributed primarily among five sites within the nuclear weapons complex based on their respective roles in support of the nuclear weapon stockpile. This SPEIS analyzes a full spectrum of alternatives associated with HE R&D as shown on Table 5.13-1.

Table 5.13-1—HE R&D Alternatives

Alternatives		Donor Site	Receiver Site
1	No Action Alternative	N/A	N/A
2a	Downsize in Place	N/A	N/A
2b	Relocate HE Processing & Fabrication from Site 300	LLNL	Pantex, LANL
2b’	LLNL HEAF Annex for local part fabrication	LLNL	Pantex, HEAF, Private industry
2c	Consolidate open-air 1-10 kg HE R&D experiments from LANL and SNL/NM to HEAF and over 10 kg thru 100 kg HE R&D experiments at LANL.	<u>1-10 kg HE R&D</u> LANL, SNL/NM, Pantex <u>10-100 kg HE R&D</u> LLNL. SNL/NM	<u>1-10 kg HE R&D</u> LLNL <u>10-100 kg HE R&D</u> LANL, NTS
2d	Consolidate unconfined firing to one or no sites.	ALL	One site or No Site
2e	Consolidate Main Charge HE R&D Experiments and Testing to one or both nuclear labs.	SNL/NM	LANL, LLNL
3a	Consolidate HE R&D Experimentation and Fabrication Activities to LANL	SNL/NM, LLNL, Pantex	LANL
3b	Consolidate HE R&D Experimentation and Fabrication Activities to LLNL	SNL, LANL, Pantex	LLNL
3c	Consolidate HE R&D Experimentation and Fabrication Activities to Pantex	SNL/NM, LANL, LLNL	Pantex
3d	Consolidate HE R&D Experimentation and Fabrication Activities to SNL/NM	LANL, LLNL, Pantex	SNL/NM
3e	Consolidate HE R&D Experimentation and Fabrication Activities from LANL to LLNL or Pantex or NTS	LANL	LLNL, Pantex, NTS
3f	Consolidate HE R&D Experimentation and Fabrication Activities from LLNL to LANL or Pantex or NTS	LLNL	LANL, Pantex, NTS
3g	Consolidate HE R&D Experimentation and Fabrication Activities from LANL and LLNL to Pantex or NTS	LANL, LLNL	Pantex, NTS
3h	Consolidate HE R&D Experimentation and Fabrication Activities to NTS	LANL, LLNL, SNL/NM, Pantex	NTS

Source: NNSA 2007.

For all alternatives, activities involving the handling or work on HE could lead to the accidental detonations resulting in severe or fatal injury of many personnel. The consequences of an accidental detonation of HE could include severe injury or death to the facility workers and the destruction of the building or facility that the accident occurred in. These potential consequences could occur at any site that conducts HE operations. Blast pressures and fragments could also cause injury to other personnel in the open area outside the facility and cause damage to nearby facilities. Additionally, low-level environmental releases and low-level exposures of personnel to airborne hazardous materials may occur from resulting plumes. Because the potential impacts are generally localized, off-site impacts from HE accidents are not expected.

No Action Alternative. Under the No Action Alternative, HE R&D activities would continue at five sites within the weapons complex, as described in Section 3.8.1. LLNL and LANL are where most of the R&D related to main charge explosives is performed. SNL has responsibility for the cradle-to-grave of the non-nuclear explosive components such as gas generators, ignitors, actuators, and timer-drivers. HE R&D is also conducted at the Pantex Plant, principally for safety and quality control purposes and manufacturing process development and improvement. NTS is used for testing of high explosives. At all five sites, compared to other NNSA activities, HE R&D activities comprise a minor part of the overall operations. HE R&D activities are responsible for less than 1 percent of the air emissions, electrical usage, water use, employment, and generated wastes (NNSA 2007). At all sites, high-explosive detonations produce impulse noises which could be audible off-site and potentially cause annoyances. In some instances, NNSA procedures require notification of potentially affected offsite residents prior to such detonations. For example, at Pantex, procedures require telephone notification of potentially affected offsite residents, as well as the use of warning sirens and lights prior to detonations greater than 1 pound. In general, these noises would be intermittent rather than continuous events and would be similar to thunder in their intensity.

5.13.1 HE R&D Minor Downsizing/Consolidation Alternatives

5.13.1.1 *Alternative 2a—Downsize in Place*

Under this alternative, LLNL and LANL would downsize existing HE R&D experimentation and fabrication activities in place, with no transfer of activities between any HE R&D sites. At LANL, any further downsizing would be accomplished within the bounding analysis of the previous DX Consolidation Plan EA and FONSI. At LLNL, B825/B826, B817, and some machining bays in B806/B807 would close. No construction would be required for this alternative, however, B825 and B826 would be decommissioned. There would be no staffing change for this alternative (175 scientists, engineers, and technicians) and no significant change in effluents, emissions, or wastes compared to the No Action Alternative (see Section 3.8.1). As some building close and the work is transferred to other buildings, as specified above, the effluents, emissions and wastes would transfer also. As such, the net effect at LLNL would be no change in effluents, emissions, and wastes. No additional downsizing would occur at Pantex, SNL/NM, or NTS. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

5.13.1.2 *Alternative 2b—Relocate HE Processing & Fabrication from Site 300*

Under this alternative, NNSA would relocate HE processing and fabrication from Site 300. The activities and configuration of the High Explosives Application Facility (HEAF), as described in the No Action Alternative, would remain unchanged. However, the HE R&D facilities at Site 300 would be closed, and HE R&D parts that are fabricated at Pantex or LANL would be shipped to LLNL for testing in HEAF.[2]

The facilities at Site 300 that would close under this alternative are:

Chemistry Area *(scale-up of formulation and synthesis of HE)*

- B825—1- and 2-inch mechanical presses
- B826—small deaerator/loader; 1-pint, 1-gallon mixers
- B827 Complex—50-pound deaerator/loader; heating ovens; 2-gallon to 5-gallon mixers; melt cast kettles; synthesis pilot plant; slurry kettles, grinders, reaction vessels

Process Area

- B809 Complex—25-inch isostatic press, drying ovens
- B817 Complex—14- & 18-inch isostatic presses, drying ovens
- B823 Complex—9-Mev, 2-Mev, 120-kev radiography of HE R&D parts
- B806 Complex, B807—machining of HE R&D parts
- B855 Complex—Large HE part machining
- B810 Complex—assembly of HE R&D parts
- B805—general machine shop, explosive waste packaging, numerically controlled (NC) machine programming

No construction at LLNL would be required for this alternative. Approximately 50 staff would lose their positions. Table 5.13-2 shows changes from eliminating the HE R&D mission from the Site 300 buildings.

Table 5.13-2—Operational Changes at LLNL Site 300–Alternative 2b

Requirements	Reductions
Plant footprint (acres)	2
Employment (workers)	50
Waste Category	**Volume**
Low level	
Liquid (gal)	100
Solid (yd^3)	10
Hazardous	
Liquid (gal)	20,000
Solid (yd^3)	25
Nonhazardous (Sanitary)	
Liquid (gal)	200,000

Source: NNSA 2007.

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[2] This alternative could only be implemented if other activities at Site 300 that require a HE processing and fabrication infrastructure, specifically hydrotesting at the Contained Firing Facility (see Section 5.16) and system environmental testing at the Environmental Test Facility (see Section 5.17), have been transferred to new facilities.

HEAF averages about 500 HE R&D shots per year. The explosive parts for these shots would have to be shipped from Pantex or LANL to LLNL. This would require an estimated 100 truck trips per year, inasmuch as R&D parts often have to be made and tested one-off before the design of the next part can be finalized. Relative to existing truck traffic, these increased trips would not be noticeable. Relocating the Site 300 processing and fabrication activities would reduce impacts from these HE R&D activities as follows:

In the short-term, land use would be unaffected. However, the vacated facilities at Site 300 could eventually undergo decommissioning, if there is not enough work-for-other to support continued site activities. This would entail the cleanup and demolition of these facilities. The specific impacts of such demolition cannot be estimated until detailed site-specific surveys are conducted.

Before any demolition, surfaces and fixtures would be tested or sampled to determine if contamination is present and in what quantities. Based on the sampling results, the buildings to be demolished would then be divided into contaminated and uncontaminated zones. Physical barriers would be established between work areas to protect workers and manage wastes and emissions. Workers would remove contaminated materials before demolition of uncontaminated areas begins. Asbestos could be present in the buildings being considered for demolition. The asbestos would be removed according to established industry and regulatory procedures. Asbestos wastes generated during renovation and demolition activities are regulated under the NESHAP for Asbestos (40 CFR Part 61) and would be managed in accordance with all applicable regulations. Air emissions generated during asbestos removal activities would be controlled by use of containment tents (such as plastic drapes) and of high-efficiency particulate air (HEPA) filtered particulate collection devices, as necessary. Similar methods of containment would be used for removal and demolition of materials and structures that are contaminated with radioactive or hazardous materials. As wastes are removed, they would be packaged and managed according to established LLNL procedures.

After contaminated materials are removed, general demolition of the remaining materials and structural elements would begin. Demolition of uncontaminated and decontaminated structures would be performed using standard industry demolition processes. After roof and walls are removed, concrete foundations and paved areas would be removed. A variety of equipment and techniques may be used in the demolition process. Typical equipment used in demolition include front-end loaders, bulldozers, wrecking balls, and pneumatic hammers, as well as various hand tools for removing such items as windows and copper wiring. Materials removed in the demolition process would be segregated to the extent feasible to facilitate recycling and waste management. Dust suppression would be conducted as necessary using best available control measures (BACMs), such as spraying with water or chemical dust suppressants. The application of specific BACMs would be determined on a case-by-case basis. After demolition is completed and waste and recycled materials are removed from the site, the area would be recontoured and revegetated or landscaped as appropriate.

Before starting demolition activities, a site-specific health and safety plan would be prepared and approved. Appropriate personnel protection measures, such as the use of personnel protection equipment (PPE) (gloves, hard hats, steel-toed boots, eye shields, and ear plugs or covers), monitoring of hazards and worker exposures, and engineered controls would be a routine part of the demolition activities required to protect worker health and safety. In addition, LLNL staff can provide site-specific hazard training as needed. Waste Minimization and Pollution Prevention Plans would be prepared under the Proposed Action to address waste issues for the demolition of the vacated buildings. As already discussed, building demolition materials would be recycled and reused to the extent practicable. All waste requirements for demolition-generated wastes would be met.

Waste minimization practices (such as material substitution, source reduction, hazard segregation, recycling, and reuse) would be incorporated into all waste-generating activities. Waste disposal would occur only after waste minimization options have been implemented or when other options are not safe or are not technically or economically feasible. Wastes would be recycled or salvaged in accordance with LLNL's property management process. Wastes would be managed through the LLNL waste management program. Solid waste would be disposed of offsite; hazardous waste would be shipped offsite to commercial facilities for treatment and disposal. Clean fill dirt would be placed on the sites of the demolished buildings, and the entire area would be landscaped.

Buildings 825, 826, 817A, B, & F, 806 A & B, and 807 are contributing elements to the Hydrodynamics Test Facility Historic District, determined eligible for listing on the NRHP as a historic property by SHPO (SHPO, 2005). Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards. Following decommissioning, NNSA would use best management practices to restore the land to a natural state. Because the facilities to be closed represent much less than one percent of the acreage at Site 300, no impacts to biological resources, soils, geology, and cultural resources would be expected.

Because the Site 300 HE R&D facilities do not utilize any significant quantities of water or electricity, infrastructure demands would not change. Additionally, none of the Site 300 facilities that would close emit significant quantities of air pollutants (individually and cumulatively all facilities emit less than 1 ton of any NAAQS pollutant or other hazardous air pollutants). As such, no changes to air quality would be expected. The changes to employment (reduction of 50 workers) would be inconsequential to the ROI. Reductions in wastes generated would be less than one percent of wastes generated at LLNL and would not change the overall waste management impacts for the site.

5.13.1.3 *Alternative 2b'—LLNL HEAF Annex for Local Part Fabrication*

Under this alternative, NNSA would implement alternative 2b (described above in Section 5.13.1.2), then construct an annex onto HEAF for local fabrication of HE R&D parts. A HEAF Annex would be constructed adjacent to HEAF containing explosives processing cells and support areas (e.g. control room, explosive storage) to provide fabrication capability that is currently provided at Site 300 and does not exist in HEAF. Construction and operational data for this alternative are shown in Tables 5.13-3 and 5.13-4, respectively.

The construction activities at HEAF would add about 1,500 square feet. Operationally, approximately 25 workers might lose their positions in this alternative. Infrastructure requirements, emissions, and wastes from the Site 300 buildings would be reduced as described in Section 5.13.2. At the LLNL Main Site, the effluents, emissions, and wastes from HEAF would increase about twenty percent over the existing values from HEAF (see Appendix A for a listing of effluents, emissions, and wastes from the HEAF). These increases in effluents, emissions, and wastes would amount to a less than one percent increase in these values compared to the overall LLNL Main Site values.

Table 5.13-3—Construction Data at LLNL–Alternative 2b'

Construction Requirements	Consumption / Use
Electrical energy (MWe)	13
Concrete (yd^3)	600
Steel (t)	50
Water (g)	1500
Land (acre)	0.2
Laydown Area Size (size of parking lot) Parking Lots (sq. ft.)	3000
Employment	
Total employment (worker years)	8
Peak employment (workers)	15
Construction period (years)	1
Waste Generated	
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	2000
Solid (yd^3)	0
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd^3)	150

Source: NNSA 2007.

Table 5.13-4—Operational Changes at LLNL–Alternative 2b'

Requirements	Additions/Subtractions
Plant footprint (acres)	-2
Net Change in Employment (workers)	-25
Waste Category	**Volume**
Low level	
Liquid (gal)	-100
Solid (yd^3)	-10
Hazardous	
Liquid (gal)	-7,000
Solid (yd^3)	-25
Nonhazardous (Sanitary)	
Liquid (gal)	-200,000

Source: NNSA 2007.

5.13.1.4 *Alternative 2c—Consolidate Open-Air 1–10 kg HE R&D Experiments from LANL and Sandia to HEAF and Over 10–100 kg HE R&D Experiments at LANL or NTS*

Under this alternative, NNSA would consolidate open-air 1-10 kg HE R&D experiments from LANL and Sandia to HEAF, and >10 kg through 100 kg HE R&D experiments at LANL or the NTS. There would be no new construction.

To accommodate the higher firing load at HEAF, more LLNL staff would be required to support the work in addition to the staff that LANL and SNL would rotate in for their respective experiments. Because no new facilities would be required for this alternative, there would be no construction impacts. Operationally, approximately 15 additional workers would be required, which would be inconsequential relative to the No Action Alternative. No significant changes in effluents, emissions, and waste would be expected from this transfer.

At SNL, this alternative would not eliminate HE R&D experiments and testing that are conducted at the ECF, nor would it decrease the laboratory space currently required to do this work. The impact to work at the TBF is also not likely to experience a major impact in this scenario, as most tests at TBF are less than 10kg. The SNL firing sites most likely affected by this alternative would be 9920, 9939, 9940 and Thunder Range. However, because these facilities are mostly funded by work-for-others, no significant changes in operational data at SNL are expected.

At LANL, consolidation of open-air 1-10 kg shots at HEAF with simultaneous consolidation of 10-100 kg shots to LANL would be expected to have no significant net effect on HE product effluent. Consolidation of 1-10 kg shots to HEAF would result in the transfer of the firing and assembly of approximately 200-250 shots/year to LLNL. LANL would transfer from 4-8 technicians to LLNL. At LANL or NTS, receiving the 10-100 kg shots could be accepted without additional environmental impacts. LANL or NTS would need to hire up to 5 individuals to meet these demands. However, none of these impacts would be consequential.

5.13.1.5 *Alternative 2d—Consolidate Unconfined Firing to One or No Site*

Under this alternative, all unconfined firing operations would be consolidated at one site or eliminated. In any case, unconfined firing operations would be eliminated at LLNL. Currently, HE R&D unconfined firing at LLNL is limited to destruction of excess explosive parts and explosives waste, through open burn or open detonation (OB/OD) at the Explosives Waste Treatment Facility located at Site 300. Therefore, the impact of this alternative to LLNL is the elimination of OB/OD destruction of explosives.

At LLNL, Building 845 would be decommissioned. Eliminating Building 845 would change effluents, wastes, and emissions by less than one percent compared to the No Action Alternative. The number of HE shipments from LLNL would increase, as a large fraction of explosive waste is shipped to other disposal sites. This could require an additional 50 shipments per year. LANL currently has the capacity to absorb all unconfined firing operations, but would need additional contained firing facilities to eliminate open-air firing in the future. Thus, construction of a

2,000 square foot facility would be the bounding case, and would fall within the bounding condition set by the DX Consolidation Plan, which is covered under the No Action Alternative.

If NNSA were to cease open burn/open detonation activities at its other sites, there would be very slight improvements to local air quality. At LANL, open burn and open detonation activities account for 2.3 and 1.1 percent, respectively of total air emissions for the site (Perea 2008). Open burn and open detonation activities at Pantex contribute about 2.03 percent of emissions of nitrogen oxides, 0.14 percent of carbon monoxide emissions, 0.3 percent of emissions of volatile organic compounds, 0.78 percent of particulate matter emissions, and 8.13 percent of hazardous air pollutants emissions (Ely, 2008). At the NTS, open burn/open detonation activities annually contribute to air emissions at the average rate of about 273 pounds of PM_{10}, 215 pounds of carbon monoxide, 130 pounds of nitrogen oxides, 10 pounds of sulfur dioxide, 44 pounds of VOC, and less than one pound of hazardous air pollutants (Plummer 2008). During 2007, open burn/open detonation activities at SNL/NM produced about 121 pounds of carbon monoxide, 232 pounds of nitrogen oxides, 2 pounds of sulfur dioxide, 1,419 pounds of PM_{10}, and 2.3 pounds of hazardous air pollutants (Lacy 2008).

5.13.1.6 *Alternative 2e—Consolidate Main Charge HE R&D Experiments and Testing to One or Both Nuclear Labs*

In this alternative, main charge[3] HE R&D experiments at SNL would be transferred to LANL or LLNL. Pantex main charge experiments are considered part of production or plant support or surveillance, not HE R&D, and are therefore not in the scope of this alternative. If the SNL experiments were transferred to LLNL, they could be accommodated in existing laboratories in HEAF. The main charge HE R&D effort is small at SNL, so there would be a negligible impact on current HEAF activities. No new facilities are required in this alternative. There would be no construction required for this alternative, no impact on staffing, and effluents, emissions, and wastes would be unchanged from the No Action Alternative.

If the SNL experiments were transferred to LANL, LANL has the current infrastructure to absorb main charge HE R&D experiments and testing that SNL is currently conducting at its site, with minimal or no impact. No new facilities would be required for this alternative. There would be no impact on staffing, and effluents, emissions, and wastes would be unchanged from the No Action Alternative. If SNL had LLNL or LANL conduct the experiments instead, this would not decrease the need for supporting work at SNL. Design of components and experiments up to the point of HE assembly would continue. SNL also has components that utilize secondary HE, which is the same family of explosives as the main charge explosives. Furthermore, SNL uses these same capabilities for the explosive materials in the non-nuclear components. If work on the main charge explosives ceased at SNL, the work would continue on the other explosive materials that are in the non-nuclear components. As a result, there would be no change in personnel and no net downsize in facility footprints.

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[3] Main charge refers to HE surrounding the pit.

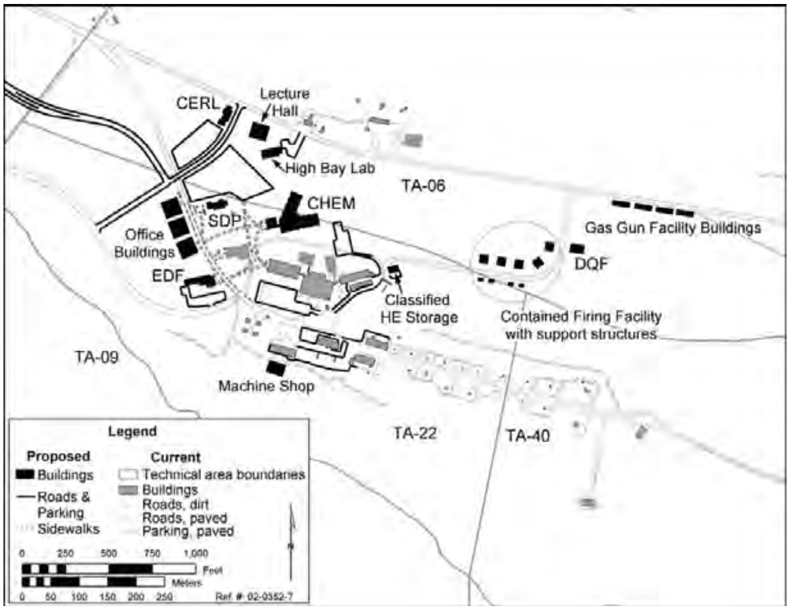
5.13.2 HE R&D Major Consolidation Alternatives

Alternatives 3a through 3g address alternatives that would transfer the entire HE R&D experimental and fabrication activities from one site to one or more other sites. It is noted that the R&D *mission* that has been assigned to each laboratory and plant would continue to be conducted by the scientists and engineers at those sites, although they may have to travel to a "user facility" at the consolidation site. It is the *capability*, i.e. facilities, machines, equipment, that is being consolidated at a single site or smaller number of sites. Some personnel (facility operating staff and technicians) may move with the capability to the consolidation site. The potential environmental impacts of each alternative would be as follows.

5.13.2.1 *Alternative 3a—Consolidate HE R&D Experimentation and Fabrication Activities to LANL*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to LANL. The following impacts at the potentially affected sites would occur:

LANL: Consolidating HE R&D at LANL would involve an increase of capacity for the types of experiments and capabilities that currently exist at LANL. LANL would need to add approximately 170,000 square feet of office and laboratory space to add the LLNL and SNL experimental and fabrication activities. Figure 5.13-1 shows the proposed location for this new facility.



Source: NNSA 2007.

Figure 5.13-1—New Construction Location–LANL Consolidation Alternative

Data for the construction and operation at LANL are contained in Table 5.13-5 and Table 5.13-6, respectively. No additional construction would be needed to add the Pantex HE R&D experimentation and fabrication activities. LANL would add up to 300 jobs under this consolidation.

Construction impacts could disturb approximately 5 acres in the vicinity of the Two-Mile Mesa Complex, which includes portions of TA-6, TA-22, and TA-40, as shown on Figure 5.13-1. Some mature trees may need to be removed from areas near the periphery of the complex. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and Homestead Era cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work would cease in that area until LANL's cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

Table 5.13-5—Construction Requirements at LANL–Alternative 3a

Construction to absorb SNL and LLNL	Consumption/Use
Peak Electrical energy (MWe)	ND
Diesel Generators (Yes or No)	Yes
Land (acre)	< 5 acres
Lay down Area Size, Parking lots	5
Water (gal)	6,000,000
Employment	
Total employment (worker years)	125
Peak employment (workers)	125
Construction period (years)	1
Waste Generated	**Volume**
Non-hazardous Solid (yd^3)	4,930

Source: NNSA 2007.
ND= no data.

Table 5.13-6—Annual Operational Requirements at LANL–Alternative 3a

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	2.6
Additional water (millions of gal.)	4.7
Added plant footprint (acres)	5
Added employment (workers)	300
NAAQS emissions (lbs/yr) PM_{10} NOx CO VOC SOx	 1,495 1,105 940 180 58
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	60
Nonhazardous	
Liquid (gal.)	200,000
Solid (pounds)	10,500

Source: NNSA 2007.

The construction or post-construction landscaping could disturb some potential release sites (PRSs). When possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LANL's Project staff could review the site and would identify procedures for working within that site area.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new building would be designed according to general design criteria for a new facility (LANL 1999a), with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

The building exterior (such as surface finish, roof lines, and windows) would be designed to be architecturally compatible with one another and with other recent buildings in the Two-Mile Mesa Complex. Typically roof drains would collect snowmelt and rain water from these buildings and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. The Two-Mile Mesa Complex is generally not visible from public roads; the proposed building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of the existing Two-Mile Mesa Complex. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects. After completion of proposed construction, the Two-Mile Mesa Complex would still resemble an industrial park but on an expanded scale.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) at the Two-Mile Mesa Complex are currently being reconfigured and upgraded for efficient distribution to new buildings associated with the DX Consolidation.

LANL is considered a major air emission source under the State of New Mexico Operating Permit program because it emits more than 100 tons per year of certain non-radioactive substances. Specifically, LANL is a major source of nitrogen oxides, emitted primarily from the TA-3 steam plant boilers. Combustion units are the primary point sources of criteria pollutants (nitrogen oxides, sulfur oxides, particulate matter, and carbon monoxide) emitted at LANL. The new building would be located in Los Alamos County, which is in attainment with NAAQS and all New Mexico Ambient Air Quality Standards (NMAAQS). The ambient air quality in and around LANL meets all EPA and DOE standards for protecting the public and workers (LANL 2001a).

Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in the Two-Mile Mesa Complex area. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased HE testing. Such testing currently occurs at LANL. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points. The public is not allowed within the fenced TAs that have firing sites, and noise levels produced by explosives tests are sufficiently reduced at locations where the public would be present to preclude hearing damage.

Such tests would not be expected to adversely affect offsite sensitive receptors (such as those at Bandelier National Monument or at White Rock). Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LANL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas and their continued presence on the LANL site over the past 10 years. In fact, the continued thriving of resident and long-term migratory populations of these sensitive species on the LANL site indicates that the level of noise generated by explosives testing under the No Action Alternative is at least tolerable to these particular species (LANL 2007).

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 120 construction workers would be onsite during the peak construction period, adding approximately 60 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

There would be no effects to sensitive species or their critical habitat due to construction. Small mammals and birds at the Two-Mile Mesa Complex building sites would be temporarily displaced by construction activities. These would be expected to return to the area after construction was completed. Game animal migration is not likely to be altered.

There are no floodplains or wetlands within the area of the proposed action. There are, however, riparian and wetland areas immediately north of the Two-Mile Mesa Complex and a floodplain in Two-Mile Canyon north of Two-Mile Mesa Complex. The new building would not entail any direct effects on floodplains or wetlands since there are none within the areas proposed for construction or demolition. BMPs would be established so that there would be no indirect effects from construction.

During construction, 125 peak construction jobs would be filled by the existing employees in the regional work force, which includes mostly Los Alamos, Rio Arriba, and Santa Fe Counties. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Los Alamos or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction would not be expected to have any adverse health effects on LANL workers or the public. NNSA and LANL workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 120 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). If the peak construction period lasts for the entire one year construction period, no deaths (0.0049) would be expected for the estimated 125 onsite construction workers from construction nor demolition-related activities that include falls, exposure to harmful substances, fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

The new construction would generate non-hazardous solid waste that would be disposed of at the Los Alamos Country Landfill, its replacement facility, or other New Mexico solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 4,930 cubic yards.

Proposed operations would have minimal effects on the LANL environment. Operations would produce the same types of waste as are generated in other LANL facilities in the Two-Mile Mesa Complex. No new radioactive or other wastewater or hazardous waste streams would be generated. The operations would not affect or be affected by geological conditions. A review of existing information on local geology at the Two-Mile Mesa area indicates that there are no *known* geologic hazards in the immediate vicinity of this site. With respect to air quality, the new facility would emit less than one percent of the existing LANL emissions.

Water quality in this area would not be affected by the operations. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by implementing the Proposed Action. Water quality would not change as a result of operations of the new building in the Two-Mile Mesa Complex.

Removal of asphalt in some areas would decrease surface water runoff and would increase surface water infiltration. Establishment of new asphalt parking areas would have the reverse effect. Water use would be expected to be static. The net increased infiltration is not expected to have any adverse effects on groundwater quality.

During operations, there would be a 300 person increase in the number of LANL employees as a result of this project. Compared to the existing workforce at LANL, this project would not have a long-term effect on socioeconomic conditions in north-central New Mexico.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease to zero. In the short-term, land use would be unaffected. However, the vacated facilities at Site 300 would eventually undergo decommissioning. This would entail the cleanup and demolition of these facilities. The specific impacts of such demolition cannot be estimated until detailed site-specific surveys are conducted. Following decommissioning, NNSA would use best management practices to restore the land to a natural state. Because the facilities to be closed represent much less than one percent of the acreage at Site 300, no impacts to biological resources, soils, and geology would be expected. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

Because the Site 300 HE R&D facilities do not utilize any significant quantities of water or electricity, infrastructure demands would not change. Additionally, none of the Site 300 facilities that would close emit significant quantities of air pollutants (individually and cumulatively all facilities emit less than 1 ton of any NAAQS pollutant or other hazardous air pollutants). As such, no changes to air quality would be expected. The changes to employment (reduction of 50 workers) would be inconsequential to the ROI. Reductions in wastes generated would be less than one percent of wastes generated at LLNL and would not change the overall waste management impacts for the site.

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease to zero. A minor decrease in operational impacts would be expected from phasing-out HE testing. This could result in a reduction of the emissions shown on Table 5.13-6a.

Table 5.13-6a—SNL HE R&D Annual Air Emissions (in Pounds Based on 2006 Data)

Facility	CO	NOx	SO2	PM10	HAPs
Explosive Components - Bldg 905	0.5	0.8	0.0	4.3	0.0
Terminal Ballistic Site(Bldg 6750)	3.8	6.4	0.1	35.3	0.0
Site 9940	15.5	26.0	0.2	144.2	0.0
Thunder Range	100.0	168.0	1.4	930.0	0.0
Sites 9920, 9930, 9939	9.0	15.1	0.1	83.7	0.0
Star Facility (Bldg 9956	10.3	15.5	0.0	221.5	2.3

Source: NNSA 2007.

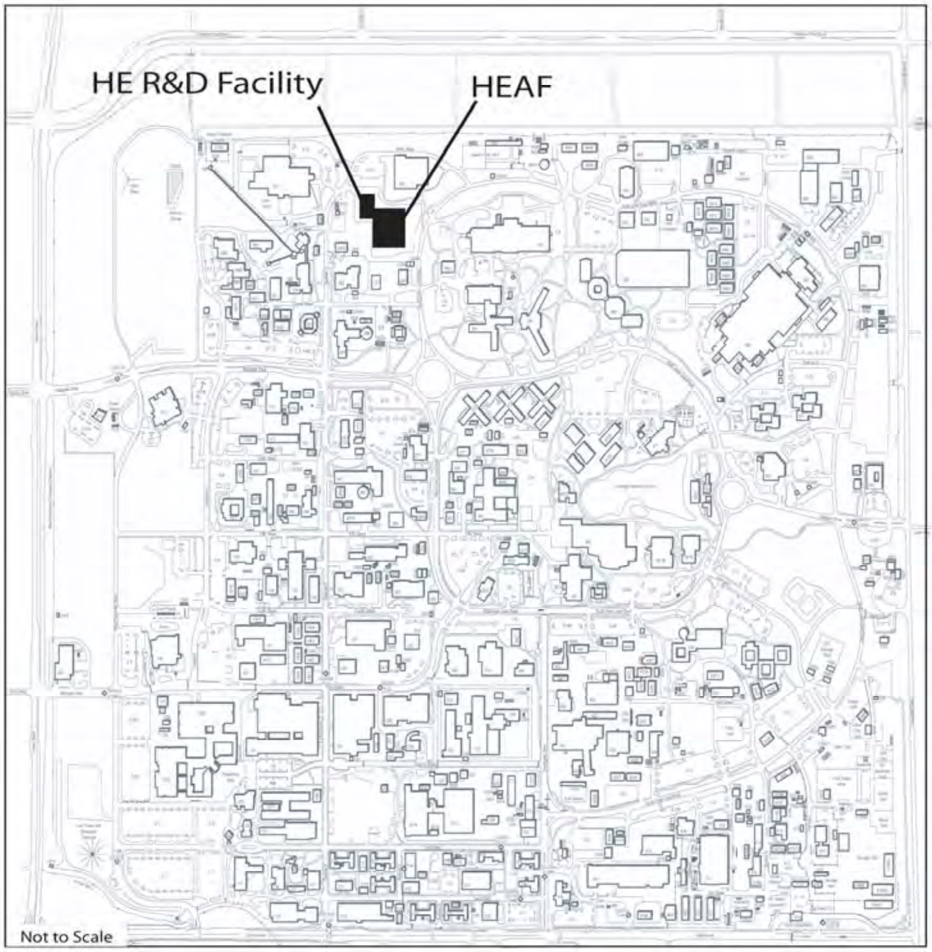
These reductions would represent less than 5 percent of SNL emissions, and would not have a noticeable affect on air quality.

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operations. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease by approximately 5 percent.

5.13.2.2 *Alternative 3b—Consolidate HE R&D Experimentation and Fabrication Activities to LLNL*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to LLNL. The following impacts at the potentially affected sites would occur:

LLNL: Construction of a new facility at LLNL would be necessary to provide the HE R&D experimentation and fabrication activities capacity from LANL and SNL[4]. A new experimental facility with about 400,000 square feet and 300 offices is projected. The new facility would be located nearby HEAF, as shown below in Figure 5.13-2. Construction data for this new facility would be as shown in Table 5.13-7.



Note: map not to scale

Figure 5.13-2—Location for New HE R&D Facility at LLNL

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[4] For this alternative, HE R&D at Site 300 would have to remain in place – alternatives 2b or 2b' could not also be adopted.

Table 5.13-7—Construction Requirements at LLNL–Alternative 3b

Construction Requirements	Consumption/Use
Electrical energy (MWh)	526
Concrete (yd^3)	24,400
Steel (t)	2,000
Water (gal)	1,500,000
Land (acre)	8-10
Laydown Area Size (part of parking lot) Parking Lots (sq feet)	120,000
Employment	
Total employment (worker years)	315
Peak employment (workers)	150
Construction period (years)	3.5
Waste Generated	**Volume**
Nonhazardous (sanitary)	
Liquid (gal)	87,500
Nonhazardous (other)	
Solid (yd^3)	6,200

Source: NNSA 2007.

Operationally, the HE R&D staff would increase by approximately 300 personnel. The effluents, emissions, and waste would increase as shown below in Table 5.13-8.

Table 5.13-8—Operational Requirements at LLNL for Alternative 3b

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6
Additional water (gal.)	4.7 million
Added plant footprint (acres)	8-10
Added employment (workers)	300
NAAQS emissions (lbs/yr)	
PM10	5,200
NOx	4,275
CO	3,460
VOC	420
SOx	375
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	0
Solid (cubic yd)	0
Hazardous	
Liquid (gal.)	300
Solid (pounds)	35
Nonhazardous	
Liquid (gal.)	63,000
Solid (pounds)	10,500

Source: NNSA 2007.

Construction impacts could disturb approximately 8-10 acres in the vicinity of the HEAF, as shown on Figure 5.13-2. Some mature trees may need to be removed to support construction. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and historic cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work would cease in that area until LLNL's cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

New building construction could disturb some previous areas of unknown contamination. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LLNL's Project staff could review the site and would identify procedures for working within that site area.

Construction of the new building would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would typically consist of a concrete slab foundation with a one- or two-story superstructure. The total height of the building above ground level would be less than 32 feet.

The building exterior (such as surface finish, roof lines, and windows) would be designed to be architecturally compatible with other buildings at LLNL. Typically roof drains would collect snowmelt and rain water and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction would be expected to be minimal. The visual effects of construction would be confined to the immediate area of LLNL. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects. After the completion of construction, LLNL would still resemble a highly-developed industrial area.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility from the HEAF.

As described in Section 4.2.4.1.2 both the Bay Area and San Joaquin Valley have been designated as nonattainment areas with respect to both the Federal ozone standard and the more stringent state standard. The Bay Area air district is classified as nonattainment with respect to California standards for particulates, attainment for the Federal PM_{10} annual standard, and unclassified for both $PM_{2.5}$ and 24-hour PM_{10} standards. The San Joaquin Valley air district is classified as nonattainment for state particulate matter standards and as a serious nonattainment area for Federal PM_{10} standards. Although particulates are not measured in Tracy, it is recognized as a regional problem.

Both the Bay Area Air Quality Management District (BAAQMD) and San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) have adopted “no net increase” provisions within their clean air plans. The “no net increase” programs require that, as a precondition to the issuance of an air permit for a significant new or modified emission source, any increases in emissions of nonattainment pollutants or precursors be offset by mandatory reductions in emissions of other sources onsite or potentially at other facilities. In the BAAQMD, the offset requirement is triggered for mid-size facilities (emissions of 15 tons per year or more of nonattainment pollutants), and a greater burden is placed on large facilities (emissions of 50 tons per year or more). The Livermore Site falls into the mid-size facility category and must abide by the requirements of the BAAQMD for emission offsets. Site 300, the majority of which lies within San Joaquin County, is under the jurisdiction of the SJVUAPCD.[5] In SJVUAPCD, offset requirements are triggered at 10 tons per year. The new building, which would be located at the Livermore Site, would have emissions well below the requirements of the BAAQMD for emission offsets.

Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers5) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in HEAF area. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LLNL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas. The noise would be sporadic and would be mitigated by the

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[5] A small portion of Site 300 falls within Alameda County, which is under the jurisdiction of the BAAQMD.

distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased HE testing. Such testing currently occurs at LLNL. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 150 construction workers would be onsite during the peak construction period, adding approximately 75 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

There would be no effects to biological resources, as the area under consideration is located in an area of previous development. There are no floodplains or wetlands within the area of the proposed action.

During construction, approximately 150 peak construction jobs would be filled by the existing employees in the regional workforce. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in LLNL or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in California.

Construction would not be expected to have any adverse health effects on LLNL workers or the public. NNSA and LLNL workers would perform site inspections and monitor construction during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 150 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (3.5 years), no deaths (0.012) would be expected for the estimated 315 worker-years.

The new construction would generate non-hazardous solid waste that would be disposed of off-site in solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 6,200 cubic yards.

Proposed operations would have minimal effects on the LLNL environment. Operations would produce the same types of waste as are generated in the HEAF. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing LLNL emissions. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately one percent of the current usage at the Livermore Site. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 300 person increase in the number of LLNL employees as a result of this project. Compared to the existing workforce at LLNL, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities, which could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality.

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Similar to LANL, a minor decrease in operational impacts would be expected from phasing-out HE testing. This could result in a reduction of the emissions shown on Table 5.13-6a. These reductions would represent less than 5 percent of SNL emissions, and would not have a noticeable affect on air quality.

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operation. Effluents, emissions, and wastes from HE R&D would decrease by approximately 5 percent.

5.13.2.3 *Alternative 3c—Consolidate HE R&D Experimentation and Fabrication Activities to Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to Pantex. The following impacts at the potentially affected sites would occur:

Pantex. Consolidating HE R&D experimentation and fabrication activities at Pantex would result in the need for both new construction and modifications to existing facilities. Data for the construction at Pantex are contained in Table 5.13-9.

Operationally, the HE R&D staff would increase by approximately 160 personnel, and office accommodations for traveling laboratory staff would be added. The effluents, emissions, and waste would increase as shown below in Table 5.13-10.

Table 5.13-9—Construction Requirements at Pantex–Alternative 3c

Construction Requirements	Consumption/Use
Peak electrical energy (MWe)	23
Concrete (yd3)	10,700
Steel (tons)	500
Water (gal)	1,500,000
Land (acre)	5.7
Laydown Size	1.7
Parking Lots	1
Total Footprint (new or added) square feet	100,000
Employment	
Total employment (worker years)	420
Peak Employment (workers)	210
Construction period (years)	3
Waste Generated (yd3)	
Low-Level Hazardous	1
Hazardous	12

Source: NNSA 2007.

Table 5.13-10—Operational Requirements at Pantex–Alternative 3c

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6 MWh
Additional water (gal.)	4.7 million
Added plant footprint (acres)	5.7
Added employment (workers)	160
NAAQS emissions (lbs/yr)	
PM10	5,300
NOx	5,150
CO	4,300
VOC	600
SOx	540
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	60
Nonhazardous	
Liquid (gal.)	263,000
Solid (pounds)	10,500

Source: NNSA 2007.

Construction impacts could disturb approximately 5.7 acres in the vicinity of Zone 11 and Zone 12, as shown on Figure 5.13-3. No construction would be conducted within a floodplain or a wetland.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. Plant facilities are visible from U.S. 60 and the local Farm-to-Market roads adjacent to the Pantex boundaries. The new building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of Zones 11 and 12. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.

The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Zones 11 and 12. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging.

Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

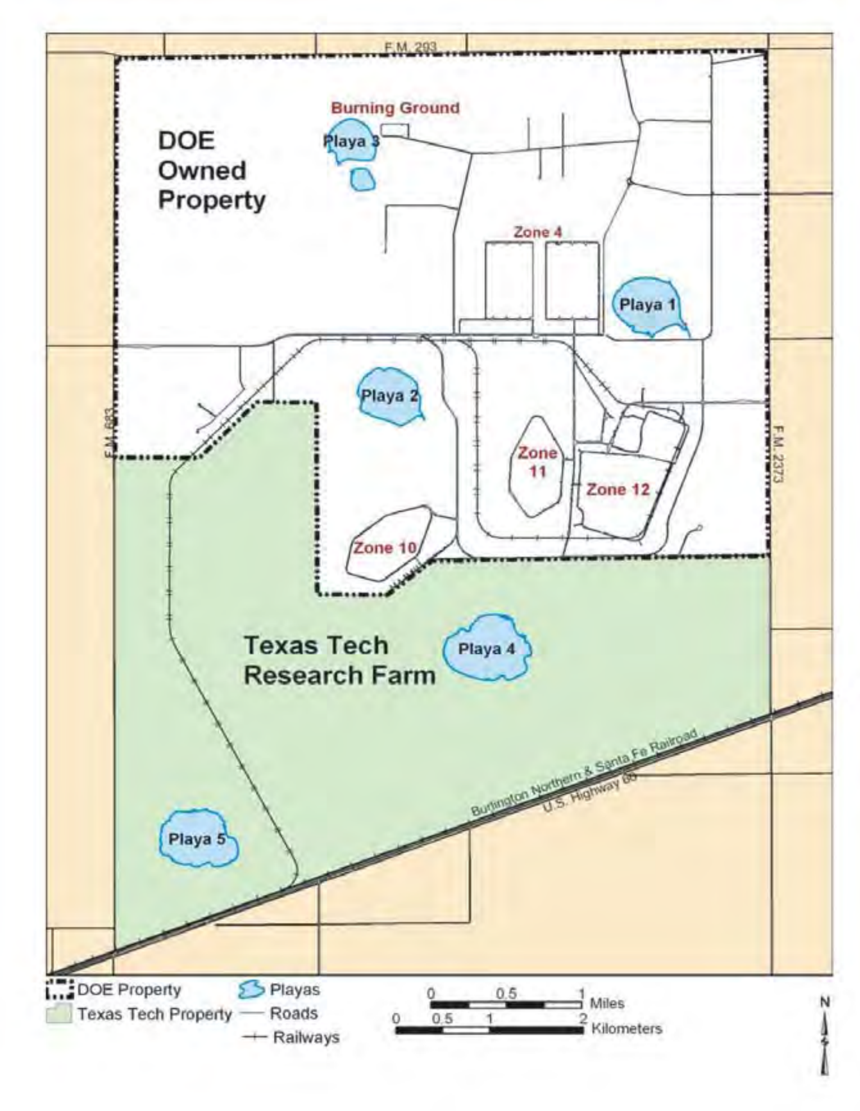


Figure 5.13-3—Zone 11 and Zone 12 at Pantex

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 210 construction workers would be onsite during the peak construction period, adding approximately 105 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the 210 peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Amarillo or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in Texas.

Construction would not be expected to have any adverse health effects on Pantex workers or the public. NNSA and Pantex workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 210 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (3 years), no deaths (0.016) would be expected for the estimated 420 worker-years. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

There would be no effects to sensitive species or their critical habitat due to construction as construction would take place in previously disturbed areas. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan. Construction solid waste is estimated at 1,550 cubic yards.

Proposed operations would have minimal effects on the Pantex environment. Operations would produce the same types of waste as are generated in other Pantex facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing Pantex emissions.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately three percent of the current usage at Pantex. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 160 person increase in the number of Pantex employees as a result of this project. Compared to the existing workforce at Pantex, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. This could result in a reduction of the emissions shown on Table 5.13-6a.

5.13.2.4 *Alternative 3d—Consolidate HE R&D Experimentation and Fabrication Activities to SNL/NM*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to SNL/NM. The following impacts at the potentially affected sites would occur:

SNL: SNL could absorb the HE R&D experimentation and fabrication activities currently performed at Pantex and activities from LANL and LLNL conducted at outdoor firing sites. In order to transfer operations from the LLNL HEAF and Site 300 operations and storage, and the LANL activities located at various facilities there, an additional total of 480,000 square feet of office and laboratory space would be required to be constructed. The construction would likely be located in Technical Areas 2 or 3, as shown on Figure 5.13-4.

The construction data that are associated with the transfer of the HE R&D experimentation and fabrication activities from LLNL and LANL are presented in Table 5.13-11. No construction would be required to accommodate the work that is currently conducted at Pantex. New firing sites would not be required to be constructed. About half of the new construction represents office space for traveling scientists and engineers, and the remaining as laboratory space.

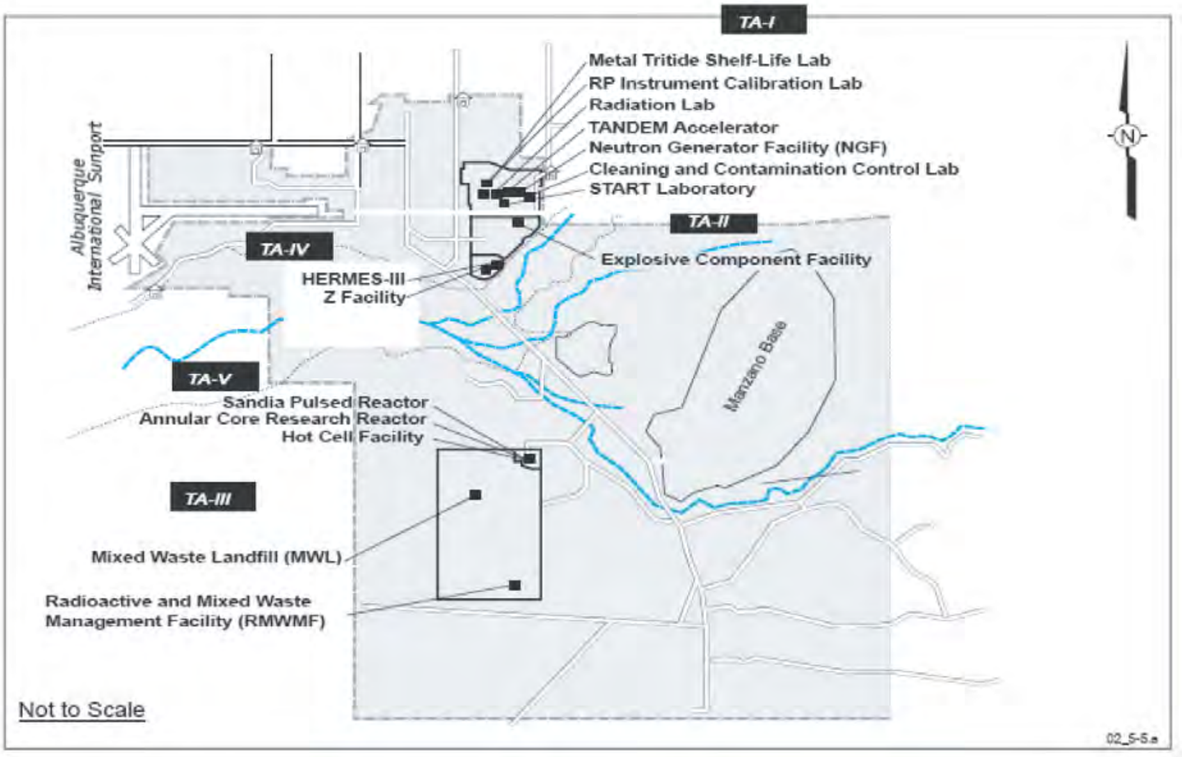


Figure 5.13-4—SNL Technical Areas

Table 5.13-11—Construction Requirements at SNL–Alternative 3d

Construction Requirements	Consumption/Use
Peak Electrical energy (MWe) (Fully occupied 6 MW)	100 KW [c]
Concrete (yd^3)	7500 [c]
Steel (t)	6000 [c]
Water (gal)	7,200,000
Land (acre)	
Laydown Area Size Parking Lots (Based on ½ offices & ½ Lab Space)	5 acres [a] 8.5 acres [c]
Employment	
Total employment (worker years)	225 [a]
Peak employment (workers)	220 [a]
Construction period (years)	2 years [a]
Waste Generated	**Volume**
Hazardous	
Liquid (gal) (no anticipated spills)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal) (Portable Toilet waste to be hauled off site)	0
Solid (yd^3)	0
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd^3)	2,650 [b]

Source: NNSA 2007.

[a] Based on data from the recently completed MESA/WIF (Weapons Integrated Facility) Project.

[b] Based on recently completed office buildings on the SNL Site.

[c] System Engineers input based on square feet of building and code requirements.

[c] Parking Lot Size based on a 480,000 sq. ft. building to be occupied ½ offices and ½ lab space has no large presentation rooms.

Operationally, approximately 325 new jobs would be added at SNL/NM to support the new processes and capabilities at the new lab. The existing SNL/NM waste management infrastructure without modification can be applied to manage and treat all anticipated waste streams from this alternative. SNL/NM does not have an OBOD site to expel excess or waste explosive samples. SNL/NM utilizes the EOD on the USAF base for this capability. Transportation would require explosive transportation from the donor sites (LANL, LLNL, Pantex) to SNL. The effluents, emissions, and waste would increase as shown below in Table 5.13-12.

Table 5.13-12—Operational Requirements at SNL–Alternative 3d

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6 MWh
Additional water (gal.)	4.7 million
Added plant footprint (acres)	13.5
Added employment (workers)	325
NAAQS emissions (lbs/yr)	
PM_{10}	5,300
NOx	4,900
CO	4,125
VOC	600
SOx	540
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	25
Nonhazardous	
Liquid (gal.)	261,000
Solid (pounds)	0

Source: NNSA 2007.

Construction impacts could disturb approximately 13.5 acres in the vicinity of Technical Areas 2 or 3. No construction would be conducted within a floodplain or a wetland.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. Most SNL/NM facilities are well within the KAFB boundary and away from public view. Because of their location and the surrounding terrain characteristics, most facilities are not visible from roads and areas with public access. The new building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of Technical Areas 2 or 3. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.

SNL is located within the Bernalillo County AQCR, which has been designated as a maintenance area under the CAA for carbon monoxide (CO) emissions and is in attainment for other federally regulated pollutants. In 2005, there were no exceedences of the criteria pollutant standards at SNL/NM. Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, NAAQS emissions would increase by approximately 7 tons annually, which is well below the 100 tons per year threshold that would require an air conformity analysis (20 NMAC Part 11.04.II.1.2, paragraph B).

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Technical Areas 2 or 3. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be used for permanent parking. Construction solid waste is estimated at 2,650 cubic yards.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with HE tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside SNL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by "thunder-like" explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because the HE R&D would be similar in nature to existing HE R&D at SNL, it is not expected to introduce any significant new noise impacts.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 220 construction workers would be onsite during the peak construction period, adding approximately 110 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the 220 peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Albuquerque or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction would not be expected to have any adverse health effects on SNL/NM workers or the public. NNSA and SNL/NM workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 220 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (2 years), no deaths (0.009) would be expected for the estimated 225 worker-years.

There would be no effects to sensitive species or their critical habitat due to construction. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan.

Proposed operations would have minimal effects on the SNL/NM environment. Operations would produce the same types of waste as are generated in other SNL/NM facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing SNL/NM emissions.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately four percent of the current usage at SNL/NM. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 325 person increase in the number of SNL/NM employees as a result of this project. Compared to the existing workforce at SNL/NM, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operation. Water use, effluents, emissions, and wastes from HE R&D would decrease by approximately 5 percent.

5.13.2.5 *Alternative 3e—Consolidate HE R&D Experimentation and Fabrication Activities from LANL to Either LLNL or Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LANL to either LLNL or Pantex. The following impacts at the potentially affected sites would occur:

LANL: Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Effluents, emissions, and wastes from HE R&D would decrease to zero.

LLNL (if receiver). Construction of a new facility at LLNL would be necessary to provide the HE R&D experimentation and fabrication activities capacity from LANL. The impacts of this facility would be similar to the impacts described under alternative 3b. Operationally, approximately 300 jobs would be added at LLNL.

Pantex (if receiver). Construction of new facilities and upgrades to existing facilities at Pantex would be necessary to support the HE R&D capacity from LANL. The impacts of this facility would be similar to the impacts described under alternative 3c. Operationally, approximately 96 jobs would be added at Pantex, and accommodations for traveling laboratory staff would be added.

5.13.2.6 *Alternative 3f—Consolidate HE R&D Experimentation and Fabrication Activities from LLNL to Either LANL or Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LLNL to either LANL or Pantex. The following impacts at the potentially affected sites would occur:

LANL (if receiver). Consolidating the LLNL HE R&D experimentation and fabrication activities at LANL would involve an increase of capacity for the types of experiments and capabilities that currently exist at LANL. LANL would need to absorb approximately 65,000 square feet of office and laboratory space to absorb the LLNL experimentation and fabrication activities. The impacts of this facility would be similar to the impacts described under Alternative 3a. Operationally, approximately 175 jobs would be added at LANL.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero.

Pantex (if receiver). Construction of new facilities and upgrades to existing facilities at Pantex would be necessary to support the HE R&D experimentation and fabrication activities capacity from LLNL. The impacts of this facility would be similar to the impacts described under Alternative 3c. Operationally, approximately 96 jobs would be added at Pantex, and office accommodations for traveling laboratory staff would be added.

5.13.2.7 *Alternative 3g—Consolidate HE R&D Experimentation and Fabrication Activities from LLNL and LANL to Either Pantex or NTS*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LLNL and LANL to either Pantex or NTS (see 5.13.2.8 for the NTS discussion). The following impacts at the potentially affected sites would occur:

Pantex. Consolidating HE R&D experimentation and fabrication activities at Pantex would result in the need for both new construction and modifications to existing facilities. Data for the construction at Pantex are contained in Table 5.13-13. The impacts of this facility would be similar to the impacts described under Alternative 3c. Operationally, approximately 116 jobs would be added at Pantex.

Table 5.13-13—Construction Data at Pantex for Consolidating LANL & LLNL HE R&D at Pantex–Alternative 3g

Construction Requirements	Consumption/Use
Peak electrical energy (Mwe)	27
Concrete (yd3)	13,500
Steel (tons)	2,100
Water (gal)	1,500,000
Land (acre)	8.1
Laydown Size	1.9
Parking Lots	1
Total Footprint (new or added)	78,000
Employment	
Total employment (worker years)	475
Peak Employment (workers)	235
Construction period (years)	3
Waste Generated	**Volume**
Low-Level Hazardous (yd^3)	12
Hazardous (yd^3)	304.8

Source: NNSA 2007.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

5.13.2.8 *Alternatives 3e Through 3g—Consolidate HE R&D Experimentation and Fabrication Activities to NTS*

NTS is being considered for the following: (1) alternative 3e: consolidation of LANL HE R&D experimentation and fabrication activities to NTS; (2) alternative 3f: consolidation of LLNL HE R&D experimentation and fabrication activities to NTS; (3) alternative 3g: consolidation of LANL and LLNL HE R&D experimentation and fabrication activities to NTS; and (4) alternative 3g: consolidation of all HE R&D experimentation and fabrication activities at NTS. For purposes of this analysis, the bounding environmental impacts would result from alternative 3g, in which all HE R&D experimentation and fabrication activities are transferred from LLNL, LANL, SNL/NM, and Pantex to the NTS. As such, this analysis focuses on that alternative.

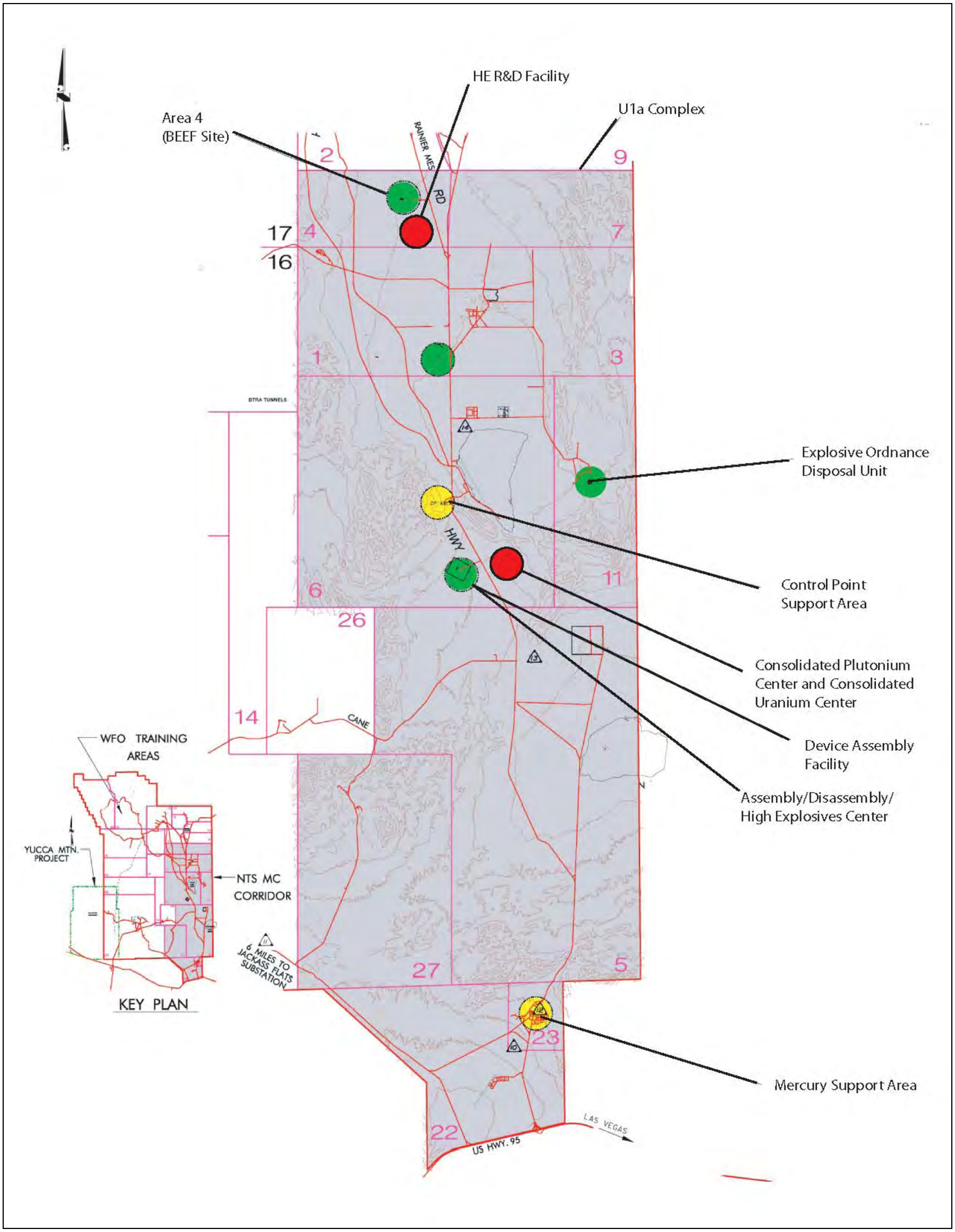
To consolidate all HE R&D experimentation and fabrication activities to the NTS would require a 100,000 square feet Explosive Components type facility to conduct SNL/NM activities and 200,000 square feet of mix use space would be required for HE R&D activities currently being conducted at LANL, LLNL, and Pantex. Construction impacts could disturb approximately 15 acres in the vicinity of the Big Explosives Experimental Facility (BEEF) (see Figure 5.13-5).

No construction would be conducted within a floodplain or a wetland. Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. All NTS facilities are not visible from roads and areas with public access. The visual effects of construction would be confined to the immediate area of Area 4 at NTS. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.



Source: NNSA 2007.

Figure 5.13-5—NTS Location for HE R&D Facility

NTS is located in the Nevada Intrastate AQCR 147. The region is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and particulate matter) under the NAAQS. Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Area 4. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be used for permanent parking. Construction solid waste is estimated at 4,650 cubic yards.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with HE tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity. Because of the great distance from NTS activities to any off-site receptors, noise impact would be minimal. Any sensitive wildlife species are unlikely to be adversely affected by "thunder-like" explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 250-300 construction workers would be onsite during the peak construction period, adding approximately 125-150 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas. Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in the ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in Nevada.

Construction would not be expected to have any adverse health effects on NTS workers or the public. NNSA and NVO workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 250–300 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (2 years), no deaths (0.02) would be expected for the estimated 250 to 300 worker-years.

There would be no effects to sensitive species or their critical habitat due to construction. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan.

Proposed operations would have minimal effects on the NTS environment. Operations would produce the same types of waste as are generated in other NTS facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing NTS emissions. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

Water quality in this area would not be affected by the operations. The facility would require approximately 5 million gallons of water per year, which would be less than 1 percent of the NTS sustainable site capacity of 1.36 billion gallons per year. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 250 person increase in the number of NTS employees as a result of this project. Compared to the existing workforce at NTS, this project would not have a long-term effect on socioeconomic conditions in the ROI.

5.14 PROJECT-SPECIFIC ANALYSIS OF TRITIUM R&D ALTERNATIVES

This section analyzes the environmental impacts of the reasonable alternatives, described in Section 3.9, for tritium R&D. For each alternative, the analysis focuses on the resources that are most likely to be affected. For example, because there would be no new construction associated with any of the alternatives, and no associated land disturbance, the following resources would not be affected: land use, visual resources, air and noise, water resources, geology and soils, biotic resources, and cultural resources. As such, this section does not discuss these resources any further. The analysis focuses on the following resources: emissions and exposures, which affect human health, socioeconomic impacts, and wastes.

No Action Alternative. Under the No Action Alternative, tritium R&D activities would continue at LLNL, LANL, SRS, and SNL/NM, as described in Section 3.9.1. At all four sites, tritium R&D activities comprise a minor part of the overall operations compared to other NNSA activities. For example, at LLNL, tritium R&D activities amount to basically one glove box system. At LANL, tritium R&D activities take place in one facility, the Weapons Engineering Tritium Facility (WETF), and affect approximately 25 people. At SRS, tritium R&D activities are conducted in conjunction with tritium production activities and thus, do not require dedicated facilities or personnel. At SNL/NM, tritium operations are primarily associated with the Neutron Generator Production Facility (NGPF) and would be unaffected by the SPEIS alternatives. At all four sites, tritium R&D activities are responsible for less than 1 percent of the air emissions, electrical usage, water use, employment, and generated wastes (NNSA 2007).

5.14.1 Consolidate Tritium R&D at SRS Alternative

Under this alternative, tritium R&D currently conducted at LLNL[6] and LANL would be consolidated at SRS into the following existing facilities: (1) H-Area New Manufacturing Building (HANM); (2) H-Area Old Manufacturing Building (HAOM); and (3) Building 773-A. No new construction would be necessary to consolidate these missions, although minor upgrades to existing laboratories may be required. Consolidating tritium R&D at SRS would increase tritium emissions at SRS, increase radiation exposures at SRS, create jobs at SRS, and increase wastes generated at SRS.

5.14.1.1 *Potential Impacts at SRS*

Tritium emissions. Tritium emissions at SRS would increase by approximately 1,000 Curies (Ci) per year at SRS.[7] During 2005, about 40,800 Ci of tritium were released from SRS, compared to about 61,300 Ci in 2004. Emitting approximately 1,000 Ci of tritium per year at SRS from increased tritium R&D would represent an increase of approximately 2.4 percent over current tritium emissions.

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[6] This does not include NIF target R&D and NIF production target filling. Those operations would remain at LLNL under all alternatives (see Section 3.7.3.5).

[7] LANL tritium R&D emissions are approximately 1,000 Ci/year, which includes a spike of 7,600 Ci from a legacy bottle that failed in 2001 (NNSA 2007).

Health impacts from tritium emissions. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. Tritium oxide releases accounted for 66 percent of the dose to the MEI. In 2005, the collective 50-mile population dose was estimated at 2.5 person-rem—less than 0.01 percent of the collective dose received from natural sources of radiation (about 214,000 person-rem). Tritium oxide releases accounted for about 68 percent of the collective dose. Increasing the tritium emissions by 2.4 percent would increase these doses as follows:

- MEI: increased dose by 0.0008 mrem/year;
- 50-mile population dose: increased dose by 0.041 person-rem.

Based on a risk estimate of 0.0006 LCFs per person-rem, the increased likelihood of a LCF for the MEI would be 4.8×10^{-7} and the likelihood of a LCF to the 50-mile population would be 2.5×10^{-5}. Accident risk at SRS would be unaffected, as these new operations would be inconsequential compared to existing tritium production operations. Because no significant off-site health risks are associated with the tritium R&D operations, no environmental justice impacts are expected.

Health impacts to workers. Approximately 25 new jobs would be created at SRS. The average exposure to a worker from tritium R&D would be approximately 4.3 mrem, resulting in a total worker dose 0.11 person-rem. Based on a risk estimate of 0.0006 LCFs per person-rem, the likelihood of a LCF to workers would be 6.6×10^{-5}.

Accidents. At SRS, receiving the tritium R&D operations from LANL could produce additional consequences due to accidents that release tritium. Assuming that the same tritium releases could occur at SRS as were analyzed at LANL (LANL 2008), consequences to the MEI at SRS would be expected to be lower than the MEI at LANL due to a much greater distance to the tritium facilities (at SRS, the MEI would be more than ten times further from the facility than the MEI at LANL). Increasing the distance to the MEI by approximately ten times would decrease the MEI dose by approximately a factor of 100. Consequently, the MEI dose at SRS would be expected to be less than 1 rem (statistically, this means that there would be less than a 1 percent chance that an LCF would result from this accident). For the 50-mile population at SRS (assumed to be 985,980 in the year 2030), it is conservatively assumed[8] that the population dose at SRS could be approximately twice as large as at LANL. For the 50-mile population surrounding SRS, the highest population dose from an accident would be expected to be less than 380 person-rem, which translates to an LCF risk of 0.22 (statistically, this means that there would be an 22 percent chance that an LCF would result if this accident were to occur).

Socioeconomic impacts. The addition of 25 new workers at SRS would increase the site workforce by much less than 1 percent and would not be noticeable in the ROI.

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[8] The assumption is conservative because the off-site population density within the initial ten mile radius at SRS is less than LANL. Radiological impacts to the 50-mile population are generally the highest within the initial ten miles of a release, as radiological concentrations generally decrease by the inverse of the distance squared.

Wastes. Wastes at SRS from tritium R&D would increase as follows:

- Mixed Waste: 28 gallons
- High Activity Waste: 330 gallons waste total
- Compactable waste: 84 cubic feet
- Non-Compactable, <20mCi/m^3: 176 cubic feet
- Mop water (low level liquid waste): 3,000 gallons

These wastes would represent less than 1 percent of current wastes generated at SRS and would be inconsequential.

5.14.1.2 Potential Impacts of Phasing Out Operations at LANL

Under this alternative, tritium R&D currently conducted at LLNL and LANL would be phased out. Phasing out tritium R&D operations from the WETF at LANL would reduce tritium emissions, wastes, and exposure to personnel as shown in Table 5.14-1.

Table 5.14-1—Reductions at LANL from Tritium R&D Phase Out

Resource Affected	Amount Reduced
Tritium Emissions	WETF average tritium emissions are approximately 1,000 Ci/year, which includes a spike of 7,600 Ci from a legacy bottle that failed in 2001.
Wastes	Mixed Waste: 28 gallons High Activity Waste: 330 gallons waste total Compactable waste: 84 cubic feet Non-Compactable, <20mCi/m^3: 176 cubic feet Mop water (low level liquid waste): 3000 gallons
Personnel Exposure	Average dose for 2006 was 4.3 mrem.
Jobs	25 maximum

Source: NNSA 2007.

At LANL, the impacts of these reductions would be as follows:

Tritium emissions. Tritium emissions at LANL would decrease by approximately 1,000 Ci per year. During 2005, about 2,400 Ci of tritium were released from LANL. Phasing out the tritium R&D at LANL would reduce tritium emissions by approximately 42 percent.

Health impacts from tritium emissions. In 2005, the estimated dose from tritium to the LANL MEI was 0.0036 mrem and the collective 50-mile population dose was estimated at 0.09 person-rem. Decreasing the tritium emissions at LANL by 42 percent would decrease these doses as follows:

- MEI: decrease dose by 0.0015 mrem per year;
- 50-mile population dose: decrease dose by 0.038 person-rem.

Based on a risk estimate of 0.0006 LCFs per person-rem, the decreased likelihood of a LCF for the MEI would be 9.0×10^{-7} and the likelihood of a LCF to the 50-mile population would be decreased by 1.6×10^{-2}.

Health impacts to workers. Approximately 25 workers at LANL would be reassigned to new jobs. Assuming these workers would no longer receive a 4.3 mrem dose, total worker dose would decrease by 0.11 person-rem. Based on a risk estimate of 0.0006 LCFs per person-rem, the likelihood of a LCF to workers would decrease by 6.6×10^{-5}.

Accidents. Phasing out LANL R&D operations at the WETF would eliminate the accident consequences associated with those operations. The accidents analyzed for WETF have included tritium releases from the following initiating events: a facility fire, a site-wide seismic event, and a wildfire (LANL 2008). For the maximally exposed individual (MEI) (assumed to be located at a distance of 2,885 feet from the facility), the highest dose from an accident was determined to be 17 rem, which translates to a statistical latent cancer fatality risk of 0.01 (statistically, this means that there would be a 1 percent chance that an LCF would result from this accident). For the 50-mile population (approximately 405,000 people), the highest population dose from an accident was determined to be 190 person-rem, which translates to LCF risk of 0.11 (statistically, this means that there would be an 11 percent chance that an LCF would result if this accident were to occur).

Socioeconomic impacts. Because the tritium R&D workers would be reassigned to other jobs at LANL, no socioeconomic impacts would result.

Wastes. Wastes at LANL from tritium R&D would decrease as follows:

- Mixed Waste: 28 gallons
- High Activity Waste: 330 gallons waste total
- Compactable waste: 84 cubic feet
- Non-Compactable, <20mCi/m^3: 176 cubic feet
- Mop water (low level liquid waste): 3000 gallons

These wastes represent less than 1 percent of current wastes generated at LANL.

Current LLNL tritium R&D (primarily to support gas transfer system development) is very small and is only included here for completeness. Transferring the LLNL tritium R&D (not NIF tritium work) to SRS would basically amount to one glove box system, which could be accommodated in the SRS facilities without any significant changes. Phasing out tritium R&D operations from LLNL would have no significant effects.

5.14.2 Consolidate Tritium R&D at LANL Alternative

Under this alternative, tritium R&D currently conducted at LLNL[9] would be consolidated at LANL into the WETF. No new construction would be necessary to consolidate these missions. Transferring the LLNL tritium R&D to LANL would basically amount to one glove box system, which could be accommodated in the WETF without any significant changes. LANL already

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[9] This does not include NIF target R&D and NIF production target filling. Those operations would remain at LLNL under all alternatives.

performs same type work within WETF. Phasing out tritium R&D operations from LLNL would have an insignificant effect on tritium emissions, wastes, and exposure to personnel at either LLNL or LANL.

5.14.3 Reduce Tritium R&D In-Place Alternative

Under this alternative, no changes in assigned tritium R&D missions would result. Instead, LLNL, LANL, and SRS would downsize tritium operation in-place. This alternative would result in the least transition impact in the Complex. All three sites would increase efficiencies in tritium operations by increasing emphasis on planning and scheduling. Any reductions in tritium emissions, wastes, and exposure to personnel are expected to be small, as these are a function of requirements rather than planning/scheduling.

5.15 PROJECT-SPECIFIC ANALYSIS OF NNSA FLIGHT TEST OPERATIONS

NNSA Flight Test Operations is a SNL-managed program to assure compatibility of the hardware to interface between NNSA weapons and DoD delivery systems. The actual flight tests are conducted at the Tonopah Test Range, located 140 miles northwest of Las Vegas, Nevada, with one or more denuclearized weapons, called Joint Test Assemblies (JTAs), which are dropped from DoD aircraft. In some cases, JTAs are not dropped, but simply attached to aircraft and flown. There are five alternatives for Flight Test Operations: (1) the No Action Alternative to continue activities at TTR; (2) an alternative to upgrade operations at TTR; (3) an alternative to operate TTR in a Campaign Mode (three options are assessed under this alternative): Option 1—Campaign from NTS; Option 2—Campaign Under Existing Permit; Option 3—Campaign Under Reduced Footprint Permit); (4) an alternative to transfer NNSA Flight Testing to the WSMR in New Mexico; and (5) an alternative to transfer NNSA Flight Testing to the NTS.

The following information and impacts are common to all of the alternatives analyzed in this section.

The Flight Test Program conducts about 10 flight tests in an average year. Compared to the 474,500 commercial flights that take place annually over the U.S., these 10 flights represent about 0.002 percent. These flight tests are typically conducted using the B-52 and B-2 bomber aircraft and the F-15E and F-16C fighter aircraft. The bomber aircraft generally originate from the 2nd Bomb Wing, at Barksdale AFB, in Louisiana, the 5th Bomb Wing, at Minot AFB, in North Dakota, or the 509th Bomb Wing, at Whiteman AFB, in Missouri. Fighter aircraft usually deploy from Nellis AFB, in Nevada, or Eglin AFB, in Florida. Flight paths to and from a test range would occur over FAA-controlled routes. Flight test ranges are controlled airspace. Once over the flight test range, flight tests are conducted at varying altitudes, ranging from as low as 200 feet to as high as 50,000 feet.

For each of the alternatives, potential accidents related to flight testing could include an aircraft crash or an inadvertent release of a JTA. These accidents could happen at any of the locations where flight testing might occur and, as discussed below, would have similar consequences. As such, these potential consequences are not expected to represent a meaningful discriminator with respect to selecting a site for flight testing. Nonetheless, for completeness, they are addressed.
With respect to an aircraft crash during flight testing, such an accident has never occurred in the past. Nonetheless, for purposes of this analysis, such an accident is assumed to occur. If an aircraft accident occurred, flight crews and people in the vicinity of the crash site could be killed or seriously injured. Given that the flight test operations would occur over generally low-populated areas (for all three potential locations), the likelihood of anyone on the ground being adversely affected is very small. This conclusion is also supported by a previous study which estimated the probability of a given location being struck by an aircraft to be so low (less than 1×10^{-7}) as to not be considered as a credible accident scenario[10] (DOE 1996g).

With respect to an inadvertent release of a JTA, such an accident could occur due to pilot error, equipment error, or other human error (for example, mistakenly identifying the incorrect target

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[10] For more information, see “Accident Analysis for Aircraft Crash into Hazardous Facilities,” DOE Standard DOE-STD-3014-2006, October 1996, Reaffirmation May 2006.

drop location). If such an error occurred, people on the ground could be killed or seriously injured. The impacts of such an accident would be less than an aircraft crash. Operating procedures, including equipment safety checks, pre-briefs, radar tracking, controlled flight ranges, and constant communications between the ground and pilots, minimize the potential for such accidents to occur.

5.15.1 No Action Alternative—Continue Operations at TTR

Under the No Action Alternative, NNSA would continue to conduct the Flight Test Mission at TTR. There would be no construction impacts associated with this alternative. However, some minimal one-time investments would be required to maintain TTR in order to meet mission requirements. These investments would primarily be associated with equipment replacements. The operational requirements are shown in Table 5.15-1. The impacts of the No Action Alternative, which are described in the TTR Affected Environment Section (see Section 4.4), would continue if no changes are made at TTR. Under the No Action Alternative, there would be no change in the workforce currently at TTR. Therefore, there would be no impacts to the ROI employment, income, or labor force.

Table 5.15-1—TTR No Action Annual Operational Requirements

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595
Peak electrical demand (MWe)	812
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range including AF)	6 million gallons
Range size (square miles)	280
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Maximum inventory of fissile material/throughput	0
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

Past weapons destruction tests, unrelated to the Flight Test Program, have contaminated soil at TTR in three areas. These sites have been characterized and remediation is ongoing. Additional details on this can be found in Section 4.4.6.2.1, of this document. In addition to these remediation projects there are several structures that must undergo D&D in order to continue ongoing operations at TTR. It is estimated that the soil and structure remediation would be a two year project requiring 80,000 worker hours, and would produce the waste volumes listed in Table 5.15-2. The soil remediation activities involve only the petroleum-contaminated areas under the buildings that are scheduled for demolition. The small quantities of LLW and hazardous wastes generated by this effort would be transported to NTS, or a commercial facility, for treatment and disposal. Non-hazardous waste would be disposed of at TTR.

Table 5.15-2—D&D Associated with TTR Operations–No Action Alternative

D&D Ongoing at TTR	D&D Amounts
Soil D&D (yd^3)	0
LLW generated (yd^3)	20
Non-Hazardous waste (yd^3)	8000
Hazardous waste (yd^3)	3703
Debris/Earth moving equip.(dozers/trucks)	2/3
D&D Related employment	
Peak	20
Total worker hours	80000

Source: NNSA 2007.

5.15.2 Upgrade of Tonopah Test Range Alternative

This section describes the impacts associated with upgrading the NNSA Flight Test Operations activities presently being conducted at TTR. This alternative, referred to as the High-Tech Mobile (HTM) option, would allow for a reduction in the operational costs at TTR through the introduction of newer, more efficient and more technologically advanced equipment. This option would lower manpower test operational needs and keep all test equipment highly reliable and operational between test dates, thereby reducing recalibration and start-up costs. There would be no construction required for this alternative as all new equipment would be in mobile vehicles or trailers. Annual operating requirements would be the same as for the No Action Alternative discussed in Section 5.15.1. Under the HTM Option, the maintenance required to update existing facilities could be conducted by current staff and would result in negligible effects to ROI employment, income, or labor force.

5.15.3 Campaign Mode Operation Alternative

An alternative to relocating flight test operations to another site would be to conduct JTA tests at TTR on a campaign basis from NTS, Sandia NM and CA, while doing work for others as time and workload permit. SNL would continue to be the program manager. This alternative would reduce the number of full-time employees to the level necessary to maintain facilities and equipment; employees from other facilities would complement resident staff in performing the actual tests. The operational requirements for this alternative are shown in Table 5.15-3.

Table 5.15-3—TTR Annual Operational Requirements–Campaign Mode

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or cubic yd)	
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Range size (square miles)	280
Employment (workers)	43
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

For option 1 (campaign from NTS), this alternative would result in the loss of approximately 92 full-time jobs at TTR through the downsizing of the permanent workforce from 135 to 43. This level of job reductions is different from the two alternatives that terminate all permanent TTR employment through the transfer of flight test operations to another facility. A discussion of the impacts associated with such a reduction in a community where supporting TTR is the primary employer is detailed in the next section. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the no-action alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area.

For option 2 (campaign under existing land use agreement), this alternative would result in the loss of approximately 57 jobs, but would create approximately 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the no-action alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area.

For option 3 (campaign under reduced footprint under a revised land use agreement), this alternative would result in the loss of approximately 70 jobs, but would create 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. Under this alternative, the JTA tests would be conducted on a campaign basis at TTR with support from the NTS, Sandia/NM and Sandia/CA. The remaining staff at TTR would also perform Work for Others (WFO) as time and workload permits. There would be no construction required as the existing facilities at TTR would be used and upgraded to sustain reliable test support. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the No Action Alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the No Action Alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area. This option could reduce the NNSA permitted area at TTR to potentially less than 1 square mile.

5.15.4 Transfer to WSMR Alternative

This alternative would move Flight Test Operations from TTR to WSMR. The WSMR has an extensive network of radar, global positioning system (GPS), telemetry, and optics sites (fixed and mobile), which interface with the Real Time Data Display System located in the Range Control Center and can be provided to remote locations both on and off range via the test support network and Defense Research Engineering Network.

5.15.4.1 *Construction and Operations Data*

The only construction that would be required to support JTA flight test at the WSMR would be the installation of a circular concrete target. The target would be used to aid in recovery efforts. It would also be used for free-fall test units. The concrete target would be constructed of 4000 psi non-reinforced concrete, 500 feet in diameter with a depth of 12 inches. Tables 5.15-4 and 5.15-5 provide the construction and operational requirements associated with relocating NNSA Flight Test Operations to the WSMR.

Table 5.15-4—WSMR Construction Requirements

Construction Requirements	Consumption/Use
Peak Electrical Energy Use	40,000 KW-hr
Diesel Generators (Yes or No)	Yes
Concrete (yd3)	800
Steel (t)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000

Table 5.15-4—WSMR Construction Requirements (continued)

Construction Requirements	Consumption/Use
Lay down Area Size	Two 11.5 acre sites
Parking Lots	N/A
Total employment (worker years)	37
Peak employment (workers)	30
Construction period	15 months
Waste Generated	**Volume**
Hazardous	
Liquid (gal)	0
Solid (yds^3)	0
Non-hazardous (Sanitary)	
Liquid (gal)	0
Solid (yds^3)	6,000
Non-hazardous (Other)	
Liquid (gal)	0
Solid (yds^3)	45

Source: NNSA 2007.

Table 5.15-5—WSMR Operational Requirements

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or yds^3)	32,150 gallons
Other process gas (N, Ar, etc.)	480cu.ft.
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range)	6 million gallons
Steam (tons)	0
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7 x 10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

The required construction is a small project and it is not anticipated that the employment of 30 construction personnel over a 15 month period would have a significant impact on the existing labor pool of the area.

During flight test operations, the primary noise would be generated by aircraft flying over the WSMR drop areas. The noise would be consistent with the existing use of the WSMR, sporadic, and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to those employed by WSMR. They would not likely result in any adverse effect on sensitive wildlife species or their habitats, and would be similar to the effects discussed under the No Action Alternative.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased flights at WSMR as a result of NNSA conducting an additional 10 flights per year. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are remotely located from the flightpath of the aircraft. The public is not allowed on WSMR and noise levels produced by the aircraft are sufficiently reduced at locations where the public would be present to preclude hearing damage. Because no significant off-site health risks are associated with the flight test operations, no environmental justice impacts are expected.

5.15.4.2 *Impacts of Phasing Out TTR Operations*

Relocating NNSA flight test operations to WSMR would entail termination of the NNSA flight test operations activities presently being conducted at the TTR. NNSA would continue the cleanup of its flight test facilities at TTR. About 135 jobs would be lost. Since the flight test operations would be conducted by existing WSMR personnel under this alternative, these jobs would not be transferred to WSMR. This section provides a detailed analysis of socioeconomic characteristics and impacts at TTR as a result of the discontinuance of flight test operations at TTR. The analysis includes a more detailed description of current socioeconomic conditions at TTR and an assessment of impacts to socioeconomic conditions from implementation of the alternatives that would transfer the Flight Test Operations to either WSMR or NTS.

Any removal of capital or employment, such as the transfer of activities from TTR, would impact the existing socioeconomic environment to some degree. The transfer and associated termination of NNSA's Flight Test Operations activities at TTR would impact the existing socioeconomic environment of the southern Nevada ROI which includes Clark and Nye counties. The existing economic environment of these counties is discussed in the first part of this section.

5.15.4.2.1 Socioeconomic Methodology and Impacts

Socioeconomic impacts consist of both direct and indirect impacts. Direct impacts are those changes that can be directly attributed to the proposed action, such as changes in employment. Indirect impacts to the ROI occur based on the direct impacts from the proposed action.

The direct impacts estimated in the socioeconomic analysis are based on data provided by TTR. Total employment and earnings impacts were estimated using Regional Input-Output Modeling

System multipliers developed specifically by the U.S. Bureau of Economic Analysis (BEA) for the southern Nevada ROI, which includes Nye and Clark Counties. These multipliers are developed from national input-output tables maintained by the BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the U.S. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels. For this analysis, the term *direct jobs,* refers to the employment created by the project and *direct income* refers to project workers' salaries. The term *indirect jobs*, refers to the jobs lost in other employment sectors as an indirect result of direct jobs lost from the transfer of TTR activities and *indirect income* refers to the income lost as a result of the loss of indirect jobs.

This section provides a more detailed description of current socioeconomic conditions at TTR. A general description of the socioeconomic environment, including population, is presented in Section 4.4.9 of this SPEIS.

Employment and income. Employment by sector has changed slightly from 2003 to 2005 as shown in Table 5.15-6. The arts, entertainment, recreation, accommodation and food services sector provides the highest percentage of the employment in the ROI, 23 percent in 2005, followed by construction, with 10.7 percent, and the retail trade, with 10.4 percent.

Table 5.15-6—2003 and 2005 Employment by Sector (%)

Sector	Clark		Nye		ROI	
	2003	**2005**	**2003**	**2005**	**2003**	**2005**
Farm employment	0.04	0.03	1.92	1.61	0.07	0.06
Nonfarm employment	99.96	99.97	98.08	98.39	99.93	99.94
Private employment	90.37	90.80	85.92	87.34	90.30	90.75
Forestry, fishing, related activities, and other 3/	0.03	0.03	0.40	0.45	0.04	0.04
Mining	0.14	0.12	6.73	5.88	0.24	0.21
Utilities	0.35	0.32	**(D)**	**(D)**	**(D)**	**(D)**
Construction	9.12	10.67	6.83	9.45	9.08	10.65
Manufacturing	2.52	2.52	1.15	1.66	2.50	2.50
Wholesale trade	2.50	2.46	1.00	1.05	2.47	2.43
Retail trade	10.76	10.39	11.88	11.76	10.77	10.41
Transportation and warehousing	3.10	3.13	**(D)**	**(D)**	**(D)**	**(D)**
Information	1.45	1.24	1.01	0.84	1.44	1.24
Finance and insurance	5.11	4.92	2.51	2.52	5.07	4.88
Real estate and rental and leasing	5.49	5.67	6.44	6.86	5.50	5.69
Professional and technical services	5.05	5.04	15.88	14.74	5.22	5.20
Management of companies and enterprises	0.71	0.95	**(D)**	0.16	**(D)**	0.94
Administrative and waste services	6.69	7.07	**(D)**	6.04	**(D)**	7.06
Educational services	0.53	0.58	**(D)**	0.39	**(D)**	0.58
Health care and social assistance	5.94	5.83	**(D)**	4.13	**(D)**	5.81

Table 5.15-6—2003 and 2005 Employment by Sector (%) (continued)

Sector	Clark		Nye		ROI	
	2003	2005	2003	2005	2003	2005
Accommodation and food services	23.96	23.32	10.12	9.55	23.75	23.11
Other services, except public administration	3.78	3.69	5.13	4.89	3.80	3.71
Government and government enterprises	9.60	9.16	12.16	11.06	9.64	9.19
Federal, civilian	1.13	1.03	1.15	0.92	1.13	1.03
Military	1.17	1.06	0.53	0.50	1.16	1.05
State and local	7.29	7.07	10.49	9.63	7.34	7.11
State government	1.33	1.33	**(D)**	0.91	**(D)**	1.32
Local government	5.96	5.74	**(D)**	8.72	**(D)**	5.79

Source: BEA 2007.
(D) No Data.

Current TTR employment. Approximately 67 percent of the workforce at TTR resides in Nye County with over 60 percent residing in Tonopah. Another 20 percent of the workforce resides within the cities of Henderson (3 percent) and Las Vegas (17 percent) in Clark County, Nevada. The remaining 13 percent of the workforce resides within the cities and counties listed in Table 5.15-7. There are 37 TTR employees (33.6 percent) who do not reside in Tonopah while working but instead reside on site at the Man Camp.

Table 5.15-7—Summary of Workforce Residence

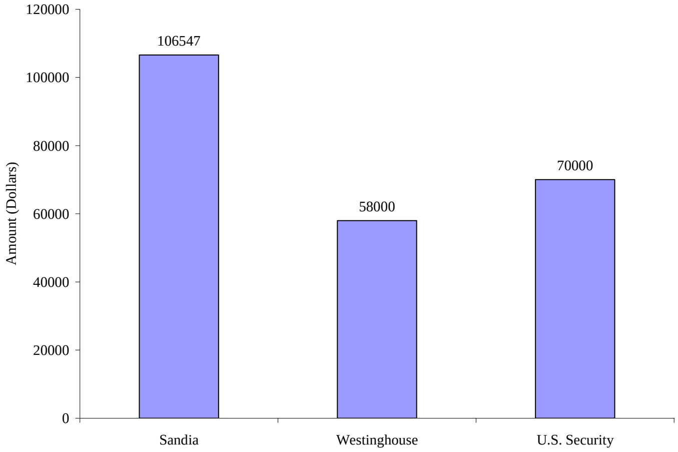
City	Percent (%)
Tonopah	64.5
Henderson	2.7
Albuquerque	0.9
Santa Clara	0.9
Las Vegas	17.3
Reno	0.9
Deeth	0.9
Boulder City	0.9
Meadview	0.9
Carson City	0.9
Fernley	0.9
Pahrump	0.9
Rio Rancho	0.9
Fallon	1.8
Caliente	1.8
Enterprise	2.7
County	**Percent (%)**
Nye	67.3
Clark	20.9
Bernalillo	0.9
Washington	1.8
Washoe	0.9
Elko	0.9
Mohave	0.9
Carson City	0.9

Table 5.15-7—Summary of Workforce Residence (continued)

County	Percent (%)
Lyon	0.9
Sandoval	0.9
Churchill	1.8
Lincoln	1.8

Source: NNSA 2007.

The average annual salary of a TTR employee is $78,182. Sandia employees earn an average annual salary of $106,547, while Westinghouse and U.S. Security employees earn an average annual salary of $58,000 and $70,000, respectively (Figure 5.15-1).



Source: NNSA 2007.

Figure 5.15-1—Average Annual Salaries of TTR Workforce

Community services. A large number of TTR employees are also involved in community associations as shown in Table 5.15-8. If operations were discontinued at TTR, it is anticipated that involvement in these reported community activities would decrease.

Table 5.15-8—Summary of Community Involvement–TTR Employees

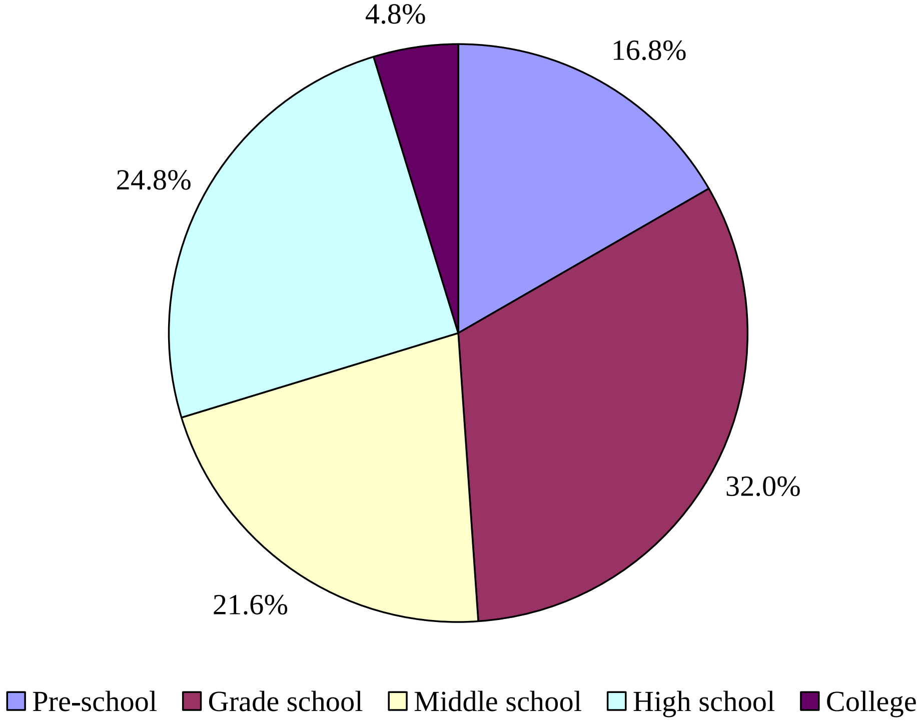
Community Activity/Association	Number of TTR Employee Participants
Greater Las Vegas Association of Realtors	6
Realtors Association	5
Church	11
Outdoor club	5
Business owner	4
Scouts	24
PTA	29
Booster Club	2
Tonopah Little League	7
MSBL Baseball League	1
Elks	14

Table 5.15-8—Summary of Community Involvement–TTR Employees (continued)

Community Activity/Association	Number of TTR Employee Participants
VFW	3
Beta Sigma Phi	1
HS Basketball Coach	1
4 R Kids	6
Nye County Search & Rescue	32
Central NV Officials Assn (NCOO)	2
HS Wrestling Coach	1
MS Wrestling Coach	1
Tonopah Volunteer Fire Department	19
Trap Shoot Assn	2
Nye County Regional Ambulance Services	3

Source: NNSA 2007.

Educational systems. There are two schools in Tonopah: Tonopah Elementary/Middle (grades K-8) and Tonopah High school (grades 9-12). As of the 2005-2006 school year, the Tonopah Elementary/Middle school had an enrollment of 212 and the Tonopah High school (grades 9-12) had 169 students enrolled for a total of 381 students. There are a total of 125 dependents of TTR employees attending school. Of these, 21 (16.8 percent) are in pre-school, 40 (32 percent) in grade school, 27 (21.6 percent) in middle school, 31 (24.8 percent) in high school, and 6 (4.8 percent) in college (see Figure 5.15-2) (NNSA 2007).



Source: NNSA 2007.

Figure 5.15-2—Percentage of TTR-Employee Dependents at Certain Stages of Schooling System

It is assumed that the 87 TTR employee dependents attending grade, middle, and high school all attend either Tonopah Elementary/Middle or Tonopah High school, representing approximately 22.8 percent of the total enrollment for both schools as shown in Table 5.15-9. The student-to-teacher ratio for the Tonopah Elementary/Middle school was 17.1 for the 2005-2006 school year. For the 2005-2006 school year, there were 13 teachers at the Tonopah High School. The average classroom sizes for Tonopah Elementary/Middle and Tonopah High school were 20.75 and 20, respectively (Table 5.15-9) (NNSA 2007).

Table 5.15-9—School Characteristics in Tonopah

School Characteristics	Tonopah Elementary/Middle	Tonopah High School	Total
Current			
TTR Students	63	24	87
Total Enrollment	212	169	381
Average Classroom Size	21.5	20	20.75
Classroom Teachers	12	13	25
Student to Teacher Ratio	17:1	13:1	16:1
After Transfer			
Total Enrollment	149	145	294
Average Classroom Size	15.1	17.2	16.15
Classroom Teachers	12	13	25
Student to Teacher Ratio	13:1	12:1	12:1

Source: NCES 2007; State of Nevada 2007.

Housing characteristics for TTR employees. There are approximately 900 occupied housing units in the Tonopah area. Of these, 351 (39 percent) are owner-occupied, while the remaining 549 (61 percent) are renter-occupied as shown in Table 5.15-10 (USCB 2007). According to the Nye County Assessor’s Office (2007), an average of 35 houses were sold annually between the years 2001 and 2006 for an average price of $65,882 as shown in Table 5.15-11.

Approximately 78 percent of TTR employees own residences, while the remaining 22 percent are renters. Fifty nine percent of the residences are stick-built (i.e. built on site), 26 percent are manufactured housing, 7 percent are mobile housing units, and 8 percent are apartments as shown in Figure 5.15-3 (NNSA 2007).

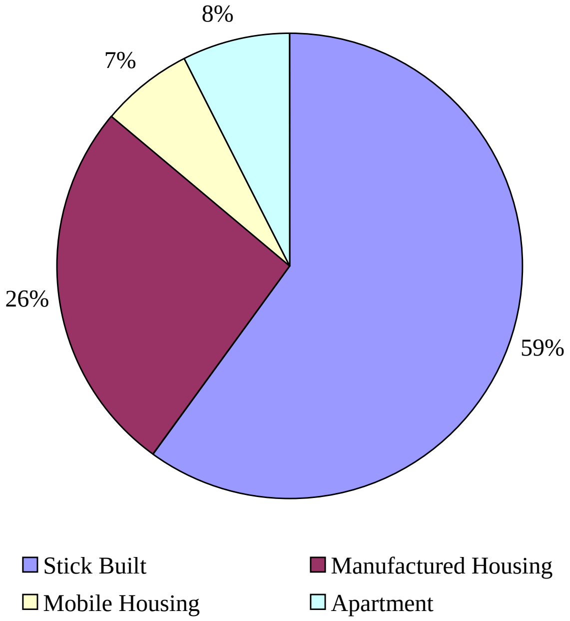
Table 5.15-10—Housing Characteristics in Tonopah

Housing Characteristics	Tonopah Area Total	TTR Employees
Current		
Owner-Occupied	351	86
Renter-Occupied	549	24
Total Occupied Units	**900**	**110**

Table 5.15-11—Home Sales Statistics for Tonopah, 2001–2006

Year	Number of Homes Sold	Average Price ($)
2001	23	65,646
2002	37	56,915
2003	30	63,491
2004	45	61,278
2005	39	72,153
2006	36	75,814
Annual Average	**35**	**65,883**

Source: Nye County Assessor 2007.



Source: NNSA 2007.

Figure 5.15-3—Types of TTR Employee Housing

Socioeconomic impacts. If the NNSA flight test operations were transferred to either WSMR or NTS, approximately 130 direct jobs in the professional, scientific, and technical services industry would be lost at TTR. WSMR would not gain any jobs in the professional, scientific and technical services industry and TTR would lose approximately 92 jobs in the campaign mode during the assignment transfer to the WSMR. Indirect effects on employment outside of this industry sector would include a loss of approximately 108jobs within the Regional Economic Area for a total job loss of about 238.

Based on the ROI average income of $78,182 for workers employed at TTR, direct ROI income would decrease by approximately $10.2 million. This would also result in additional losses to indirect income in supporting industries. The total impact to the ROI income from both TTR worker and supporting industry losses would be approximately $15.9 million ($10.2 million direct and $5.7 million indirect).

The population would experience a decrease of approximately 238 persons residing within the ROI at TTR. There could be a population increase of approximately 238 in the WSMR or NTS ROI from discontinued operations at TTR. Community organizations could lose the services of 180 persons involved in community activities at TTR.

As shown in Table 5.15-9, the enrollment at Tonopah Elementary/Middle School would potentially decrease by 63 students, reducing the total enrollment to 149, the average classroom size to 15.1, and, assuming current staffing levels, the student-to-teacher ratio to 12. The Tonopah High School would potentially lose 24 students, reducing the total enrollment to 145 and the average classroom size to 17.2.

It is assumed that the many of the 86 TTR employees who own their houses would place them on the market if the Flight Operations Program were to be transferred, reducing the number of owner-occupied units to a level below 351. Exactly how far below this level is difficult to assess, because if all 86 houses were placed on the market it would amount to more than 20 percent of the houses in a town where a primary employer had stopped operations. As compared to the 35 average annual homes for sale in Tonopah over the past 6 years, the addition of 86 homes for sale would increase this annual statistic by 245 percent, representing a potentially significant impact on the housing market. Housing prices would likely drop and some houses could continue to be occupied by the owners or sit vacant.

Of the 549 renter-occupied residences in the area, it is assumed that the 24 TTR employees who rent their residences would not renew their leases, reducing the number of renter-occupied units to 525 as shown in Table 5.15-10 and Figure 5.15-4. This would represent only 4.4 percent of the total number of units for rent within the Tonopah area, and would not result in a significant impact on the rental market.

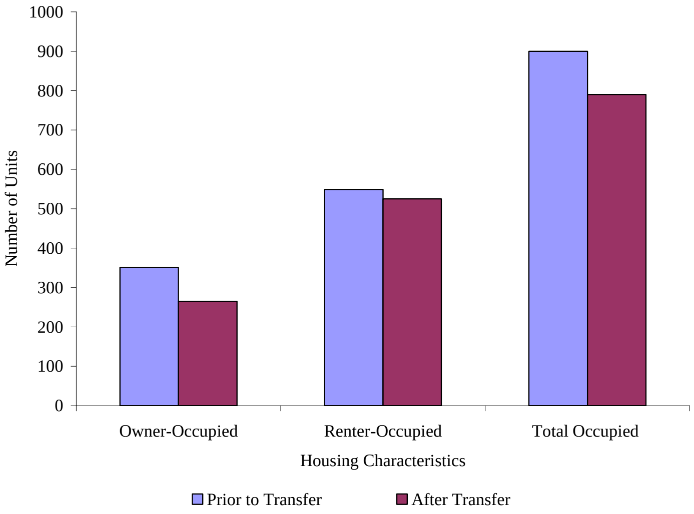
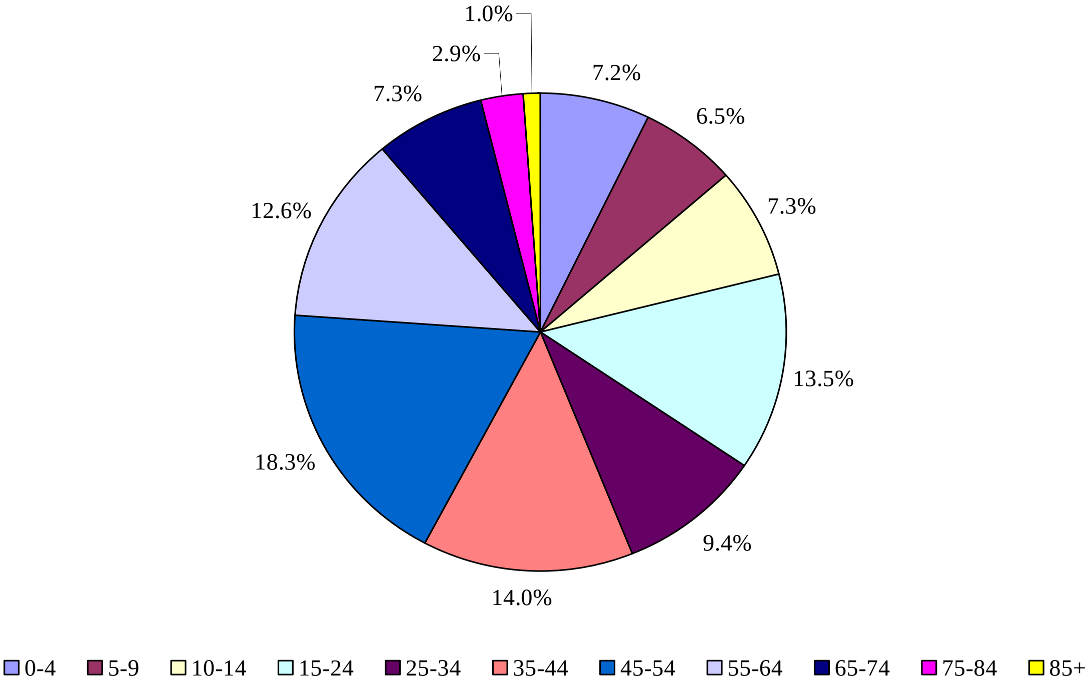


Figure 5.15-4—Potential Housing Changes with Transfer of Operations–TTR

5.15.4.2.2 Supplemental Socioeconomic Analysis

Supplemental information pertaining to socioeconomic characteristics of the region surrounding TTR has been provided in the University of Nevada 2007 report, "Complex 2030 Proposal Estimated Economic Impacts on Northern Nye and Esmeralda Counties." The primary study area researched in this report consists of the communities of Tonopah, Round Mountain, Manhattan, Goldfield, and Silverpeak, also known as the Central Nevada Regional Study Area (CNRSA). The UN 2007 Report focused on detailed socioeconomic characteristics of the Tonopah region, including results from a survey of residents and an independent analysis of direct, indirect, and total impacts to socioeconomic resources in Tonopah and surrounding areas. The following section provides relevant information derived from the UN 2007 Report, which is included in Chapter 12.

In 2007, there were 7,221 individuals living in the CNRSA. Over 55 percent of the total CNRSA population resides in Tonopah, which also has the largest concentration of families (1,034) and households (1,726). Approximately 32.3 percent of the population in Tonopah is between the ages of 35 and 54 as shown in Figure 5.15-5. The average family size in Tonopah is 2.93 persons, which has decreased since the 2000 estimate of 2.97 persons (UN 2007).



Source: UN 2007.

Figure 5.15-5—CNRSA Percent Age Distribution, 2007

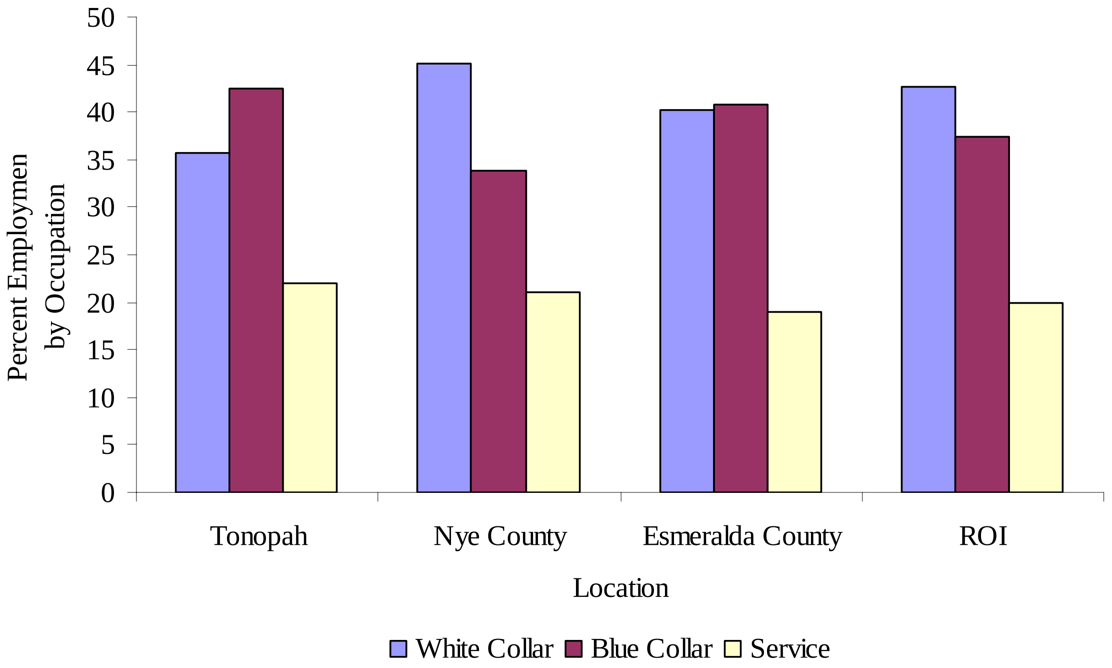
As of 2000, approximately 46.7 percent of Tonopah residents 25 and older have a high school diploma and 22.8 have some college education without the attainment of a college degree as shown in Table 5.15-12. An estimated 16.5 percent of the Tonopah population 25 and older has less than a high school education, which is less than the 20.9 percent for the ROI, 19.3 percent for the State of Nevada, and 19.6 percent for the United States (UN 2007).

Table 5.15-12—Number and Percent of Tonopah Population, Age 25 and Older by Highest Level of Educational Attainment, 2000

Level of Education	Individuals	Percent
>9th Grade	2,761	3.1
9th-12th (no diploma)	11,933	13.4
High School Graduate	41,586	46.7
Some College (no diploma)	20,303	22.8
Associate Degree	4,541	5.1
Bachelor Degree	5,254	5.9
Master/Doctorate Degree	2,582	2.9

Source: UN 2007.

According to the University of Nevada study (2007), 35.8 percent of the civilian labor force in Tonopah was considered to have white collar jobs (professional, managerial, or administrative employment), 21.9 percent service jobs, and 42.4 percent held blue collar positions (manual labor employment). When compared to the ROI, Tonopah has a higher percentage of blue collar employees and a lower percentage of white collar employees as shown in Figure 5.15-6 (UN 2007).



Source: UN 2007.

Figure 5.15-6—Percent Employment by Occupation in Tonopah Compared to the ROI, 2007

In 2007, the average household income in Tonopah was $45,296, which was comparable to the ROI average of $44,663 but less than the State of Nevada average of $62,564 and the national average household income of $62,737 (UN 2007).

Results from the UN survey (2007) indicate that households of TTR employees have lived within the CNRSA for a longer period of time and typically have a larger, younger household with larger average income versus households of non-TTR employees as shown in Table 5.15-13. Individuals within both types of households (TTR employees and non-TTR employees) appear to have attained similar levels of education as shown in Table 5.15-14.

Table 5.15-13—Comparison of Key Characteristics of TTR and Non-TTR Household Respondents

Characteristic	TTR	Non-TTR	Total
Average Years in CNRSA	5.4	4.5	4.8
Average Household Size	2.7	2.4	2.5
Average Respondent Age	48.1	53.5	52
Average Household Income	$64,200	$48,300	$52,800

Source: UN 2007.

Table 5.15-14—Comparison of Education Levels of TTR and Non-TTR Household Respondents

Education Level	TTR	Non-TTR	Total
Some High School	3.40%	3.10%	3.20%
High School Diploma	38.60%	29.30%	31.90%
Some College	35.20%	34.70%	34.80%
Associate Degree	13.60%	10.20%	11.20%
Bachelor Degree	6.80%	11.10%	9.90%
Graduate Degree	2.30%	11.60%	8.90%

Source: UN 2007.

As shown in Table 5.15-15, TTR households appear to have greater monthly expenditures when compared to non-TTR households and the CNRSA average household (UN 2007).

Table 5.15-15—Comparison of Estimated Monthly Expenditures for TTR Households and Non-TTR Households

Expenditure Category	TTR Household	Non-TTR Household	CNRSA Average Household
Housing			
Rent	$71	$133	$114
Mortgage	$562	$266	$359
Property Tax	$230	$162	$180
Grocery	$493	$481	$484
Food Away from Home	$179	$132	$146
Utilities (Electric, Natural Gas, Propane, Water, Cable/Satellite, Phone)	$576	$460	$492
General Merchandise	$251	$146	$178
Medical (Doctor, Dentist, Optometrist, Hospital, Prescription)	$404	$283	$315
Insurance (Vehicle, Health, Life)	$388	$351	$362
Recreation (Gaming, Indoor, Outdoor)	$99	$88	$91
Vehicle Expenses (Oil, Maintenance, Gas)	$323	$312	$315

Table 5.15-15—Comparison of Estimated Monthly Expenditures for TTR Households and Non-TTR Households (continued)

Expenditure Category	TTR Household	Non-TTR Household	CNRSA Average Household
Services (Accounting, Lawyer, Child Care, Miscellaneous)	$159	$111	$127
Credit Card (Principal and Interest)	$439	$340	$372
Miscellaneous	$796	$385	$156
Savings and Retirement	$140	$170	$163
Total Monthly Expenses (except housing)	$4,547	$3,421	$3,740
Total Monthly Income	$5,350	$4,025	$4,400
Allocation for Housing and Miscellaneous Taxes	$803	$604	$660

Source: UN 2007.

5.15.4.3 *Potential D&D Requirements*

TTR contains approximately 105 major buildings, with a total area of 161,505 square feet of space. TTR facilities also include approximately 90 smaller buildings, including towers and small sheds. These structures encompass an additional 18,000 square feet. If flight testing were transferred to either WSMR or NTS, NNSA would undertake D&D of approximately 180,000 total square feet (structures) and remediation of contaminated soils surrounding these structures. As detailed in Section 4.4.6.2.1, remediation of contamination resulting from former weapons destructions tests is ongoing at TTR and not scheduled to be completed until 2022. If flight testing were transferred, the required additional D&D would be limited to the existing structures and some small amount of immediately co-located soils. It is estimated that the D&D required by the closure of TTR would be a two year project requiring a total of close to 300,000 worker hours to complete and generate the waste volumes shown in Table 5.15-16. D&D of the facilities and cleanup of the site would have to meet the standards of the Air Force, which is the landlord, and the State of Nevada. Non-hazardous waste generated by this project would be disposed of on-site. LLW and hazardous waste generated by this effort would be transported to NTS or a commercial facility for treatment and disposal.

Table 5.15-16—D&D Associated with Transfer of Flight Testing–TTR

D&D Required	D&D Amount
Soil D&D (yd^3)	20,000
LLW generated (yd^3)	500
Non-Hazardous waste (yd^3)	45,619
Hazardous waste (yd^3)	7,462
Debris/Earth moving equip.(dozers/trucks)	5/10
D&D Related employment	
Peak	75
Total worker hours	299,300

Source: NNSA 2007.

5.15.5 Transfer to NTS Alternative

This alternative would entail the termination of flight test operations at TTR and the relocation to NTS. Existing communications systems and empty storage and office facilities at NTS could easily be adapted to allow for the JTA Flight Test Program.

5.15.5.1 *Construction Requirements*

As in a transfer to WSMR, a target area would have to be constructed and a few enhancements to Building CP-40 (existing building at NTS) would have to be made. Tables 5.15-17 and 5.15-18 present the requirements for construction and operation of Flight Test Operations at NTS.

Table 5.15-17—Construction Requirements–NTS

Requirements	Consumption/Use
Peak Electrical Energy (KW-hr)	40,000
Diesel Generators (Yes or No)	Yes
Concrete (yds^3)	800
Steel (tons)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000
Lay down Area Size	Two 11.5 acre sites
Parking Lots	N/A
Total employment (worker years)	37
Peak employment (workers)	30
Construction period	15 months
Hazardous	
Liquid (gal)	0
Solid (yds^3)	0
Non-hazardous (Sanitary)	
Liquid (gal)	0
Solid (yds^3)	6,000
Non-hazardous (Other)	
Liquid (gal)	0
Solid (yds^3)	45

Source: NNSA 2007.

Table 5.15-18—Operating Requirements–NTS

Annual Operations	Consumption/Use
Annual electrical energy (megawatt-hours [MWh]	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or cubic yd)	32,150 gallons
Other process gas (N, Ar, etc.)	480cu.ft.
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32

Table 5.15-18—Operating Requirements–NTS (continued)

Annual Operations	Consumption/Use
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Generated	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

The required construction is a small project and it is not anticipated that the employment of 30 construction workers over a 15-month period would place any drain on the existing labor pool of the area.

During flight test operations, the primary noise would be generated by aircraft flying over the NTS target drop areas. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to those employed by NTS. These individuals would not likely even be exposed to any high levels of noise as they are remotely located and not in proximity to the actual drop target areas. In addition, these tests are not likely to result in any adverse effect on sensitive wildlife species or their habitats.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased flights at NTS as a result of NNSA conducting flight tests. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are remotely located from the flightpath of the aircraft. The public would not be allowed access to those areas on NTS where flight test operations would occur; in fact, for safety reasons, such areas would be cleared of all personnel and closely monitored so as to exclude any access during such tests. Those areas of NTS where the public is allowed access would be sufficiently remote that the public probably would not perceive the presence of the aircraft, at all. Because no significant off-site health risks are associated with the flight test operations, no environmental justice impacts are expected.

Sensitive wildlife species are unlikely to be adversely affected by the aircraft noise. NTS has conducted large HE test detonations on a regular basis, for a number of years. There has been no apparent, adverse impacts to any species associated with these tests.

5.15.6 Transportation

Due to the proximity of all alternative sites, the transportation requirements are similar for all three action alternatives. All transportation of JTAs is conducted in NNSA Safeguards Transporters operated by the Office of Secure Transportation, based in Albuquerque, New Mexico. Vehicles are state-of-the-art and all personnel associated with such shipments are highly trained both initially and on an ongoing basis. Shipments by such transport have an exemplary safety record. Although routes have been determined and environmental impacts evaluated for such transport, specifics of this information are classified.

5.15.6.1 *Removal of Test Weapon from the Stockpile*

In order to conduct tests at TTR, weapons are removed from the stockpile at various locations across the U.S. and abroad and transported to Pantex. Once the weapon has been inspected, the SNM is removed from the weapon, and instrumentation is added to it, the weapon becomes a JTA. Transportation required to support this activity would be the same as for existing operations and would be the same for all alternatives.

5.15.6.2 *Transport of JTAs to Air Force Installations*

Once the JTAs have been inspected and certified at Pantex, they are transported to U.S. Air Force (USAF) installations on NNSA’s fleet of SGT vehicles, and then loaded onto test aircraft. The specific locations of the USAF installations use to support this operation are not relevant and would be similar for all alternatives. Transportation required to support this activity would be the same as for existing operations and would be the same for all alternatives.

5.15.6.3 *Transport of JTAs from Test Site to Pantex*

Once the JTA test has been completed, the JTA is returned to Pantex for post testing analysis and disposition. For fly-over tests, this transportation route would be from the Air Force installation from which the aircraft originated to Pantex. Transportation required to support this activity would be the same for existing operations as it would be for all alternatives for fly over tests. Dropped JTAs would be transported from the test facility to Pantex. Transportation required to support this activity would be site specific and vary for each alternative site. The No Action Alternative, the TTR Upgrade Alternatives, and the Relocation to NTS would all be similar, since the distances and routes to Pantex are about the same for TTR and NTS. The transportation route from the Relocation to the WSMR Alternative is less than half of the other two alternatives.

5.16 PROJECT-SPECIFIC ANALYSIS OF HYDRODYNAMIC TESTING

Hydrodynamic testing (hydrotesting) is the execution of high-explosive-driven experiments to assess the performance and safety of nuclear weapons. Hydrodynamic tests, except for some underground sub-critical experiments at the NTS, do not normally employ fissile materials, but must not preclude the potential to do so should the stewardship mission require it. The alternatives for meeting the goal of the NHP are explained in the section 3.11. These alternatives are: (1) the No Action Alternative, which would continue operations at the existing facilities of LANL, LLNL, NTS, SNL, and Pantex; (2) an alternative to downsize the number of hydrotesting facilities at LANL, LLNL, NTS, SNL, and Pantex; (3) an alternative to consolidate hydrotesting activities at LANL; and (4) a next generation alternative to consolidate all hydrotesting activities at the NTS.

5.16.1 No Action Alternative

This alternative entails the continued operation of the hydrotesting facilities and missions currently being conducted at five weapons complex sites: LLNL, LANL, NTS, Sandia, and Pantex. Under the No Action Alternative, NNSA would continue to conduct hydrotesting at these facilities and sites. There would be no construction impacts associated with this alternative. The impacts of the No Action Alternative are described in the relevant sections of the Affected Environment Chapter of this SPEIS (Chapter 4). The impacts described in that chapter would continue under the No Action Alternative. Additionally, more details regarding the No Action Alternative for hydrotesting is contained in Section 3.11.1, and in Appendix A. The major No Action Alternative facilities are summarized below.

5.16.1.1 *Hydrotesting Facilities at Lawrence Livermore National Laboratory*

LLNL’s Site 300 has been used since 1955 to perform experiments that measure variables important to nuclear weapon safety, conventional ordnance designs, and possible accidents (such as fires) involving explosives. The facilities used for Site 300 firing activities consist of four firing point complexes; the 801, 812, 850, and 851, and several other associated smaller support facilities. Of particular note is the Contained Firing Facility (CFF) located at the 801 complex. There are 30 employees at LLNL’s hydrodynamic test facilities. 30 employees are at the 801 complex, of which 10 of these employees are at the CFF.

5.16.1.2 *Hydrotesting Facilities at Los Alamos National Laboratory*

The primary hydrotesting facility at LANL is the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT), which has an intense high-resolution, dual-machine radiographic capability. Some other smaller firing sites at LANL support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments. LANL hydrodynamic testing has 34 employees of which 29 are at the DARHT.

5.16.1.3 *Hydrotesting Facilities at the Nevada Test Site*

The NTS has several facilities which are utilized for very large explosion-type experiments. The

Big Explosives Experimental Facility (BEEF) is one such facility at NTS which is the only NNSA facility where some experiments, due to the amount of HE utilized, can be conducted. The U1a Complex is an underground facility that would continue to conduct HE/Pu tests. NTS has three additional, smaller outdoor facilities. No employees are associated with these facilities.

5.16.1.4 *Hydrotesting Facilities at Sandia National Laboratory and Pantex*

Smaller hydrotesting facilities are located at Pantex, near Amarillo, Texas, and Sandia National Laboratory (SNL or Sandia) in Albuquerque, New Mexico. Both Pantex and Sandia have several outside blasting table facilities which are primarily used for HE R&D activities and can only handle small hydrotesting experiments. No employees are associated with these facilities.

5.16.2 Downsize–in-Place Alternative

The Downsize-In-Place Alternative would continue hydrotest activities by, consolidating LLNL activities at Building 801 Complex in the CFF, consolidating LANL activities at the DARHT, closing the smaller facilities at both of these sites, and moving tests requiring larger amounts of HE to the BEEF, at NTS. This alternative would entail the closure of a number of facilities both at LLNL and LANL. It would also entail the closure of all hydrotesting facilities at Pantex and SNL. It should be noted that some of the facilities used for hydrotesting at SNL are shared facilities with the HE R&D Program and that any decisions to close these facilities would require a joint decision on the part of both programs. NTS would close all of its facilities, except for BEEF.

5.16.2.1 *LLNL Impacts*

At LLNL, the Downsize-In-Place Alternative would entail the closing of the Building 812 Complex and the Building 850 Complex. The Building 851 Complex would either be closed or turned over to other non-NNSA programs. The associated support facilities would probably not be impacted by this alternative as they are smaller, multi-purpose facilities which could be of use to other program activities. This would entail the D&D and disposal of an estimated 3,200 cubic yards of hardened concrete, steel and other non-hazardous material, and an estimated 9,200 cubic yards of soils which would require D&D. It is estimated that emissions would be reduced by approximately 20 percent, and waste generation reduced by approximately 10 percent. The majority of the reductions in air emissions would be a result of the closing of the smaller outdoor facilities and the increased utilization of the enclosed CFF-like facility. There would be a loss of 26 jobs. These impacts are presented in Table 5.16-1. Buildings 850, and 851A at Site 300 have been determined eligible for listing in the NRHP and would be affected by decommissioning. Prior to D&D activities, these buildings would be recorded and photo documented to accepted standards. A thorough review would be conducted to assure that there would be no impacts to any cultural or archeological resources.

5.16.2.2 *LANL Impacts*

Under the Downsize-In-Place Alternative LANL would close all hydrotesting facilities except for the DARHT, which has an intense high-resolution, dual-machine radiographic capability—

and a few of the other smaller firing sites at LANL, which support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments. There would be a loss of 5 jobs. This would entail D&D and disposal of an estimated 8,500 cubic yards of hardened concrete, steel and other non-hazardous material and an estimated 17,000 cubic feet of soil which would have to undergo D&D. This alternative would result in reduced air emissions of up to 40 percent and reduce waste generation by approximately 10 percent. These impacts are presented in Table 5.16-1.

5.16.2.3 *Pantex and Sandia Impacts*

At Pantex, at least six outdoor burn areas would be closed. At SNL, at least three outdoor burn areas would be closed. It should be noted that some of the facilities used for hydrotesting at SNL are shared facilities with the HE R&D Program and that any decisions to close these facilities would require a joint decision on the part of both programs. There would be no job loss as there are no employees assigned to these facilities at Pantex and SNL/NM. These are all small facilities and could entail the D&D and disposal of an estimated 2,200 cubic yards of hardened concrete, steel and other non-hazardous materials, and generate an estimated 4,000 cubic feet of contaminated soil which would then have to undergo D&D. Because special nuclear materials were used in past tests, this would entail the generation of small levels of TRU and Low Level wastes. These impacts are presented in Table 5.16-1.

Table 5.16-1—Impacts of Facility Closures for the Downsize-in-Place Alternative

	LLNL	LANL	Pantex & SNL	NTS	TOTAL
Employment loss	26	5	0	0	31
Soil D&D (yds^3)	9,200	17,000	4,000	2,000	32,200
LLW generated (yds^3)	1,350	28,112	10,000	5,000	44,462
TRU generated (yds^3)	0	0	20	10	30
MLLW generated (yds^3)	0	0	20	10	30
Non-Hazardous waste					
Liquid (gal)	13,165	0	0	10	13,175
Solid (yds^3)	3113	8,487	2,200	1,000	16,246
Hazardous Waste					
Liquid (gal)	220	0	0	0	220
Solid (yds^3)	317	492	80	45	934
Employment					
Peak	20	107	20	12	159
Total Worker-Years	45	200	45	23	313

Source: NNSA 2007.

5.16.2.4 *NTS Impacts*

BEEF and the U1a Complex would remain open, but NTS would close the smaller outdoor facilities. This would entail the generation, D&D, and disposal of an estimated 1,000 cubic feet of hardened concrete, steel and other non-hazardous material, and the generation of an estimated 2,000 cubic yards of contaminated soil which would require D&D. Because special nuclear materials were used in past tests, it is expected that this D&D would generate small quantities of TRU waste and low level wastes. Reductions in air emissions and waste generation would be small since the facilities eliminated by this alternative are small in comparison to the BEEF and the U1a Complex, which would continue to operate. These impacts are presented in Table 5.16-1.

5.16.2.5 *Summary of Impacts for the Downsize-in-Place Alternative*

Closure of close to a dozen facilities would entail a substantial clean-up and D&D effort. Although not heavily contaminated, these facilities all have a substantial amount of reinforced concrete and steel structures designed to withstand sizeable HE explosions. There would be a total job loss of 31 (26 at LLNL and 5 at LANL). It is estimated that at least 10,000 gross square feet of hardened concrete and steel structures and soil immediately surrounding these structures would have to be dismantled, razed, dug up, undergo D&D, and disposed of. Table 5.16-1 presents the cumulative impacts of the Reduce-In-Place Alternative.

After these closures, the Hydrotesting Program would operate the DARHT and a few support facilities at LANL, the CFF and Building Complex 801 at LLNL, and the BEEF and the U1a Complex at NTS. The option of using facilities maintained by the HE R&D Program would continue to exist for smaller experiments, under this alternative.

5.16.3 Consolidation at LANL Alternative

This alternative would consolidate all large-scale hydrotesting at the single location of LANL. Since LLNL and NTS both have required capabilities not presently at LANL, this alternative would entail maintaining the CFF at the Building 801 Complex and its associated support facilities at LLNL until these capabilities could be established at LANL. In addition, it is not anticipated that it would be possible to transfer the capability to conduct Hydrotesting experiments requiring very large amounts of HE, presently being conducted at the BEEF, at NTS, to LANL. Accordingly, under a consolidation of hydrotest capabilities at LANL, the BEEF would still be required to maintain its operational status at NTS.

This alternative would entail a large amount of clean-up and D&D associated with the closure of all hydrotesting facilities at LLNL, SNL, NTS (except for BEEF and the U1a Complex), Pantex, and a substantial number of facilities at LANL. It is estimated that this alternative would entail the closure and clean-up of close to 17,000 square feet of hardened concrete and steel structures designed to withstand very large HE explosions.

5.16.3.1 *LLNL Impacts*

This alternative would entail the closure of all of the LLNL hydrotesting facilities. This would result in the loss of 56 jobs at LLNL. The CFF would remain in operation until a new CFF-like replacement facility could be constructed at LANL. Once this CFF-like replacement facility was operational at LANL, the CFF would be closed and undergo D&D. This would result in the D&D and closure of a substantial number of facilities at LLNL. It is estimated that this would generate 15,700 cubic yards of hardened concrete, steel and other non-hazardous material, and that an estimated 25,500 cubic yards of soil would be required to undergo D&D. In addition, quantities of LLW and hazardous waste would be generated. Because all hydrotesting would cease after a replacement CFF was constructed and in operation at LANL air emissions and waste generation attributable to this activity would decrease to zero. These impacts are presented in Table 5.16-2. Five buildings and two districts at the Livermore Site and Site 300 have been determined eligible for listing in the NRHP and could be affected by decommissioning. Prior to D&D activities, these buildings would be recorded and photo documented to accepted standards. A thorough review would be conducted to assure that there would be no impacts to any cultural or archeological resources.

5.16.3.2 *LANL Impacts*

Under this alternative, LANL would close the same facilities as it would for the Downsize-In-Place Alternative, the impacts of which are discussed in Section 5.16.2. As discussed in the LLNL section, above, this alternative could require the construction of a new CFF-like facility at LANL. In this process it would make sense to collocate LANL's distant support facilities (storage, staging and assembly) during the construction of such a new facility. The construction of such a facility would involve a two to three year process resulting in an 8,000 to 12,000 square foot primary structure, with two to three smaller support buildings, situated on a five to seven acre site. There would be an increase of 10 employees associated with the operation of the new CFF-like facility. With the five jobs lost through the closing of the smaller facilities at LANL, this would result in a net gain of 5 jobs. These impacts are presented in Table 5.16-2. The impacts associated with the construction and operation of a CFF-like facility, at LANL, are shown in Table 5.16.3.

5.16.3.3 *Pantex and Sandia Impacts*

The impacts to Pantex and Sandia would be the same as for the Downsize-In-Place Alternative, the impacts of which are detailed in Section 5.16.2.

5.16.3.4 *NTS Impacts*

The impacts to NTS would be the same for this alternative as they would be for the Downsize-In-Place Alternative, the impacts of which are detailed in Section 5.16.2.

5.16.3.5 *Consolidated Impacts*

The Consolidation at LANL Alternative would close all hydrotesting facilities at Pantex, Sandia, and LLNL, and all but the BEEF, at NTS. The CFF would remain open, at LLNL, until a replacement CFF could be constructed and brought on-line at LANL. Table 5.16-2 presents the impacts associated with the closing of facilities required by the Consolidation at LANL Alternative, and Table 5.16-3 presents the impacts associated with the construction of a replacement CFF, at LANL and the operation of facilities resulting from the Consolidation at LANL Alternative.

Table 5.16-2—Impacts of Facility Closures–LANL Consolidation Alternative

	LLNL	LANL	Pantex & SNL	NTS	TOTAL
Employment changes	-56	+ 5	0	0	-51
Soil D&D (yds^3)	25,500	17,000	4,000	2,000	48,000
LLW generated					
Liquid (gal)	40,000		10,000	5,000	55,000
Solid (yds^3)	100	0	20	12	130
TRU generated (yds^3)	0	0	20	10	30
MLLW generated (yds^3)	0	0	0	0	0
Non-Hazardous waste					
Liquid (gal)	13,165	0	0	0	13,165
Solid (cubic yards)	15,692	8,487	2,200	1,000	27,379
Hazardous Waste					
Liquid (gal)	517	0	0	0	517
Solid (cubic yards)	15,270	492	80	45	15,887
D&D Related Employment					
Peak	120	107	20	12	259
Total Worker-Years	240	200	45	23	508

Source: NNSA 2007.

Table 5.16-3—Construction and Operation Impacts of a CFF-Like Facility–LANL

Construction	Consumption/Use
Electric use MWh/yr	150
Diesel generators number & size	
Concrete (yds^3)	5,000
Steel (tons)	2,500
Water (gallons)	200,000
Land (acres)	5 to 7
Laydown area (acres)	3
Parking lots (acres)	2
Employment	
Total (worker years)	60
Peak (workers)	50
Construction period	24 months
Waste	
Hazardous (yds^3)	0
Non-hazardous	0
Liquid	22,000
Solid (yds^3)	1,300
Electricity (MWh/yr)	14
Water (gal/yr)	40,000
Footprint Acres	0.12
Employees	10
Explosives Lbs/yr	234
DU lbs/yr	207
Beryllium lbs/yr	4
LLW	
Liquid (gal)	9,000
Solid (yd^3)	64
MLLW	
Liquid (gal)	0
Solid (kg/yr)	7,200

Table 5.16-3—Construction and Operation Impacts of a CFF-Like Facility–LANL (continued)

Construction	Consumption/Use
TRU Waste	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous Waste	
Liquid (gal)	569,713
Solid (yd^3)	2.8
Non Hazardous Waste	
Liquid (gal)	2,412
Solid (yd^3)	0.1
NOx emissions (tons/yr)	0.0271
CO emissions (tons/yr)	0.0167
SOx emissions (tons/yr)	0.0018

Source: NNSA 2007.

In addition, this alternative could require the construction of a new containment facility at LANL. In this process it may be possible to locate support facilities (storage, staging and assembly) at the facility. The construction of such a facility would involve a two to three year process resulting in a primary containment structure, with possibly two to three smaller support buildings situated at an existing firing site. Options for sites include TA-15-306 and TA-36-12 as well as DARHT. Construction at TA-15-306 would present no conflicts as no experimental program is using that site at this time. Table 5.16-3, which is based on the construction and operation of CFF, gives an idea of what the impacts associated with a new facility capable of performing the experiments presently being conducted at CFF would be. Although the new facility would probably be smaller than the existing CFF, it would accommodate the co-location of LANL facilities presently located at other TA locations.

Construction impacts required for a new CFF like facility would be expected to disturb from 5 to 7 acres at one of two potential sites on TA-15, or at a third potential site on TA-36. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and Homestead Era cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work would cease in that area until LANL’s cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

The construction or post-construction landscaping could disturb some potential release sites (PRSs). When possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LANL’s Project staff could review the site and would identify appropriate procedures for working within that site area.

The new CFF-like facility would be constructed in accordance with seismic criteria in current building codes. This facility would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new facility would be designed according to general design criteria for a new facility (LANL 1999a), with a minimum lifetime expectancy of 30 years of operation.

The newly constructed facility would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) at the Two-Mile Mesa Complex are currently being reconfigured and upgraded for efficient distribution to new buildings associated with the DX Consolidation.

LANL is considered a major air emission source under the State of New Mexico Operating Permit program because it emits more than 100 tons per year of certain non-radioactive substances. Specifically, LANL is a major source of nitrogen oxides, emitted primarily from the TA-3 steam plant boilers. Combustion units are the primary point sources of criteria pollutants (nitrogen oxides, sulfur oxides, particulate matter, and carbon monoxide) emitted at LANL. The new building would be located in Los Alamos County, which is in attainment with NAAQS and all NMAAQS. The ambient air quality in and around LANL meets all EPA and DOE standards for protecting the public and workers (LANL 2001a).

Clearing or excavation activities during site construction and during the D&D of the closed facilities would have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality

Work at both the new facility construction site and the D&D sites would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at these sites would be audible primarily to the involved workers. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, two acres of temporary parking lots, three acres of laydown yards, and construction access roads would be required. At the completion of the construction process these areas would be reclaimed or used for permanent parking. Additional laydown and temporary storage yards would be required at the D&D sites.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be minimally affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 50 construction workers would be onsite during the peak construction period, adding an estimated additional 40 personal vehicles to local roadways during the construction period and another 20 construction vehicles (such as dump trucks, bulldozers, drill rigs, cranes, and cement mixer trucks). These vehicles would operate primarily during the daylight hours and could be left onsite over night. Temporary construction lighting would be directed toward the work area. An additional 107 construction workers with an additional 90 personal vehicles would be added to the local roadways for the 24 months of the D&D activities. There would also be an additional 30 to 35 construction vehicles to enable the D&D activities to be conducted.

There would be no effects to sensitive species or their critical habitat due to construction or D&D activities. Small mammals and birds at the construction site or at the temporary storage yards for D&D activities would be temporarily displaced. These would be expected to return to the general area after construction and D&D activities were completed. Game animal migration is not likely to be altered.

The new building or D&D activities would not entail any direct effects on floodplains or wetlands since there are none within the areas proposed for construction or demolition. BMPs would be established so that there would be no indirect effects from construction.

During the construction and D&D period, there would be no increase in the number of LANL employees as a result of this project. The estimated additional 50 peak construction jobs and the 107 D&D jobs would be filled by the existing employees in the regional work force, which includes mostly Los Alamos, Rio Arriba, and Santa Fe Counties. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Los Alamos or the region. There would be short-term benefits during construction and D&D process in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction and D&D activities would not be expected to have any adverse health effects on LANL workers or the public. NNSA and LANL workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 157 peak-period (50 construction and 107 D&D) workers. Approximately 60 (20 construction and 40 D&D) of these workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). If the peak construction period lasts for the entire one year construction period, no deaths (0.0049) would be expected for the estimated 157 (50 construction and 107 D&D) onsite workers from construction nor demolition-related activities that include falls, exposure to harmful substances, fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles.

The new construction and the D&D of the facilities to be closed would generate non-hazardous solid waste that would be disposed of at the Los Alamos Country Landfill, its replacement facility, or other New Mexico solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 1,300 cubic yards and the D&D activities is expected to generate 13,165 cubic yards of soil and 15,270 cubic yards of solid waste. No new radioactive or other wastewater or hazardous waste streams would be generated.

Water quality in this area would not be affected by the construction, D&D or the operation of the new facility. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by implementing the Proposed Action. Water quality would not change as a result of operations of the new facility.

During operations, there would be only a 10 person increase in the number of LANL employees as a result of this project. Compared to the existing workforce at LANL, this project would not have a long-term effect on socioeconomic conditions in north-central New Mexico.

During operations, the primary noise generated by air blast waves and ground vibration impacts associated with high explosives tests, would be minimized by the containment vessel of the new facility. It is not expected that any incremental noise would be detectable outside of the new CFF-like facility. Accordingly, there would not be any adverse effect on non-involved workers, the public, or sensitive wildlife species or their habitats.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased explosions resulting from hydrotesting. Such testing currently occurs at LANL both in the Hydrotesting Program and in the HE R&D Program. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points. The public is not allowed within the fenced TAs that have firing sites, and noise levels produced by explosives tests are sufficiently reduced at locations where the public would be present to preclude hearing damage.

Such tests would not be expected to adversely affect offsite sensitive receptors (such as those at Bandelier National Monument or at White Rock). Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LANL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas and their continued presence on the LANL site over the past 10 years. In fact, the continued thriving of resident and long-term migratory populations of these sensitive species on the LANL site indicates that the level of noise generated by explosives testing under the No Action Alternative is at least tolerable to these particular species (LANL 2008).

The reasonably foreseeable hydrotest accident scenarios associated with a CFF-like facility, which could produce the greatest potential impacts, are the following:

- **Case 1.** Accidental detonation of a test of a 60-kg charge of explosives at an outdoor firing table.
- **Case 2.** Accidental detonation of a 60-kg explosives test which could release up to 20 mg (200 curies) of tritium with dispersal through an unsecured blast door in the CFF or at the new CFF-like facility constructed to replace the CFF.

In each case, the involved workers would probably be fatally injured from blast effects due to peak overpressure and debris, but there would be no injury offsite to members of the general public. No damage to current buildings offsite or in other areas of LANL would be expected from such accidents. Potential impacts from the two accident scenarios are summarized in Table 5.16-4.

Table 5.16-4—Potential Impacts from Accidents at a CFF-Like Facility

Scenario	Involved Worker at 30 meters (rem)	Uninvolved Worker at 50 meters (rem)	Offsite Member of Public at 1,340 meters (mrem)	Excess LCFs, Offsite Member of the Public
Case 1	0	0	0	0
Case 2	0.026	0.015	1.1×10^{-4}	5.5×10^{-8}

Source: DOE 1996d.

These projected radiation doses are lower than DOE guideline limits for workers and for the general public; thus the greatest effects would be fatalities or injuries to workers due to primary blast effects. Because no significant off-site health risks are associated with the operations of a CFF-like facility, no environmental justice impacts are expected.

5.16.4 Consolidation at NTS

Moving hydrodynamic testing to NTS would consolidate the capabilities that currently exist at LANL, LLNL, SNL, Pantex, and NTS to one location and provide the next generation capabilities required to maintain the nuclear deterrent in the 2020 to 2050 timeframe. This potential alternative provides the maximum consolidation with the greatest number of facility closures. However, both DARHT at LANL, and CFF at LLNL, are relatively new facilities that would be expensive to replace in the near term. Consequently, a decision on a next generation hydrotesting facility probably would be premature at this time. However, the alternative is analyzed in this section for completeness.

To the extent the potential environmental impacts of the next generation hydrodynamic test facility can be forecast at this time, a significant part of the public and worker exposures and impacts due to normal operation of the next generation hydrodynamic test facility would be those related to the conduct of hydrodynamic tests and dynamic experiments at the facility. While the impacts are inherently site-dependent, the hydrodynamic tests and dynamic experiments themselves can be anticipated to be similar to such activities as analyzed at DARHT in the

DARHT Facility EIS (DOE 1995a); therefore the DARHT Facility impacts are summarized here for reference. Table 5.16-5 presents the construction and operational requirements for such a facility at NTS.

Table 5.16-5—Construction and Operational Requirements–Consolidation at NTS

Construction	**Consumption/Use**
Electric use MWh/yr	365
Diesel generators number & size	3
Concrete (yds^3)	16,000
Steel (tons)	1,600
Water (gallons)	350,000
Land (acres)	17
Laydown area (acres)	3.5
Parking lots (acres)	2
Employment	
Total (worker years)	175
Peak (workers)	40
Construction period	24 months
Non-hazardous	0
Liquid	22,000
Solid (yds^3)	1,300
Operation	**Consumption/Use**
Electricity (MWh/yr)	2,520
Water (gal/yr)	100,000
Footprint Acres	17
Employees	29
Avg. Annual dose (rem)	0.097
Maximum worker dose (mrem)	1.84
Explosives (lbs/yr)	3,300
Depleted U (lbs/yr)	720
Lead (lbs/yr)	14
LLW	
Liquid (gal)	0
Solid (yd^3)	12,500
TRU Waste	
Liquid (gal)	0
Solid (tons)	2
Hazardous Waste	
Liquid (gal)	2,500
Solid (yd^3)	310
Non Hazardous Waste	
Liquid (gal)	0
Solid (ft^3)	9,400
NOx emissions (lbs/yr)	31.5
CO emissions (lbs/yr)	93
SOx emissions (lbs/yr)	0.42

Source: NNSA 2007.

Population-based impacts may be expected to be lower at NTS. The normal radiological impacts of the DARHT Facility to the annual collective dose to the population residing within 50 miles would be expected to be 0.57 person-rem. Latent cancer fatalities at this dose would not be expected. The maximum annual dose to any nearby resident would be about $2x10^{-5}$rem with a corresponding latent cancer fatality of $1x10^{-8}$. The average annual dose to individual workers would probably not exceed 0.02 rem with a corresponding maximum probability of latent cancer fatality of $8x10^{-6}$. Routine exposure to chemicals is expected to be low. The likelihood of a severe facility accident occurring would be very small. The population dose resulting from acute accidental release in the bounding facility accident, accidental uncontained detonation of a plutonium-containing assembly, evaluated on a what-if basis (related DOE safety studies indicate a probability of less than 10^{-6} per year), would be expected to range from 9,000 to 24,000 person-rem in the maximally exposed sector, based on 50th or 95th percentile atmospheric dispersion factors, respectively. Five to twelve latent cancer fatalities would be expected from this dose. Population dose from acute accidental plutonium release from a containment breach was estimated to range from 210 to 560 person-rem, for which no latent cancer fatalities would be expected. For workers, the likelihood of a severe accident occurring and resulting in death would be minimized by a comprehensive training program and an explosives safety program.

Because the concept of this facility has not developed to the point where it is even possible to define the structure size or type, it is not possible to estimate the specific impacts associated with the construction and operation beyond the general emission concepts discussed above. If this alternative were eventually pursued, the appropriate NEPA environmental impact analysis would be performed at the time data to enable such analysis became available.

In addition to the next generation facility which would be constructed for the consolidation at NTS Alternative, an alternative to also construct a new CFF-like facility at NTS in the 2040 timeframe is also being considered. The impacts associated with the construction and operation of this facility would be similar to the impacts detailed in the LANL Consolidation Alternative (see Section 5.16.3).

5.17 PROJECT-SPECIFIC ANALYSIS OF MAJOR ENVIRONMENTAL TEST FACILITIES

5.17.1 Introduction

This section discusses the environmental impacts which could result from actions supporting the following Alternatives for Major ETFs located at LANL, LLNL, SNL, and NTS.

Major ETF Alternatives

- **No Action.** Maintain status quo at each site. All facilities must be maintained, or upgraded to meet current safety and security standards.
- **Downsize-in-Place.** No duplication of capability within a given site, but there may be duplication from site to site - phase out aging and unused facilities.
- **Consolidate ETF Capabilities at One Site (NTS or SNL).** Would entail closings at sites not selected and construction of new facilities if NTS were selected. This alternative also includes an option to move the LLNL Building 334 ETF capabilities and the LLNL Site 300 Building 834 Complex to Pantex.

5.17.2 No Action Alternative

ETFs are currently located at three National Laboratories (SNL, LANL and LLNL) and the NTS. Under the No-Action Alternative, DOE/NNSA would continue to operate the existing ETFs at these four sites at the current levels of activity. Only those upgrades and maintenance required to allow for the current activities would take place. There would be no changes to current resource requirements, waste generation, emissions, infrastructure, or employment. A full description of these ETF facilities at these four sites, along with the operational requirements, may be found in Appendix A.

At LLNL, six small structures at the Thermal Test Facility are currently being demolished and surrounding soils will be regarded to the preexisting state. These facilities have not been included in this analysis, as the project has been on-going for a number of years and is expected to be completed prior to any decisions resulting from this SPEIS.

It should be pointed out that the use of Category I/II SNM is an issue that affects the ETF program. SNL/NM is currently removing its Category I/II SNM, and by the end of 2008 should no longer maintain any Category I/II SNM. After that date, any ETF testing requiring such material at SNL/NM would use it in a “campaign mode” only while the test is being conducted. Special security arrangements will be implemented during the test and the material would be removed and returned to the site it came from after the test is completed. For the actions proposed by the ETF Alternatives, use of Category I/II SNM would be dealt with in a similar manner.

5.17.3 Downsize-in-Place Alternative

The Downsize-in-Place Alternative entails the elimination of duplicate activities within a given site, and the closing of unused facilities and facilities which require major upgrades to bring them on-line. This Alternative would entail the closure of the following facilities listed in Table 5.17-1.

Table 5.17-1—ETF Closures– Downsize-in-Place Alternative

LANL	LLNL	Sandia National Labs[3]
Thermo-Conditioning Facility (5 structures)	Dynamic Testing Facility Building (836 Complex)	ACRR and Sandia Pulsed Reactor Facility[1]
PIXY	Building 834 Complex	Low Dose Rate Gamma Irradiation Facility
		Auxiliary Hot Cell Facility
		Centrifuge Complex
		SNL/CA Environmental Test Complex[2] (4 structures)

Source: NNSA 2007.
[1] The reactor, itself has been moved to NTS
[2] These buildings might not be demolished and undergo D&D; in that event, they would be reused for other purposes.
[3] Downsize in place would not effect the SNL/CA facilities

The scheduled closure of SNL facilities in Table 5.17-1 would be contingent upon completion and time phasing of existing programmatic work at the sites, as previously discussed in Section 3.12.2. The Downsize-In-Place Alternative would not effect the SL/CA facilities

Unless other customers/sponsors are found for these facilities are found, they will be subject to closure and would require the demolition of more than 27 structures, some of which are hardened concrete and steel structures. Some of the structures are merely sheds and of a light construction material type. Some of these facilities have conducted experiments involving radioactive materials for a number of years and would require additional D&D beyond normal demolition activities. Some soils surrounding the structures would be disturbed and some of these soils might prove be contaminated with radioactive materials and/or hazardous wastes. A complete site assessment would be made at and around each of these facilities prior to any demolition activities.

Demolition and D&D would result in the generation of solid, non-hazardous waste, hazardous wastes, low level radioactive wastes, and potentially some mixed wastes. It is not envisioned that there would be any TRU waste generated as a result of the closure and D&D of facilities associated with this alternative.

In the case of the Sandia Pulsed Reactor if no other customer/sponsor is found, its fuel would be removed and taken to NTS and stored for future use. The buildings it occupies will be D&D. The reactor itself will undergo D&D and be disposed of at NTS as LLW.

In addition to the closing of structures, there would be minor job losses at SNL/NM (16), and at LLNL (6). The potential for 6 job losses at LLNL comes from the closure of the SNL/CA facility. The LLNL and the LANL ETF staff would be unaffected by facility closures, as the work and the tests being conducted at these sites would continue at other ETFs. Because the two facilities at NTS would not be affected by this alternative, they would continue operations, and there would be no impacts.

An assessment of the environmental impacts resulting from the closure and D&D (if needed) was made for each structure which would close as a result of this alternative and is summarized in Table 5.17-2.

Table 5.17-2—Impacts from ETF Closures– Downsize-in-Place Alternative

NNSA Site	Facility Closures	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	2	2,849	2,741	2,000	2	40	8,518	0	13,040
LLNL[a]	2	100	0	6,374	199	85	44,000	6	17,202
SNL	5	5,100	37	8,700	42	107	48,880	16	42,717,

Source: NNSA 2007.

[a]For downsize in Place Alternative SNL/CA facilities would not be effected

The potential environmental impacts at LANL, LLNL, SNL/NM, and NTS which could result from the Downsize-In-Place Alternative are presented below:

5.17.3.1 *Downsize-in-Place Alternative Impacts at LANL*

The Downsize-in-Place Alternative would entail the closing and the D&D of the Thermo-Conditioning Facility and PIXY. This would reduce the ETF floor space by 13,040 square feet and leave the K Site Environmental Test Facility and the Weapons Component Test Facility in operation. Closure and D&D of the two facilities at LANL is expected to entail 8,518 total worker hours, involve three large earth movers and six large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL. These construction vehicles would not be utilized for off-site runs during either the morning or evening rush hours and would remain on site over night. The peak employment would total 40 construction workers with the average work-force being slightly smaller. This would add another 30 vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take eleven months to complete.

It is expected that 2,849 cubic yards of soil would have to be excavated. None of this soil is expected to be contaminated with hazardous waste or radioactive materials, but a thorough site characterization would be conducted prior to any soil disturbance and soil would be sampled at regular intervals during the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering the mounds with either vegetation or tarps. Once the demolition process is completed this soil would be used as landscaping grade material. If some of this soil was determined to be contaminated, it would be treated according to applicable regulatory requirements and then taken to TA-54 for final treatment and disposal. It is expected that 2,741 cubic yards of low level waste will be generated. This waste would consist mainly of equipment, glove-boxes and contaminated concrete. This LLW would be sorted, compacted, and packaged on-site and transported directly to Area G, located in TA-54.

The 2 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercially licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste are generated through this process, they would be packaged, on-site, for transport and taken to Area G of TA-54 for treatment and final disposition. An estimated 2,000 cubic yards of non-hazardous, solid waste would be generated by the demolition of these facilities. This waste would consist primarily of concrete, steel reinforcement, and metal scrap. This waste would be transported to the Los Alamos County Landfill for disposal.

LANL is located within the New Mexico Intrastate AQCR 157. None of the area within LANL and its surrounding counties is designated as nonattainment areas with respect to any of the NAAQS (40 CFR 81.332). The only pollutant of concern resulting from this action would be particulate matter, the emissions of which could exceed the 24-hour limits established by the New Mexico Environmental Improvement Board. Dust suppression measures utilizing water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Los Alamos, Santa Fe, Rio Arriba, Taos, Mora and San Miguel, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would be no loss of jobs attributable to this action as the ETF program would continue at LANL, and the tests would be conducted at other facilities.

5.17.3.2 *Downsize-in-Place Alternative Impacts on LLNL*

For LLNL, the Downsize-in-Place Alternative would entail the closing and the D&D of the Thermal Test Facility and the Dynamic Testing Facility (836 Complex), at Site 300, and the

SNL/CA Environmental Test Complex near the Main LLNL Site. This action would reduce the ETF floor space by approximately 17,200 square feet by closing all ETF facilities at LLNL Site 300 and the SNL/CA environmental test complex.[11] It is expected this would entail 44,000 total worker hours, involve four large earth movers and 12 large dump-trucks. Peak employment would total 85 construction workers with the average daily work-force being smaller. It is estimated that the total job would take thirty-six months. Construction vehicles would be entering and leaving LLNL during the day, at non-rush hours. The construction vehicles would not operate on the highways during rush hour times. The workforce would add an estimated additional 60 personal vehicles, but work arrival times and departure times could be staggered to minimize impacts on the existing traffic patterns.

It is expected that only 100 cubic yards of soil would need to be excavated. This soil is not expected to be contaminated, but a thorough site characterization of the buildings and surrounding soils would be done prior to any demolition, and soil would be monitored closely for contaminants throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering with either vegetation or tarps and then used as landscape grade once the demolition process is completed. No LLW is expected to be generated. The expected 199 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercial licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste were to be generated through this process, it would be packaged, on-site, for transport and taken to the Nevada Test Site for treatment and disposal. 6,374 cubic yards of non–hazardous, solid waste would be generated in the demolition of these structures. This waste would consist mainly of concrete, reinforcement steel, metal scrap and wood. This waste would be transported to the nearby Corral Hollow Sanitary Landfill, for disposal.

LLNL is located within the San Francisco BAAQMD and the SJVUAPCD. This area has been designated a nonattainment area for carbon monoxide, ozone, and particulate matter. LLNL could be required to submit a Risk Analysis Study to the State of California prior to commencing any demolition activities. The pollutant of concern would be particulate matter. Dust suppression measures utilizing the spraying of water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices.

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[11] The 58,803 square feet of floorspace at the SNL/CA environmental test complex was not included, as this space could be utilized by other programs.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Santa Cruz, Santa Clara, Stanislaus, Tuolumne, and Calveras which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. Closure of the SNL/CA Environmental Test Complex would lead to the loss of 6 jobs. This number in relation to the total employment of LLNL, or the region, is not significant enough to have measurable impacts for LLNL or within the ROI.

5.17.3.3 *Downsize-in-Place Alternative Impacts on SNL/NM*

For SNL, the Downsize-in-Place Alternative would entail the closing and the D&D of 42,717 square feet of floor space by closing the ACRR and Sandia Pulsed Reactor Facility, the Low Dose Rate Gamma Irradiation Facility, the Auxiliary Hot Cell Facility, and the Centrifuge Complex. This is expected to entail 48,880 total worker hours, involve eight large earth movers and twenty large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around SNL. These construction vehicles would remain on site over night. The Peak employment would total 107 construction workers with the average work-force being smaller. This would add another 70 personal vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take twenty months to complete.

It is expected that 5,100 cubic yards of soil would have to be excavated. Small portions of this soil would probably be contaminated with hazardous wastes. A thorough site characterization would be conducted prior to any soil disturbance. Any quantities of contaminated soil would be taken to SNL’s Hazardous Waste Management Facility, where it would be packaged for shipment off site to a commercial RCRA permitted facility. Any asbestos material would be handled in accordance with the requirements of TSCA and be shipped off site to a licensed commercial facility for disposal. Non-contaminated soil would be mounded and protected from the environment by vegetation or tarps and used as landscaping grade once the demolition activities would be completed. An estimated 8,700 cubic feet on non-hazardous waste would be generated by the demolition of these structures. This waste would consist of concrete, steel, plastic, wood, and general refuse. This waste would be transported to the nearby Albuquerque Landfill for disposal.

It is expected that 37 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, and a small quantity of contaminated concrete. This LLW would be taken to TECH Area III, where it would be sorted, compacted, and packaged for shipment to NTS. The estimated 8,700 cubic feet of non-hazardous waste, along with any asbestos waste would likewise be taken to Tech Area III, where it would be sorted and packaged for shipment off site to a commercial RCRA permitted facility or TSCA approved facility. It is estimated that this sorting would generate 42 cubic yards of hazardous waste. It is not expected, but if any quantities of mixed waste were to be generated through this process, they would be packaged at Tech Area III and taken to NTS for treatment and disposal.

Bernalillo County has been designated as a maintenance area under the CAA for CO and PM_{10}. Prior to any demolition activities, SNL would be required to perform a conformity analysis and obtain a pre-construction permit from the State of New Mexico. Required dust suppression activities would be determined through this process.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Albuquerque, Valencia, Socorro, Torrance, Cibola and Sandoval, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would a loss of 16 jobs attributable to this action. This number is small in relation to the total employment of SNL, or the region, and is not significant enough to have measurable impacts within SNL or within the ROI.

5.17.4 Consolidate ETF Capabilities at One Site (NTS or SNL) Alternative

There are two options for the Consolidate all ETF Capabilities at One Site Alternative. One would consolidate existing ETF capabilities to the NTS. This option would close all ETF facilities at LANL, LLNL, and SNL and require construction of new facilities at NTS to replace some of the required capabilities lost through facility closings. The two NTS facilities at the DAF and the U1a Complex would remain in operation. Building 334 at LLNL and three of the facilities at SNL (considered to be capabilities critical to the continuance of the ETF Program) would remain open until the new replacement facilities could be constructed and begin operation.

A second option would consolidate existing large scale ETF capabilities to SNL. This alternative would close all ETF facilities at LANL and LLNL, but would continue operations of the DAF and the U1a Complex at NTS. For this option, the operations conducted in the Engineered Test Bay (Building 334) at LLNL would be transferred to NTS (as discussed above), or transferred to Pantex, as discussed in Section 5.17.4.3. The Engineered Test Bay (Building 334) at LLNL would remain open until its new replacement could begin operation.

5.17.4.1 *Option 1—Consolidate ETF Capabilities at NTS*

This option would entail the closing of all ETF facilities at LLNL, LANL and SNL and the construction of the following five facilities at NTS: (1) an ACRR Facility (to be closed at SNL); (2) an Engineered Test Bay (Building 334-type facility to be closed at LLNL); (3) an Aerial Cable Facility and Control Building (to be closed at SNL); (4) a Building 334 and a Building 834 (to replace closed facility at LLNL Site 300); and (5) an Underground Sled Track Complex (sled tracks to be closed at LLNL and SNL). An alternative to constructing a new Building 334-type facility and Building 834 Complex at NTS would be to move the equipment from these two LLNL facilities to existing facilities at Pantex or to a planned replacement facility at Pantex (see Section 5.17.4.3). As a result of this option, the facilities listed in Table 5.17-3 would close.

Table 5.17-3—ETF Closures–NTS Consolidation Alternative

LANL	LLNL	Sandia National Lab
K Site Environmental Test Facility	Building 834 Complex	Centrifuge Complex
Weapons Component Test Facility	Building 836 Complex	Auxiliary Hot Cell Facility
PIXY	Building 834	Low Dose Rate Gamma Irradiation Facility
Thermo-Conditioning Facility (5 Structures)		ACRR and Sandia Pulsed Reactor Facility
		Simulation Tech Lab (HERMES and RHEPP)
		PBFA Saturn and Sphinx
		Radiation Metrology Lab
		Gamma Irradiation Facility
		Model Validation and System Cert Test Center
		Complex Wave Test Facility
		Light Initiated HE Test Facility
		Sled Track Facility
		Aerial Cable Facility and Control Building
		Radiography Building and Nondestructive Test
		Mobile Guns Complex
		Thermal Test Complex
		Vibration Acoustics and Mass Properties Lab
		Engineered Sciences Experimental Facility
		Component Environmental Test & Advanced Diagnostic Facility
		SNL/CA Environmental Test Complex (4 structures)
		Photometrics/Data Acquisition Complex
		Mechanical Shock Facility

Source: NNSA 2007.

Closure of the above listed facilities would entail a substantial effort. Some of these facilities have conducted experiments involving radioactive materials for a number of years and would require additional D&D beyond normal demolition activities. Some soils surrounding the structures would be disturbed and some of these soils might prove to be contaminated with radioactive materials and/or hazardous wastes. A complete site assessment would be made at and around each of these facilities prior to any demolition activities. Additional soil sampling would be conducted throughout the demolition process.

Demolition and D&D would result in the generation of solid, non-hazardous waste, hazardous wastes, low level radioactive wastes, and potentially some mixed wastes. It is not envisioned that there would be any TRU waste generated as a result of the closure and D&D of facilities associated with this alternative.

In addition to the closing of structures, there would minor job losses associated with this Alternative at SNL/NM, LANL, and LLNL. An assessment of the environmental impacts resulting from the closure and D&D (if needed) was made for each structure which would close as a result of this alternative and is summarized in Table 5.17-4, below:

Table 5.17-4—Environmental Impacts from ETF Consolidation at NTS Alternative

NNSA Site	Facility Closures	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	3	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	3	300	20	7,174	239	95	100,475	6	89,466*
SNL	22	5,300	478	119,193	3,654	1,016	456,340	224	404,352

Source: NNSA 2007.

[a] Assumes D&D of SNL/Environmental Test Complex, and attributes such impacts to LLNL as this is geographic area where the impacts would be incurred.

5.17.4.1.1 Impacts on LANL from the ETF Consolidation at NTS Alternative

The consolidation alternatives would entail the closing and the D&D of all ETF facilities at LANL. Closure of these facilities would remove 43,567 square feet of floor space and is expected to entail 112,518 total worker hours, involve six large earth movers and twelve large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL. These construction vehicles would not be utilized for off-site runs during either the morning or evening rush hours and would remain on site over night. The peak employment would total 110 construction workers with the average work-force being slightly smaller. This would add another 70 vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take thirty months to complete.

It is expected that 9,849 cubic yards of soil would have to be excavated. None of this soil is expected to be contaminated with hazardous waste or radioactive materials, but a thorough site characterization would be conducted prior to any soil disturbance and soil would be monitored throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering the mounds with either vegetation or tarps. Once the demolition process is completed this soil would be used as landscaping grade material. If some of this soil was determined to be contaminated, it would be treated according to applicable regulatory requirements and then taken to TA-54 for final treatment and disposal. It is expected that 12,743 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, glove-boxes and contaminated concrete. This LLW would be sorted, compacted, and packaged on-site and transported directly to Area G, located in TA-54.

Only 5 cubic yards of hazardous waste is expected to be generated. This waste would be shipped off site to a commercial RCRA licensed facility for treatment and disposal. Any asbestos wastes would be handled according to the requirements of TSCA, and shipped off site to a certified facility. It is not expected, but if any quantities of mixed waste were to be generated through this process, it would be packaged, on-site, for transport and taken to Area G of TA-54, for treatment and disposal. An estimated 503,000 cubic yards of non-hazardous waste would be generated by the demolition of these facilities. This waste would consist primarily of concrete, steel reinforcement, and metal scrap. This waste would be transported to the nearby Los Alamos County Landfill for disposal.

LANL is located within the New Mexico Intrastate AQCR 157. None of the area within LANL and its surrounding counties are designated as nonattainment areas with respect to any of the NAAQS (40 CFR 81.332). The only pollutant of concern is particulate matter, the emissions of which could exceed the 24-hour limits established by the New Mexico Environmental Improvement Board. Dust suppression measures utilizing water and other construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Los Alamos, Santa Fe, Rio Arriba, Taos, Mora and San Miguel which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would be a loss of 29 jobs attributable to this action at LANL. This amounts to less than 1 percent of the total employment of SNL.

5.17.4.1.2 Impacts on LLNL from the ETF Consolidation at NTS Alternative

For LLNL, the consolidation alternative would entail the closing and the D&D of all of the ETF facilities, with a loss of 89,466 square feet of floor space and would be expected to entail 100,475 total worker hours, involve eight large earth movers and 24 large dump-trucks. SNL/CA ETFs would undergo D&D but would not be demolished, as they are newer, multi-purpose facilities which may be useful for other purposes. Peak employment would total 95 construction workers with the average daily work-force being smaller. It is estimated that the total job would take thirty-six months. Construction vehicles would be entering and leaving LLNL during the day, at non-rush hours. The construction vehicles would not operate on the highways during rush hour times. The workforce would add an estimated additional 78 personal vehicles, but work arrival times and departure times could be staggered to minimize impacts on the existing traffic patterns.

It is expected that only 300 cubic yards of soil would need to be excavated. This soil is not expected to be contaminated, but a thorough site characterization of the buildings and surrounding soils will be done prior to any demolition and continued on a regular basis throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering with either vegetation or tarps and then used as landscape grade once the demolition process is completed. It is expected that 20 cubic yards of LLW would be generated. This waste would be packaged on site and shipped to NTS for treatment and disposal. The expected 239 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercial licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste were to be generated through this process, they would be packaged, on-site, for transport and taken to the Nevada Test Site for treatment and disposal. 7,174 cubic yards of non–hazardous waste would be generated in the demolition of these structures. This waste would consist mainly of concrete, reinforcement steel, scrap metal and wood. This waste would be transported to the nearby Corral Hollow Sanitary Landfill for disposal.

LLNL is located within the San Francisco Bay Area Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District. This area has been designated a nonattainment area for carbon monoxide, ozone, and particulate matter. LLNL could be required to submit a Risk Analysis Study to the State of California prior to commencing any demolition activities. The pollutant of concern would be particulate matter. Dust suppression measures utilizing the spraying of water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Santa Cruz, Santa Clara, Stanislaus, Tuolumne, and Calveras, which constitute the ROI, are more than sufficient to support such an action without impinging upon other ongoing activities in the area. Closure of the SNL/CA Environmental Test Complex would lead to the loss of 6 jobs. This number in relation to the total employment of LLNL, or the ROI, is not significant enough to have measurable impacts.

5.17.4.1.3 Impacts on SNL from the ETF Consolidation at NTS Alternative

For SNL, the consolidation alternative would entail the closing and the D&D of all of the ETF facilities with the exception of about 14,000 square feet of the ACRR and Sandia Pulsed Reactor Facility. This would amount to 404,352 square feet of floor space that would close and undergo D&D at SNL/NM This effort would be expected to entail 456,340 total worker hours, involve sixteen large earth movers and forty large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL as they would not operate during peak traffic hours. These construction vehicles would remain on site over night. The peak employment would total more than 1000 construction workers with the average work-force being smaller. This would add another 560 personal vehicles to the normal commuting traffic and has the potential to affect the existing flow of traffic. Arrangements would have to be made to stagger shifts and consider alternative or night time working shifts. It is estimated that the total job would take forty months to complete.

It is expected that 5,300 cubic yards of soil would have to be excavated. Small portions of this soil would probably be contaminated with hazardous wastes. A thorough site characterization would be conducted prior to any soil disturbance and continued throughout the demolition process. Any quantities of contaminated soil would be taken to SNL’s Hazardous Waste Management Facility, where it would be packaged for shipment off site to a commercial RCRA permitted facility. Non-contaminated soil would be mounded and protected from the environment by vegetation or tarps and used as landscaping grade once the demolition activities would be completed. An estimated 119,193 cubic feet on non-hazardous waste would be generated by the demolition of these structures. This waste would consist of concrete, steel, plastic, wood, and general refuse. This waste would be transported to the Albuquerque Landfill for disposal.

It is expected that 478 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, and a small quantity of contaminated concrete. This LLW would be taken to TECH Area III, where it would be sorted, compacted, and packaged for shipment to NTS. The estimated 3,654 cubic feet of hazardous waste, along with any asbestos waste would likewise be taken to Tech Area III, where it would be sorted and packaged for shipment off site to a commercial RCRA permitted facility or TSCA approved facility. It is not expected, but if any quantities of mixed waste are generated through this process, they would be packaged at Tech Area III and taken to NTS for treatment and disposal.

SNL is located within the Albuquerque-Mid Rio Grande New Mexico Intrastate AQR 152. Portions of the ARQU are designated nonattainment for carbon monoxide and total suspended particulate matter. Prior to any demolition activities, SNL would be required to obtain a permit from the State of New Mexico. Required dust suppression activities would be determined through this process. Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Albuquerque, Valencia, Socorro, Torrance, Cibola and Sandoval, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would a loss of 224 jobs attributable to this action. This number, in relation to the total employment of SNL of more than 6,000, is less than 4 percent. For the ROI, this is not a significant number.

5.17.4.1.4 Impacts on NTS from the ETF Consolidation at NTS Alternative

The Consolidate ETF Capabilities at NTS Alternative would require the construction of five new facilities at NTS: (1) an ACRR-like facility (replacing SNM testing capability lost at SNL); (2) an Engineering Test Bay (ETB) (replacing LLNL’s Bldg 334, a required capability); (3) an Aerial Cable Test Facility (replacing capability lost at SNL); (4) a Building 834 Complex (to replace the closed facility at LLNL Site 300); and (5) a sled track (replacing a required capability lost at LANL and SNL), which could be constructed above or below ground. The ACRR-like facility, the Building 334-like facility, and the Building 834 Complex could either be located in conjunction with the existing U1a Complex (underground) or within the PIDAS and in or adjacent to the DAF facility. The Aerial Drop facility would be sited at the Area 12 T Tunnel Complex Surface Area.

Annular Core Research Reactor (ACRR). The ACRR is a critical element in the neutron vulnerability and hardness testing and certification of stockpile weapon systems electronic components (e.g., transistors, integrated circuits), subsystems (e.g., fire sets, neutron generators), and systems (e.g., AF&F system). The ACRR is also a critical element in the hostile environment testing of weapon system physics packages (both primary and secondary) at the full-up system level, as well as material sample tests. In addition, ACRR performs neutron radiographic nondestructive examinations of weapons systems components (e.g., neutron generators).

This facility has required capabilities for the Complex which are not found elsewhere and must be maintained. The ETF Consolidation at NTS Alternative would require the construction and operation of such a facility at NTS. There are two proposed sites for this new facility. One would be a stand alone new building within the existing PIDAS of the DAF. The second alternative would be to construct the new ACRR underground at the U1a Complex. Tables 5.17-5 and 5.17-6 show the expected requirements for the construction and operation of a new ACRR at each of these two locations.

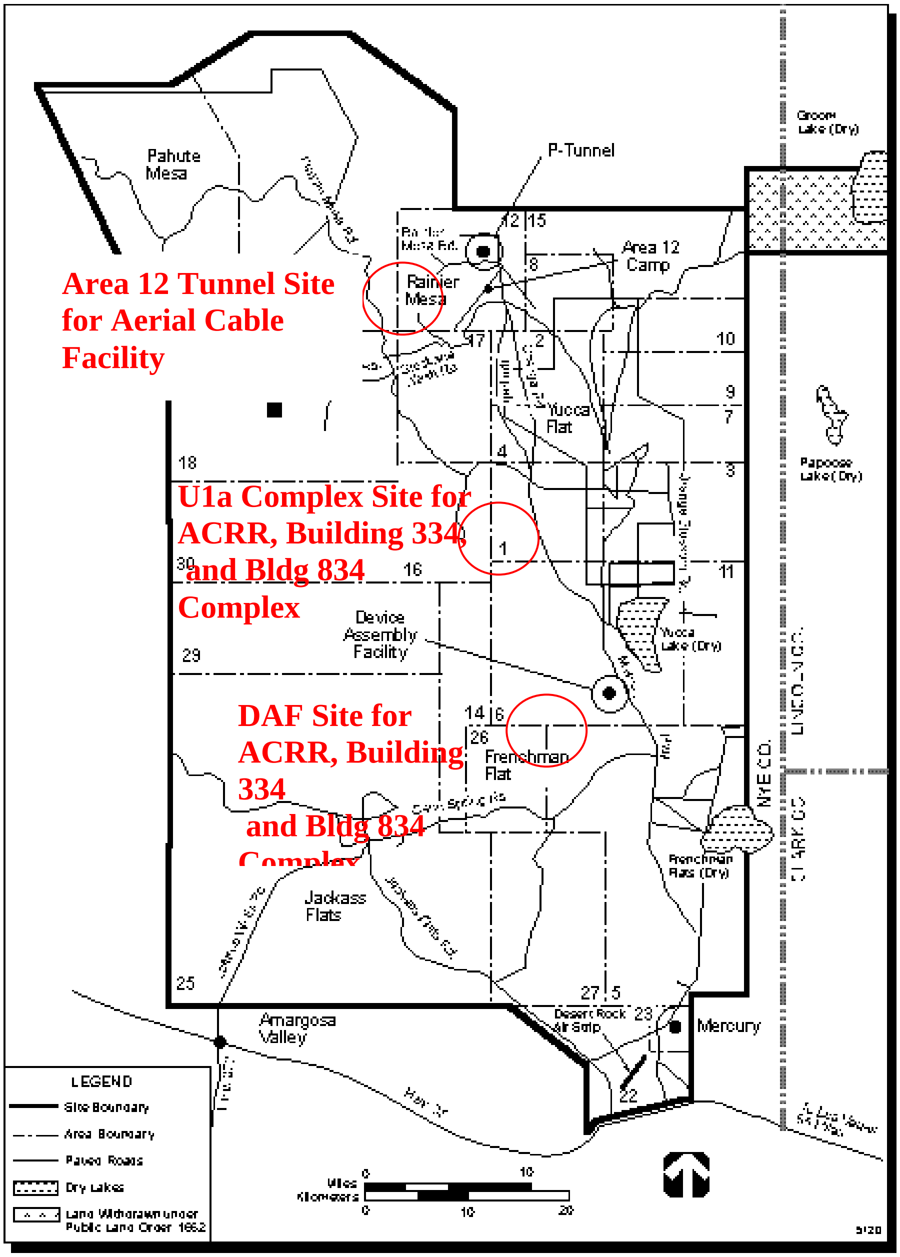
Table 5.17-5—Annular Core Research Reactor (ACRR) Sited within the DAF PIDAS

Construction	Consumption/Use
Water Needed for Construction (gal):	1,000,000 gallons
Total Square Footage of New Construction	2800 square feet
Total Land Area Disturbed by Facility Footprint (acres)	3.25 acres
Laydown Area Size (acres)	0.25 acres
Parking Lot (acres) Existing DAF Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	40 worker years
Peak construction employment (workers)	60 workers
Construction period (years)	3 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Mainly waste concrete with a smaller quantity of packaging materials (cardboard, pallets, etc.)	20 cubic yards
Operation	**Consumption/Use**
Electrical usage (MWh /yr)	489,787
Water use Gal/year)	13,793 existing ACRR Facility
Employment	
Total	42
Radiation workers	12
Waste Generation	
TRU (yd^3)	.2
Low Level (yd^3)	10

Table 5.17-5—Annular Core Research Reactor (ACRR) Sited within the DAF PIDAS (continued)

Operation	Consumption/Use
Hazardous (yd^3)	.4
Non-hazardous(gallons)	30,000
Emissions	
NAAQS (tons/year)	NOX .9, CO 1.6., PM 0.1, SOX .03, VOC 0.1
Radionuclide emissions	Argon-41

Source: NNSA 2007.



Source: NNSA 2007.

Figure 5.17-1—Location of New Facilities for Consolidation at NTS

Table 5.17-6—Annular Core Research Reactor (ACRR) Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	400,000 gallons
Land	
Total Square Footage of New Construction	8600 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	.25 acres
Parking Lot (acres) Existing U1a Complex Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	70 worker years
Peak construction employment (workers)	20 workers
Construction period (years)	4 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3)	8000 cubic yards
Construction	**Consumption/Use**
Electrical usage (MWh /yr)	489,787
Water use Gal/year)	13,793 existing ACRR Facility
Employment	
Total	42
Radiation workers	12
Waste Generation	
TRU (yd^3)	.2
Low Level (yd^3)	10
Hazardous (yd^3)	.4
Non-hazardous(gallons)	30,000
Emissions	
NAAQS (tons/year)	NOX .9, CO 1.6., PM 0.1, SOX .03, VOC 0.1
Radionuclide emissions (Ci/yr	Argon-41

Source: NNSA 2007.

If the ACCR operations at SNL were transferred to NTS, the accident risks associated with those operations at SNL would be eliminated. Previously, accidents analyzed for the ACRR have included a target rupture, a fuel handling accident, the rupture of a waterlogged fuel element, and an airplane crash and fire in the reactor room with unirradiated fuel and targets present (DOE 2006a). For the bounding accident (an airplane crash and fire with a 6.3×10^{-6} probability of occurring), the increased probability of an LCF for the maximally exposed individual (MEI) would be 1.0×10^{-10} (statistically, this means that there would be much less than a 1 percent chance that an LCF would result if this accident were to occur). This accident would result in 1.6×10^{-6} additional LCFs to the 50-mile population. For the noninvolved worker, this same accident would result in an increased probability of an LCF of 4.9×10^{-8}. Transfer of the ACRR mission to NTS would be expected to result in similarly low risks to the MEI, surrounding population, and non-involved workers. Due to the remoteness of the NTS, the large distance to the MEI (more than 13 miles), and the much smaller surrounding population, risks would be expected to be even lower than those presented above for SNL.

Building 334. Building 334 is in the Superblock at the LLNL main site and is often referred to as the Hardened Engineering Test Building (HETB). The building is primarily used for environmental testing of SNM. One half of the building is the Radiation Measurement Facility, including the Intrinsic Radiation (INRAD) Bay and the other half is the ETF, consisting of the Engineering Test Bay (ETB). The two bays are separated from each other by a thick concrete wall. With regard to environmental testing, Building 334 is currently the only building within the Complex that can facilitate environmental testing of special nuclear material (SNM) (i.e., pits and secondary assemblies containing SNM). Environmental testing includes vibration, shock, thermal conditioning, or combinations of these environments. This would necessitate the construction and operation of a Building 334-type facility at NTS. Note that only the Engineering Test Bay part of Building 334 is being proposed. Accordingly the Building 334-like facility proposed to be constructed at NTS will be referred to as Engineered Test Bay (slightly smaller than the existing Building 334 at LLNL).

As with the ACRR, the capabilities of Building 334 must be maintained and therefore a Building 334-type facility would have to be constructed at NTS. This facility could be constructed at one of two potential sites; the DAF and the U1a Complex. If constructed at the DAF, the facility would be located in two test bays, within the existing DAF structure, thereby not disturbing any new land, benefiting from existing infrastructures, and minimizing environmental impacts. The facility could also be sited underground at the U1a Complex. Tables 5.17-7 and 5.17-8 show the construction and operation impacts for such a facility at the two potential locations.

Table 5.17-7—Building 334-Like Facility Sited at NTS DAF

Construction	Consumption/Use
Water Needed for Construction (gal)	100,000 gallons
Land	None disturbed
Total Square Footage of New Construction: Facility would be located in an existing high bay at the DAF (High Bay is approximately 1800 square feet).	0 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is a retrofit of an existing facility, no additional surface land area is disturbed by this modification to the existing facility	0 acres
Laydown Area Size (acres)	2 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	20 worker years
Peak construction employment (workers)	15 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and reinforced concrete removed to allow for mounting of shock and vibration equipment to reactive masses in floor providing base isolation.	200 cubic yards
Operation	**Consumption/Use**
Electrical usage	480 MWh/yr
Water use	2,000 gal / yr
Employment	
Total	2

Table 5.17-7—Building 334-Like Facility Sited at NTS DAF (continued)

Operation	Consumption/Use
Radiation workers	2
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Table 5.17-8—Building 334-Like Facility Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	500,000 gallons
Land	
Total Square Footage of New Construction	9600 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	2 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	87.5 worker years
Peak construction employment (workers)	20 workers
Construction period (years)	4.5 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and Rock Mined to Create Space for this facility and removed to the surface.	8000 cubic yards
Operation	**Consumption/Use**
Electrical usage	480 MWh/yr
Water use	2,000 gal / yr
Employment	
Total	2
Radiation workers	2
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Aerial Cable Facility. Located in the Coyote Test Field at SNL, the aerial cable test facility performs gravity drop and accelerated pull-down tests in support of bomb qualification tests and weapons development activities. Gravity drop tests are performed from a cable suspended between two peaks, giving up to a 600-foot vertical distance for acceleration. A rocket-assisted (320-foot sled track) pull-down technique is used to provide higher impact velocities when gravity tests are not adequate. For the Consolidation of ETF Capabilities at NTS, this facility would have to be constructed at NTS, to replace an existing, required capability which would lost with the closing of all facilities at SNL. In addition, the proposed replacement site in Nevada would allow for running the rocket sled into an existing (and currently unused) tunnel thereby greatly mitigating fire risks associated with use of the rocket sled in Aerial Cable Test activities. Table 5.17-9 shows the requirements and the impacts associated with the construction and operation of an Aerial Cable Test Facility at the 12T Tunnel complex at NTS.

Table 5.17-9—Aerial Cable Test Facility Sited at Area 12 T Tunnel Complex Surface Area

Construction	Consumption/Use
Water Needed for Construction (gal): The majority of this water consumption is for dust mitigation at the job site.	1,100,000 gallons
Land	None disturbed
Total Square Footage of New Construction	40,000 square feet
Total Land Area Disturbed by Facility Footprint (acres)	15 acres
Laydown Area Size (acres)	1 acre
Parking Lots (acres) Existing parking area is sufficient.	0 acres
Employment	
Total construction employment (worker years)	130 worker years
Peak construction employment (workers)	50 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3) waste concrete, excavated dirt, and small quantities of packaging materials	250 cubic yards
Operation	**Consumption/Use**
Electrical usage	100 MWh/year
Water use	62,720 Gal / year
Employment	
Total	6
Radiation workers	0
Emissions (tons / year)	NOX 3.55, CO 0.06, PM 10.87, VOC 1.67
Waste generation	
TRU	0
LLW	0
Hazardous	2 (yd^3)
Non-hazardous (sanitary)	0

Source: NNSA 2007.

Building 834 Complex

The Building 834 Complex, presently located at LLNL, Site 300, is comprised of four buildings totaling 4,289 square feet located of an 11.5 acre site in the Site 300 area of LLNL. The facilities located at this complex are used for thermal and humidity testing of weapons components and systems. The original layout had a total of 12 buildings, but through downsizing efforts now only 4 are used for thermal testing (1 control room, 2 test cells, and 1 temporary storage magazine). The strength of the test facilities at the Building 834 Complex is the ability to test large weapon assemblies with large quantities of HE. In addition to testing of HE, the Building 834 Complex has the authorization basis to test other hazardous materials commonly found in Legacy weapon assemblies. Relocation to NTS would only require 1 control room and 1 test cell, thereby requiring only 2,100 square feet of floor space. Table 5.17-10 shows the requirements and environmental impacts associated with the construction and operation of a Building 834 at the existing DAF, at NTS, and Table 5.17-11 shows the requirements and environmental impacts associated with the construction of a Building 834 Complex at the existing U1a Complex, at NTS.

Table 5.17-10—Building 834 Complex Sited at NTS DAF

Construction	Consumption/Use
Water Needed for Construction (gal)	1,000 gallons
Land	None disturbed
Total Square Footage of New Construction: Facility would be located in an existing high bay and adjacent hall space at the DAF (High Bay is approximately 1800 square feet with 300 sq. ft. of adjacent hall space).	2,100 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is a retrofit of an existing facility, no additional surface land area is disturbed by this modification to the existing facility	0 acres
Laydown Area Size (acres)	1 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	4 worker years
Peak construction employment (workers)	5 workers
Construction period (years)	1 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and reinforced concrete removed to allow for mounting of shock and vibration equipment to reactive masses in floor providing base isolation.	50 cubic yards
Operation	**Consumption/Use**
Electrical usage	80 MWh/yr
Water use	1,000 gal / yr
Employment	
Total	2
Radiation workers	1
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Table 5.17-11—Building 834 Complex Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	2,000 gallons
Land	
Total Square Footage of New Construction	2,100 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	1 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	4 worker years
Peak construction employment (workers)	5 workers

Table 5.17-11—Building 834 Complex Sited at NTS U1a Complex (continued)

Construction	Consumption/Use
Construction period (years)	1 year
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and Rock Mined to Create Space for this facility and removed to the surface.	100 cubic yards
Operation	**Consumption/Use**
Electrical usage	80 MWh/yr
Water use	1,000 gal / yr
Employment	
Total	2
Radiation workers	1
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Underground sled track complex. Located in TA III, at SNL, the Sled Track Facility supports weapons system qualification testing and weapons development efforts that must simulate penetration, flight, high-acceleration, and high-shock environments. This environment may be provided through impact, reverse ballistic, or ejection testing. Sled Track capabilities will remain a key requirement for the ETF Program. Under the Consolidation of ETF Capabilities at NTS Alternative, maintenance of this capability would require the construction and operation of a new Sled Track Complex. Construction of a sled track in one of the tunnel complexes at the NTS would have the added benefit of minimizing safety issues. Table 5.17-12 shows the requirements and environmental impacts associated with the construction and operation of an underground Sled Track Complex in one of the existing tunnel complexes at NTS.

Table 5.17-12—Underground Sled Track Complex–NTS

Construction	Consumption/Use
Water Needed for Construction (gal)	350,000 gal
Land	
Total Square Footage of New Construction (not including parking areas (see below)	65,400 square feet
Total Land Area Disturbed by Facility Footprint (acres)	5 acres
Laydown Area Size (acres)	1.5 - 2.5
Parking Lots (acres)	0 - 1 acres
Employment	
Total construction employment (worker years)	100 worker years
Peak construction employment (workers)	50 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd^3)	0
Nonhazardous (yd^3) waste concrete, excavated dirt, and small quantities of packaging materials	500 cubic yards
Operation	**Consumption/Use**
Electrical	2,000,000 KW-hr

Table 5.17-12—Underground Sled Track Complex–NTS (continued)

Operation	Consumption/Use
Water usage (gal)	200,000 gallons
Plant Footprint (square ft.)	110,000 square feet
Employment	
Total	20
Radiation Workers	2
Average Annual Dose	
Waste Generation	
TRU (yd3)	
Low Level (yd3)	
Hazardous (yd3)	0
Non-Hazardous (yd3)	<20 yd^3
Emissions	
NAAQS Emissions (tons/yr)	NOX 2.92, CO 1.48, PM 17.24, SOX 0.014, VOC 2.33
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	8.75

Source: NNSA 2007.

Construction of these five major facilities with a combined floor space of 119,900 square feet at NTS would be undertaken concurrently so the impacts must be viewed on an additive basis. Since two of these facilities could be constructed either above or below ground with differing construction requirements/impacts, the larger of the two requirements/impacts was used.

The combined construction water requirement would be for 2,952,000 gallons. NTS receives its water from a water system divided into four service areas with 11 groundwater wells for potable water, 2 wells for nonpotable water, approximately 30 usable storage tanks, 13 usable construction water sumps, and 6 water transmission systems. The annual maximum production capacity of site potable water is estimated to be approximately 1.36 billion gallons per year. With a current annual water usage of a maximum of 400 million gallons, there is more than sufficient water resources to support these construction projects, and furnish the 290,000 gallons/yr needed to operate them (NNSA 2008b).

The combined person-years for completion of the project would be 391.5 with a total peak employment of 195. One project would last for one year, two projects would last two years and two projects would last 4 and 4.5 years. The Las Vegas area is a rich resource for construction labor and qualified construction firms. There are ample resources in the immediate area to allow for these projects. Noise should only be an issue for workers at the four construction sites. Here the requirements of OSHA, including the training of workers, would be strictly adhered to. Dust suppression would be minimized during construction to the least amount possible.

In the past several years, NTS has been provided power under contracts with the Nevada Power Company and Western Area Power Administration. Electrical capacity at NTS is approximately 176,800 MWh per year and peak load capacity, approximately 45 MWe. In 2000, NTS electrical usage was approximately 101,000 MWh per year and peak load usage was 27 MWe (NNSA 2008b). There is more than sufficient capacity to furnish the 575,000 MWh of electricity to operate these facilities.

None of these facilities would generate measurable levels of wastes, all of which can be managed on site. NTS has an extensive waste management system, and can manage treatment and disposal of all wastes on site, except for the disposal of TRU waste. The proposed ACRR Facility is expected to generate 0.2 cubic yards of TRU waste on annual basis. This waste would be taken to the Transuranic Pad Cover Building at Area 5 of NTS. Here the waste would be stored until it could be characterized, visually examined, and packaged at the Waste Examination Facility, also in Area 5. Once this is done the waste would be packaged for shipment and disposal at WIPP, in accordance with the WIPP Waste Acceptance Criteria requirements.

The proposed sites for all four facilities are located in developed areas. Accordingly, it is not likely that archaeological, prehistoric cultural, historic, or Native American resources would be disturbed. The Consolidated Group of Tribes and Organizations has identified several sites at NTS that are important to Native American people, including storied rocks, rock shelters, wooden lodges, rock rings, springs and certain other archeological sites. None of the proposed construction sites infringe upon these areas.

The desert tortoise inhabits the southern one-third of NTS. Although these proposed sites are not in that portion of NTS, NTS would take every effort possible to assure that activities would not jeopardize the continued existence of the Mojave population of the species and that no critical habitat would be destroyed or adversely modified. There are no wetlands or aquatic resources in the vicinity of the proposed construction sites.

Geologically, NTS is a tectonically active area. This has been factored into the design process for the proposed facilities. The most recent volcanic activity in the immediate area was 3.7 million years ago and the likelihood for renewed activity in the next 10,000 years is slight. Additional information on the affected environment of NTS can be found in Chapter four of this SPEIS, in Section 4.3.

The noise from this construction would be limited to the remote areas of NTS where it would take place and as such only be an issue with associated workers. These workers would be trained in OSHA requirements and be required to work in accordance with those requirements. The noise associated with the construction would not interfere with sensitive habitats or indigenous wildlife species.

5.17.4.2 *Option 2: Consolidate ETF Capabilities at SNL*

This option would entail the closing of all ETF facilities at LLNL, LANL and constructing a new Building 334-like facility at SNL. This alternative would maintain the operation of the two NTS ETF facilities (at DAF and the U1a Complex) and allow for construction of an underground rocket sled track facility at NTS. The same facilities that would close at SNL for the Consolidation-In-Place Alternatives (see Table 5.17-1 in Section 5.17.3, above) would also close for this alternative. Table 5.17-13 lists the facilities that would close for this alternative.

Table 5.17-13—Facilities to Close for ETF Consolidation at SNL Alternative

LANL	LLNL	Sandia National Lab
K Site Environmental Test Facility	Engineered Building 834 Complex	Sandia Pulsed Reactor Facility (part of the ACRR and Sandia Pulsed Reactor)
Weapons Component Test Facility	Dynamic Testing Facility (836 Complex)	Low Dose Rate Gamma Irradiation Facility
PIXY with Sled Track	Building 334	Auxiliary Hot Cell Facility
Thermo-Conditioning Facility (5 Structures)		Centrifuge Complex
		SNL/CA Environmental Test Complex (4 structures)

Source: NNSA 2007.

The scheduled closure of SNL facilities in Table 5.17-1 would be contingent upon completion and time phasing of existing programmatic work at the sites, as previously discussed in Section 3.12.2.

Closure of the above listed LANL and LLNL facilities are the same as for the Consolidate ETF Capabilities at NTS Alternative which has already been described in Sections 5.17.4.1.1 and 5.17.4.1.2. For SNL, the facilities that would close are the same as for the Consolidation-In-Place Alternative already described in Section 5.17.3.3. A summary of the impacts incurred as a result of the closures required by the Consolidation of ETF Capabilities at SNL Alternative are shown in Table 5.17-14.

Table 5.17-14—Closure Impacts Resulting from ETF Consolidation at SNL Alternative

Facility	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak employment	Total Worker Hours	Jobs lost	Floor Space (ft^2)
LANL	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	300	20	7,174	239	95	100,475	6	89,466*
SNL	5,100	37	8,700	42	107	48,880	16	26,235

[a] Assumes D&D of SNL/Environmental Test Complex, and attributes such impacts to LLNL as this is geographic area where the impacts would be incurred.

5.17.4.2.1 Impacts on LANL from the ETF Consolidation at SNL Alternative

The ETF Consolidation at SNL Alternative impacts on LANL are the same as those discussed in Section 5.17.4.1.1, and as summarized in Table 5.17-12.

5.17.4.2.2 Impacts on LLNL from the ETF Consolidation at SNL Alternative

The ETF Consolidation at SNL Alternative impacts on LLNL are the same as those discussed in Section 5.17.4.1.2, and as summarized in Table 5.17-12.

5.17.4.2.3 Impacts on SNL from the ETF Consolidation at SNL Alternative

Under the ETF Consolidation at SNL Alternative, the SNL facilities identified in Table 5.17-11 would close. These facility impacts would be the same as discussed in Section 5.17.4.1.3 and as summarized in Table 5.17-12. Closing all ETF Facilities at both LLNL and LANL, and consolidating ETF capabilities at SNL, would require the construction of a new Building 334 and Building 834 Complex-type facilities at SNL, unless this mission were to be transferred to NTS (as previously discussed in Section 5.17.4.1.4) or to Pantex (see Section 5.17.4.3 below). Impacts associated with the construction of these two facilities at SNL would be similar to the impacts associated with constructing the same such facilities at the DAF, at NTS. The impacts associated with such construction may be found in Tables 5.17-7 and 5.17-10.

5.17.4.3 *ETF Pantex Option*

Should the Alternative to Consolidate ETF Capabilities at One Site (NTS or SNL) be selected, all ETF activities at LLNL would cease. Activities being conducted at Building 334 at LLNL, in Superblock, and at the Building 834 Complex, at LLNL Site 300, are critical to the Complex and would have to be relocated. An alternative to constructing a new Building 334-like facility and a Building 834 Complex facility at NTS would be to move the equipment and activities presently being conducted at Building 334 and Building 834 Complex to existing buildings at Pantex. The existing buildings at Pantex have bays used for similar testing activities, but not with SNM. The Pantex facilities (or the Weapons Surveillance Facility, presently being pursued as a replacement for these existing buildings) could accommodate these ETF activities with minimal refitting and no new construction. This Section assesses the environmental impacts of the option for moving the LLNL Building 334 and Building 834 Complex activities and equipment to Pantex.

Pantex conducts ETF-like work on a regular basis as a function of production certification and quality assurance. The existing facility at Pantex is a two story 3,000 square foot block and cement structure, with a concrete slab floor. Because this facility is used on an intermittent basis, it could easily share space with another program. Moving the activities and equipment from LLNL to Pantex would only require minor modifications.

The nature of the work presently being conducted in Building 334 and Building 834 Complex, at LLNL, is to test classified test objects made from SNM and to test actual weapons and weapons components, and as such needs to be located in a secure PIDAS (Perimeter Intrusion Detection and Assessment System) area similar to what is found at the LLNL Superblock, and at LLNL Site 300. Any other location for this work would need to be a Category II Nuclear Facility and have the facility infrastructure to support this hazard level of work.

Existing free workspace at Pantex would be sufficient to accommodate these additional activities, and has sufficient security, power, and water requirements. The only modifications to the Pantex facility would be the digging of a pit and the addition of a roof extension to allow for the installation of the measurement tower. This would require breaking-up the existing concrete floor, excavating a pit (12 feet by 12 feet by 14 feet deep), the addition of a roof extension (8 feet), and the pouring of concrete to line the pit. All modifications to the existing building would be done without an increase in the building footprint. The following is a list of the equipment at Building 334 which would be relocated to Pantex:

1. ***Measurement tower.*** Expanded aluminum metal tower with a minimum footprint of 25' by 25' with a minimum load limit of 6,000 pounds with a 2,500 pound point load. This tower needs to be a minimum of 15 feet above the concrete floor. This height is required to again minimize the signal received by the detectors related to the building composition.
2. ***Sealed source storage pit.*** A sub floor pit for the storage of Class 1-4 sealed sources used in measurement activities. This would also require source cells be designed using lead shielding to aid in attenuation of any signal from the sources while in their storage locations.
3. ***5-ton bridge crane.*** Due to the size and weight of many of the test assemblies, as well as the necessary fixturing, an overhead bridge crane is needed to lift and position the objects within the test facility.

The existing crane, spin test equipment, and aerial measurement tower equipment would be shipped, via commercial transport, from LLNL to Pantex. This is estimated to require 3 standard container sized truckloads.

Fugitive dust emissions and noise resulting from modifications at Pantex would be minimized due to the enclosed environment. The 22 yards of concrete and dirt to be removed to allow for the measurement tower could easily be managed on-site, at one of Pantex's existing landfills. Noise emanating from this site would be limited to the involved site workers. Involved site workers would be required to wear the appropriate personal protective equipment, including hearing protection. The construction modifications would require four workers, a backhoe, and one dump truck. The building modifications are estimated to entail a total of about 2600 worker hours and last a period of about four months. The modification to the building would involve excavation, the pouring of steel reinforced concrete, the laying of block and brick, the repairing of the roof and the adding of a new roof structure, the transport of equipment from LLNL, the installation of LLNL equipment, and the wiring for the new equipment.

Transfer of this activity to Pantex would result in the addition of two new jobs, once modifications were completed and the new equipment installed. The four construction jobs and the two full time operational jobs are insignificant compared to the total employment in the ROI and at Pantex. Once operational, these activities would not be expected to create additional waste other than normal office refuse, occasional use of solvents and cleaning fluids, and would not use additional water other than the sanitary and personal usage for the two new employees. The increased electrical demand would be minimal and the new activities would not add to the current emissions.

An accident involving an aircraft impact into a Building 334-type facility (which would be similar to an assembly cell) at either Pantex or NTS would have the greatest potential to cause environmental impacts. Such an accident has previously been postulated and analyzed for an assembly cell (DOE 1996c). Although considered to be credible but an extremely unlikely event with an estimated probability in the range of $1\text{x}10^{-7}$ to $5 \text{ x } 10^{-6}$ per year, this accident scenario is presented because it could cause sufficient damage to release SNM. The MEI and offsite impacts from the previous analysis are considered to be bounding because the material at risk for the ETF mission would be significantly less. For the noninvolved worker, the analysis estimates that a worker at 100 meters (328 ft) would not survive the aircraft crash effects. The accident consequences to the MEI are estimated to be a dose 23 rem; this corresponds to an LCF risk of 0.01 (a risk of an LCF approximately once every 72 years). The 50-mile population dose at Pantex would be approximately 2.8×10^3 person-rem; this would correspond to 1.7 LCFs. At NTS, these consequences would be significantly lower due to the greater distance to the MEI and the lower 50-mile population.

5.18 PROJECT-SPECIFIC ANALYSIS OF SANDIA NATIONAL LABORATORIES, CALIFORNIA (SNL/CA) WEAPONS SUPPORT FUNCTIONS

The SNL/CA Weapons Support mission has evolved over the past several decades into a robust weapons design and R&D activity. Conducting operations out of seven major facilities consisting of 29 buildings, this activity is a required and integral part of the Nuclear Weapons Complex. Additional information about the activities conducted by this formation is presented in Section 3.13.

There are two alternatives for the SNL/CA Weapons Support Functions: (1) the No Action Alternative to continue activities at SNL/CA; (2) an alternative to consolidate these functions with similar activities presently being conducted at SNL/NM.

5.18.1 No Action Alternative

Under the No Action Alternative, NNSA would continue to conduct the existing weapons non-nuclear component design and engineering work at the SNL/CA facilities. There would be no construction impacts associated with this alternative. However, some facilities investments would be required through the year 2030 in order to meet mission requirements, including renovation of space to meet future mission needs and building maintenance. These investments would primarily be associated with general building maintenance, wear and tear, and equipment replacements. Under the No Action Alternative, there would be no change in the workforce currently at SNL/CA. Therefore, there would be no impacts to the ROI employment, income, or labor force. Additionally, under the No Action Alternative, NNSA could also consider administrative actions at Sandia/CA that would: (1) change landlord responsibilities at the site; (2) share infrastructure with LLNL; and (3) share staff with LLNL or transfer staff to LLNL. None of these administrative actions would give rise to any significant potential environmental impacts.

5.18.2 Consolidate SNL/CA Weapons Support Functions to SNL/NM

This alternative would entail moving the weapons non-nuclear component design and engineering work at the SNL/CA facilities to SNL/NM, and transferring the positions and equipment associated with these functions to SNL/NM. Because the affected facilities are generally in good repair or are relatively new, they could be utilized by other ongoing programs, although a review of building conditions that includes the identification of any remediation and/or restoration issues would be required.

Moving some of the SNL/CA weapons support functions would impact a maximum of 500 jobs at SNL/CA. This number is not significant in relation to the total employment of LLNL of about 8,000, or the civilian labor force of 1,777,645 for the ROI. In addition, these changes could be more than offset by work separate from the weapons program. Acceptance of these activities at SNL/NM would be accommodated in existing facilities. The addition of 500 jobs is not significant enough to have measurable impacts either on the ROI, or SNL/NM. There would be no change in effluents, emissions, or wastes associated with the transfer of this mission.

5.19 TRITIUM PRODUCTION IN TENNESSEE VALLEY AUTHORITY REACTORS

DOE is responsible for providing the nation with nuclear weapons and ensuring that these weapons remain safe and reliable. Tritium, a radioactive isotope of hydrogen, is an essential component of every weapon in the U.S. nuclear weapons stockpile. Unlike other materials utilized in nuclear weapons, tritium decays relatively quickly, at a rate of 5.5 percent per year. Accordingly, the tritium in each nuclear weapon must be replenished periodically. The *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (Tritium PEIS), issued in October 1995, evaluated the alternatives for siting, construction, and operation of tritium supply and recycling facilities at five DOE sites for four different production technologies, including using a commercial light water reactor (CLWR) without specifying a reactor location (DOE 1995). In the ROD for the Tritium PEIS (60 FR 63878), issued December 12, 1995, DOE decided to pursue a dual-track approach on the two most promising tritium supply alternatives: (1) Initiate purchase of an existing CLWR (operating or partially complete) or reactor irradiation services; and (2) design, build, and test critical components of an accelerator system for tritium production.

The *Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor* (CLWR EIS) evaluated the environmental impacts associated with producing tritium at one or more of five CLWRs (DOE 1999). The CLWR EIS analyzed the potential environmental impacts associated with fabricating tritium-producing burnable absorber rods (TPBARs); transporting non-irradiated TPBARs from the fabrication facility to the reactor sites; irradiating TPBARs in the reactors; and transporting irradiated TPBARs from the reactors to the Tritium Extraction Facility at SRS in South Carolina. In a ROD dated May 6, 1999, DOE announced that the CLWR would be DOE’s primary option for tritium production and designated the Tennessee Valley Authority’s (TVA) Watts Bar and Sequoyah 1 and 2 Nuclear Plants as the Preferred Alternative for CLWR tritium production (64 FR 26369).

To produce tritium in a CLWR, TPBARs are inserted into the reactor core. The TPBARs are long, thin tubes that contain lithium-6, a material that produces tritium when it is exposed to neutrons in the reactor core. The exterior dimensions of the TPBARs are similar to the burnable absorber rods, so that they can be installed in fuel assemblies where burnable absorber rods are normally placed. Burnable absorber rods absorb excess neutrons and help control the power in a reactor to ensure an even distribution of heat and extend the reactor’s fuel cycle. In addition to producing tritium, TPBARs provide the same role as burnable absorber rods in the operation of the reactor.

The neutron absorber material in the TPBARs is enriched in the isotope lithium-6, instead of the boron usually used in the burnable absorber rods. When the TPBARs are inserted into the reactor core, neutrons are absorbed by the lithium-6 isotope, thereby initiating a nuclear process that turns it into lithium-7. The new isotope then splits to form helium 4 and tritium. The tritium is captured in a solid metal nickel-plated zirconium material in the TPBAR called a “getter.” The tritium is chemically bound in the TPBAR “getter” until the TPBAR is removed from the reactor during refueling and transported to the Tritium Extraction Facility at the Savannah River Site in South Carolina. There the tritium is extracted by heating the TPBARs in a vacuum to temperatures in excess of 1,000 degrees Centigrade (C) (1,800 degrees Fahrenheit [F]). Following extraction, the tritium is purified.

The replacement of burnable absorber rods with TPBARs has few impacts on the normal operation of the reactor. The normal power distribution within the core and reactor coolant flow and its distribution within the core remain within existing technical specification limits. Some tritium permeates through the TPBARs during normal operation, which increases the quantity of tritium in the reactor's coolant water system. Since tritium is an isotope, of the hydrogen atom, once the tritium is in the reactor's coolant water system, it could combine with oxygen to become part of a water molecule and could eventually be released to the environment.

During the Fall 2003 refueling cycle, the first 240 TPBARs were inserted in the Watts Bar core. Since that time, the reactor has completed two cycles with each having 240 TPBARs. The latest cycle has 368 TPBARs. The present tritium production cycle calls for an increase to 1,200 TPBARs by April 2011 and to continue at that level until March 2020 in the Watts Bar Reactor. There is no tritium production scheduled for the Sequoyah 1 & 2 reactors until April 2015. At this time the number of TPBARs scheduled to be inserted in a Sequoyah reactor would begin with 480 and increase to 1,000 through March 2021 (Hasty 2008). At these levels, the impacts of actual tritium production at the CLWRs would be expected to be approximately one-half those projected in the CLWR EIS.

In a tritium production mode, the Watts Bar and Sequoyah Nuclear Plants would continue to comply with all Federal, state, and local requirements. Tritium production has little or no effect on land use, visual resources, water use, air quality, archaeological and historic resources, biotic resources (including threatened and endangered species), and socioeconomics. It may have some incremental impacts in the following areas: radiation exposure (worker and public), water quality, spent fuel generation, and low-level radioactive waste generation. Tritium production affects the calculated accident and transportation risks associated with these reactors. Each of these areas is discussed below.

<u>Radiation Exposure</u> Tritium production could increase average annual worker radiation exposure by approximately 0.82 to 1.1 millirem per year. The resultant dose would be well within regulatory limits. Radiation exposure to the public from normal operations could also increase, but would still remain well within regulatory limits at each of the reactor sites. At either Watts Bar 1, Sequoyah 1, or Sequoyah 2, the total dose to the population within 50 miles could increase by a maximum of 1.9 person-rem per year. Statistically, this equates to one additional fatal cancer approximately every 1,000 years from the operation of Watts Bar 1, Sequoyah 1, or Sequoyah 2.

<u>Water Quality</u> The CLWR EIS indicated that tritium released in liquid effluent without the presence of TPBARS and tritium production would be about 639 Curies per year. It predicted that with tritium production the amount of tritium released each year would be about 0.9 Curies per year per TPBAR or 1,539 Curies with 1,000 TPBARS and 3,699 Curies with 3,400 TPBARS. During 2002, the year preceding installation of TPBARS in the Watts Bar 1 Reactor, the actual release of tritium in liquid effluent was 490 curies. Actual operating experience with 240 TPBARS in 2004 resulted in liquid effluent release of 726 Curies of tritium (NRC 2008). Based on this limited operating experience, the rate of tritium released in liquid effluent is actually slightly higher than predicted in the CLWR EIS at 0.98 Curies per year per TPBAR. Even with this somewhat higher rate of release, tritium levels in the Tennessee River

would be well below the 20,000 picocuries per liter level standard in the *Safe Drinking Water Act*.

Spent Fuel Generation Given irradiation of 3,400 TPBARs (the maximum number of TPBARs without changing the reactor's fuel cycle), additional spent fuel would be generated at Watts Bar 1, Sequoyah 1, or Sequoyah 2. In the average 18-month fuel cycle, spent fuel generation could increase from approximately 80 spent fuel assemblies up to a maximum of 140, a 71 percent increase. If fewer than approximately 2,000 TPBARs were irradiated, there would be no change in the amount of spent fuel produced by the reactors.

Low-Level Waste Generation Tritium production at Watts Bar 1, Sequoyah 1, or Sequoyah 2 may generate approximately 0.43 additional cubic meters per year of LLW. This represents a 0.1 (Sequoyah 1 or Sequoyah 2) to 1.0 (Watts Bar 1) percent increase in LLW generation over non-tritium production reactor operations.

Accident Risks Compared to normal operations, tritium production could change the potential risks associated with accidents at the nuclear plants. If a limiting design-basis accident occurred, tritium production at the 3,400 TPBAR level increases the risk of a fatal cancer for an individual living within 50 miles of the nuclear plants by from 1.4×10^{-9} to 2.1×10^{-9} at Watts Bar 1 and Sequoyah 1 or 2, respectively. Statistically, this equates to a risk to the individual of one fatal cancer from tritium production approximately every 710 million to 490 million years, respectively. For a beyond design-basis accident (an accident that has a probability of occurring approximately once in a million years or less), tritium production would result in small changes in the consequences of an accident. This is due to the fact that the potential consequences of such an accident would be dominated by radionuclides other than tritium.

Transportation Tritium production necessitates additional transportation to and from the reactor plants. Most of the additional transportation involves nonradiological materials. Impacts are limited to vehicle emissions and traffic fatalities. At each of the reactors, the nonradiological transportation risks are less than one fatality per year. Radiological materials transportation impacts include routine and accidental doses of radioactivity. The risks associated with radiological materials transportation are less than one fatality per 100,000 years.

The environmental impacts of CLWR tritium production at the Watts Bar and Sequoyah reactors are minor. However, if NNSA were to terminate the production of tritium at the Watts Bar and Sequoyah reactors some minor beneficial environmental impacts would ensue. The very small increases in radiological dose would not occur to either workers or the public. Statistically, there would be one less cancer fatality in 1,000 years in the population within 50 miles of the reactors. Water quality in the Tennessee River would improve marginally with a small decrease in tritium concentration. A very small amount of LLW associated with tritium production at the reactors would not be generated each year. The consequences of transportation associated with tritium production (i.e., potential for less than one traffic fatality per year and one LCF per 100,000 years) would not occur. Because NNSA has no plans to install over 1,200 TPBARs in any one fuel cycle at any of the reactors, there would be no change in spent fuel generation with or without tritium production.

5.20 IMPACTS OF THE PREFERRED ALTERNATIVES

NNSA's Preferred Alternative for Complex Transformation is described in Chapter 3, Section 3.17. The impacts of the separate pieces of the Preferred Alternative are addressed in detail in Sections 5.1, 5.5, 5.9, 5.12, 5.13, 5.14, 5.15, 5.16, and 5.17 of this SPEIS. This section summarizes the environmental impacts of the various areas incorporated in the Preferred Alternative. In order to reduce the bulk of the SPEIS relevant tables from the above noted sections were not reproduced in this section.

5.20.1 Restructuring SNM Facilities

NNSA would retain the three major SNM functional capabilities (plutonium, uranium, and weapon assembly/disassembly) involving Category I/II quantities of SNM at three separate sites. The preferred alternative would upgrade plutonium facilities at LANL for R&D, storage, processing, and manufacture of plutonium parts (pits) for the nuclear weapons stockpile. Production rates of up to 20 pits per year would be enabled by construction and operation of the Chemistry and Metallurgy Research Replacement – Nuclear Facility. Until completion of a new Nuclear Posture Review in 2009 or later, the net production at Los Alamos would be limited to a maximum of 20 pits per year. Other national security actinide needs and missions would be supported at TA-55 on a priority basis (e.g., emergency response, material disposition, nuclear energy). Highly-enriched uranium storage and uranium operations would continue at Y-12, including pursuit of a new Uranium Processing Facility (UPF) in order to provide a highly-enriched uranium production capability. The weapons Assembly/ Disassembly/High Explosives (A/D/HE) mission would remain at Pantex. Finally, SNM Category I/II operations at LLNL Superblock would be phased out and storage of Category I/II SNM at Pantex would be consolidated into Zone 12.

5.20.1.1 *Plutonium Manufacturing and R&D at LANL*

For plutonium manufacturing and R&D at LANL, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or consolidated within PF-4. Additionally, this alternative includes the CMRR-NF facility.[12]

The potential impacts of implementing the preferred alternative are addressed below. It should be noted that limiting production to a maximum of 20 pits per year, would be expected to result in the following changes, relative to the impacts of the 50/80 Alternative:

- Radiological air emissions would be reduced such that the 50-mile population dose would be reduced from 0.20 person-rem per year to 0.19 person-rem per year.
- Worker dose would decrease from 220 person-rem per year to 90 person-rem per year (LANL 2008). Statistically, a dose of 90 person-rem would result in a LCF risk of 0.05, which would equate to 1 LCF for every 20 years of operation.

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[12] The CMRR, which is approximately 400,000 square feet, consists of both a nuclear and non-nuclear facility. The nuclear facility is approximately one-half of the CMRR.

- LLW and TRU wastes would decrease. LLW from plutonium operations would be reduced to 68 cubic yards per year, and TRU wastes would be reduced to 42 cubic yards per year.

Impacts to land use, visual resources, site infrastructure, noise, water, geology and soils, biological and cultural resources, socioeconomics and environmental justice would not be substantially affected by imposition of a 20-pit-per-year production limitation.

Land Use

Construction activities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint, with 6.5 acres of total area disturbed during construction. The area required for operation of the preferred alternative would represent approximately 2.7 percent of the total land area at TA-55, and approximately 5.4 percent of the undeveloped land at TA-55. Although there would be a change in land use (to nuclear materials production), the preferred alternative is compatible with existing LANL land use plans.

Visual Resources

Activities related to the construction and operation of the preferred alternative would result in a change to the visual appearance at TA-55. but would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

Site Infrastructure

The projected demand on electrical resources associated with construction activities of the facilities necessary to support the preferred alternative are 4,380 MWh with a peak load of 1.0 MWe. This represents less than 1 percent of site electrical capacity. The estimated annual electrical requirements for operation of the preferred alternative are 44,000 MWh with a peak load of 10 MWe. This represents 3.8 and 7.7 percent, respectively of site electrical capacity and 7.5 and 23 percent of available site capacity. The existing electrical infrastructure would be adequate to support construction and annual operations under the preferred alternative.

Air Quality and Noise

Construction associated with the preferred alternative at LANL, would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the LANL site boundary (DOE 2003d).

Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The maximum concentrations of criteria pollutants at the LANL site boundary were modeled and are presented in Table 5.1.4-4. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For most pollutants, incremental concentration increases would generally be small (less than 5 percent). The greatest increase would occur for total suspended particulates (TSP), which could increase by approximately 28 percent. Because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. NNSA estimated routine radionuclide air emissions (see Table 5.1.4-5). As shown in Table 5.1.4-6, the expected annual radiation dose to the offsite maximally exposed individual (MEI) would be 3.0×10^{-9} mrem per year, which is much smaller than the limit of 10 millirem (mrem) per year set by both EPA (40 CFR Part 61 Subpart H) and DOE Order 5400.5 for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would be 2.5×10^{-8} person-rem per year.

Although noise levels in construction areas could be as high as 110 A-weighted decibels (dBA), these high local noise levels would not extend far beyond the boundaries of the construction site. There would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 1 mile) there would be no change in noise impacts on the public except for a small increase in traffic noise levels from construction employees and material shipments. Operational noise impacts would be similarly minor.

Construction and Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Water Resources

Environmental impacts associated with the programmatic alternatives at Los Alamos could affect groundwater resources. No impacts to surface water are expected. In 2005, LANL used approximately 359 million gallons of groundwater. Discharges were in compliance with permits.

There would be no impact to surface water availability from construction or operations. Liquid wastes generated during construction would be from sanitary wastewater and concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities. Appropriate soil erosion and sediment control measures would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. No impacts to surface water from potential construction-related spills would be expected. The location at TA-55 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated.

No impacts on surface water resources are expected as a result of preferred alternative operations at LANL. Sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. The preferred alternative would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, mopping floors in contaminated areas, and testing fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed in accordance with DOE procedures.

It is estimated that construction activities would require a total of approximately 550,000 gallons of groundwater mainly to support construction under the preferred alternative. This would increase LANL's annual water use by less than 1 percent.

Operations under the preferred alternative would use 43 million gallons of groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. Site water requirements for the operation of the preferred alternative would increase LANL's annual use by approximately 12 percent. A summary of water usage is provided in Table 5.1.5–2.

Geology and Soils

The dominant contributor to seismic risk at LANL is the Pajarito Fault System. Five small earthquakes (magnitudes of 2 or less on the Richter scale) have been recorded in the Pajarito Fault since 1991. These small events, which produced effects felt at the surface, are thought to be associated with ongoing tectonic activity within the Pajarito Fault zone (LANL 2006a).

A comprehensive update to the LANL seismic hazards analysis was completed in 2007. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes. All new facilities and building expansions at LANL would be designed to withstand the maximum expected earthquake-generated ground acceleration. Thus, site geologic conditions would not likely affect the facilities.

The land area to be disturbed by implementation of the preferred alternative is relatively small; the impact on geologic and soil resources would be minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit.

Biological Resources

Construction would take place within the TA-55 built environment. Approximately 6.5 acres of low value vegetation and habitat would be affected during construction but only about 2.5 acres would be permanently affected. Wildlife and vegetation present are characteristic of species adapted to built environments with open settings, i.e., non-forested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and consists primarily of small mammals, lizards, and birds. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, plutonium operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

There would be no direct impacts to wetlands or aquatic resources from construction or operation of the preferred alternative as there are no wetlands or perennial or seasonal aquatic habitats within the area proposed for the construction of the facility or any of the associated construction staging and laydown areas. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution to the TA-55 watershed.

No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. It is expected that both construction and operation of a preferred alternative at LANL would have minimal affect on the core and buffer area for the Mexican spotted owl as the facility would be located in an existing highly developed environment. Prior to any habitat modifying activities, NNSA would conduct site specific surveys at the appropriate time and assess, in coordination with the U.S. Fish and Wildlife Service (USFWS), the potential impacts to special interest species. If threatened or endangered species were found, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of the preferred alternative on any threatened and endangered species.

Cultural Resources

Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during preferred alternative construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate cultural resources that could potentially be impacted by the construction of the preferred alternative. In consultation with the New Mexico Site Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995) NNSA would determine the possibility for impacts to cultural resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. If previously unknown cultural resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

Only one paleontological resource has been reported within LANL, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction activities associated with the preferred alternative.

Operation

Operation of the preferred alternative would have no impact on paleontological resources.

Socioeconomic Resources

During peak construction, 190 workers would be employed at the site. In addition to the direct jobs created by construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 201 indirect jobs would be created, for a total of 391 jobs. The total annual impact to ROI income would be approximately $11 million ($5.9 million direct and $5.2 million indirect). Table 5.1.9-4 presents the impacts to socioeconomic resources from construction.

Operation under the preferred alternative would require 680 workers. In addition it is estimated that approximately 721 indirect jobs would be created, for a total of approximately 1,401 jobs. Direct income in the ROI would increase by $32.1 million annually. This would also generate about $43.2 million in indirect income in supporting industries. The total impact to the ROI income would be approximately $75.3 million.

The influx of new construction and operations workers would not likely increase the demand for housing beyond the ability of the current housing market to absorb.

The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

Environmental Justice

Section 4.1.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation related to the preferred alternative at LANL are expected. To the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, cultural and archaeological resources. As shown in Section 5.1.11, Human Health and Safety, there would be no large adverse impacts to any populations.

NNSA also analyzed the potential risk due to radiological exposure through subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. This special pathways receptors analysis is important to the environmental justice analysis because those consumption patterns reflect the traditional or cultural practices of minority populations in the area (LANL 2006a).

Health and Safety

No radiological risks would be incurred by members of the public from construction activities associated with the preferred alternative. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site where construction would occur in the immediate vicinity of PF-4. Workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

The potential risk of occupational injuries and fatalities to workers constructing the preferred alternative would be expected to be bounded by injury and fatality rates for general industrial construction. Based on a peak workforce of 190 workers, the annual Total Recordable Cases would be 18, lost workdays would be 9, and total fatalities would be less than 0.1.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the preferred alternative. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards. Implementation of worker protection programs would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

The release of radioactive materials and the potential level of radiation doses to workers and the public from operation of NNSA facilities are regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order also requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, EPA dose requirements in *National Emission Standards for Radionuclides Other than Radon from Department of Energy Facilities* (40 CFR Part 61, Subpart H) limit exposure to the offsite MEI from all air emissions to 10 mrem per year.

As shown in Table 5.1.11-2, the expected annual radiation dose to the offsite MEI from implementation of the preferred alternative would be 3×10^{-9}, which is ten orders of magnitude smaller than the limit of 10 mrem per year. The risk of a LCF to this individual from operations would be less than or equal to 1.8×10^{-12} per year, or about 1 chance in 1.8 trillion. With a collective dose of 2.5×10^{-8}, the projected number of fatal cancers to the population within 50 miles would be less than or equal to 1.5×10^{-11} per year, or about 1 chance in 15 billion.

The estimates of annual radiological doses to workers are provided in Table 5.1.11-3. As shown in the table, the annual doses to individual workers for all levels of production, including the preferred alternative would be well below the DOE limit of 5,000 mrem (10 CFR Part 835) and the DOE-recommended control level of 1,000 mrem (10 CFR Part 835). Operations under the preferred alternative would result in an average individual worker dose of approximately 380 mrem annually. The total dose to workers associated with operations would be approximately 154 person-rem. Statistically, a total dose of 154 person-rem would result in 0.09 annual LCFs to the workforce.

During normal (accident-free) operations, total facility staffing for the preferred alternative would be approximately 680. Based on this number of workers, the estimated annual injury and fatality rates for the preferred alternative are 29 total recordable cases, 15 lost workdays, and 0.02 fatalities.

No chemical-related health impacts are associated with normal (accident-free) operations of the preferred alternative. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the preferred alternative at LANL. General information regarding accidents may be found in Section 5.12 of this SPEIS. Additional details supporting the information presented here are provided in Appendix C.

The most severe accident analyzed for the preferred alternative is an explosion in a feed casting furnace. The frequency of such an event is 1.0×10^{-2} with consequences of 0.0878 LCF to the MEI and 19.4 LCF in the offsite population living within 50 miles (80 kilometers) of the accident. For this accident, the LCF risk to the MEI would be approximately 9×10^{-4}, or approximately 1 in 1,000. For the population, the LCF risk would be 0.19, meaning that an LCF would statistically occur once every 5 years in the population.

NNSA estimated the impacts of the potential release of the most hazardous chemicals under the preferred alternative. None of the chemicals released in an accident would exceed ERPG-2 limits offsite (see definition of ERPG values in the shaded box in section 5.1.12.2.2).

Transportation

Construction and operation of the preferred alternative would result in increased traffic due to commuting workers and deliveries of materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (less than one percent based on employment increases) compared to the average daily traffic levels reported in

Section 4.1.12. NNSA analyzed the potential impacts of transporting radiological materials for plutonium manufacturing and R&D at LANL. Based on a bounding 200-pit-per-year production level, both nonradiological and radiological impacts of transportation would be very low. Radiological transportation impacts are presented in Section 5.10 for all the action alternatives.

Waste Management

Construction associated with the preferred alternative at LANL, would generate about 4 cubic yards of hazardous waste, 9,750 cubic yards of non-hazardous solid waste, and 7,800 cubic yards of liquid non-hazardous waste. These wastes, when added to ongoing LANL waste generation, would not exceed the capacity of existing waste management systems and facilities.

The preferred alternative would generate about 575 cubic yards of TRU waste and 2.6 cubic yards of TRU mixed waste per year. These wastes would be packaged in accordance with the WIPP Waste Acceptance Criteria (WAC), placed in TRUPACT-II shipping containers, and shipped to WIPP. This would be done within the Solid Waste Management Facility in TA-54. The liquid portions would be solidified.

Operation of the preferred alternative would generate an estimated 1,850 cubic yards of LLW per year. This waste would be processed at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G.

About 265 tons of hazardous waste would be generated each year by operation of the preferred alternative. This amount is small in comparison to the total amount of hazardous waste generated by LANL routine operations and would be handled similarly to existing hazardous waste at LANL.

The preferred alternative is expected to generate 700 cubic yards of non-hazardous waste. This waste would be processed through the existing LANL waste management system and facilities and would not exceed existing capacities.

The preferred alternative is expected to generate approximately 16,000 cubic yards of non-hazardous liquid waste. This waste would be processed through the existing LANL waste management system and facilities and would not exceed existing capacities.

5.20.1.2 *Uranium Manufacturing and R&D at Y-12*

Under the Preferred Alternative, Y-12 would continue as the uranium center providing component and canned subassembly production, surveillance and dismantlement. In addition to completing construction of the Highly Enriched Uranium Materials Facility (HEUMF) and consolidating highly enriched uranium (HEU) storage in that facility, NNSA would pursue a UPF at Y-12.

Land Use

Construction of a UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. An estimated 8 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the UPF. The land required for UPF operations would represent approximately one percent of Y-12's total land area of approximately 800 acres. The UPF would allow the PIDAS protected area at Y-12 to be reduced from approximately 150 acres to 15 acres. Although there would be a change in land use, a UPF would be compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

Visual Resources

Currently, there is no BLM classification for Y-12; however, the level of development at Y-12 is consistent with VRM Class IV, which is used to describe a highly developed area. Most of the land surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes). Existing visual resources are discussed in Section 4.9.2.

Activities related to the construction of the UPF would result in a change to the visual appearance of the proposed location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These short-term visual impacts would not be out of character for an industrial site such as Y-12. With the UPF Y-12 would remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

Site Infrastructure

Construction of the UPF is expected to require 11,000 MWh per year of electricity with a peak load of 2.5 MWe; both representing less than one percent of present site capacity. Operation of the UPF is estimated to require 120,000 MWh per year with a peak load of 18.4 MWe, representing 2.1 percent and 4.7 percent, respectively of present site capacity. The existing electrical infrastructure at Y-12 would be adequate to support annual construction and operational requirements for the UPF.

Air Quality and Noise

Y-12 is completely within Anderson County. Tennessee. The EPA has designated Anderson County as a basic nonattainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (EPA 2005a). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS.

No radiological air emissions are expected in association with construction activities of a UPF. Construction of the UPF would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Fugitive dust generated during the clearing, grading, and other earth moving operations would also cause short-term impacts to air quality, predominantly to particulate matter in the air. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Y-12 site boundary, with the exception of $PM_{2.5}$ and PM_{10} concentrations (which could be mitigated using dust suppression), and the 8-hour ozone concentration (see Table 5.9.4-2). The 8-hour ozone concentration exceedance is not a result of Y-12-specific activities. The estimated maximum annual pollutant emissions resulting from construction in Table 5.9.4-1 and the nonradiological emissions presented in Table 5.9.4–2 would adequately bound non-radiological construction air impacts of the UPF.

UPF operations would not be expected to increase air emissions at Y-12 because it would replace existing EU operations. No significant new quantities of criteria or toxic pollutants would be generated from the new facility itself. Any releases of nitrogen and argon, which are used to maintain inert atmospheres for glovebox operations, would be less than current releases from existing EU operations. No new hazardous air emissions would result from the facility operation.

Operation of the UPF would result in some radiological airborne emissions. The current design calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from the existing EU facilities, and are likely to be less due to the incorporation of newer technology into the facility design. For purposes of this SPEIS analysis, the radiological airborne emissions and resulting impacts from the UPF would remain unchanged from the No Action Alternative, which are estimated to be 0.10 Curies of uranium, based on releases into the atmosphere in 2004 (DOE 2005a).

As shown in Table 5.9.4-6, the expected annual radiation dose to the offsite MEI from operation of the UPF would be 0.4 mrem per year, which is much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61 Subpart H) and DOE Order 5400.5 for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would be 5.8 person-rem per year. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.9.11.

Construction of the UPF would result in a temporary increase in noise levels near the area. Although noise levels in construction areas could be as high as 110 dBA, these noise levels would not extend far beyond the boundaries of the construction site. Given the distance to the site boundary (approximately 1.3 miles) there would be no major change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels.

Given the distance to the site boundary (approximately 1.3 miles) noise emissions from operation of the UPF would not likely disturb the public. Noise from traffic associated with the operation of the UPF would likely increase traffic noise levels along roads used to access the site.

Construction and operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers.

These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Water Resources

Y-12 uses approximately 2 billion gallons per year of water while the ORR uses approximately twice that amount. The ORR water supply system, which includes the city of Oak Ridge treatment facility and the East Tennessee Technology Park treatment facility, has a capacity to supply 11,715 million gallons of water per year (DOE 2005b).

At Y-12, surface water resources would likely be used to meet almost all construction and operations water requirements. As shown in Table 5.9.5-1 potential annual water requirements for construction of the UPF would be 4,000,000 gallons, which would not substantially affect the average annual water use for Y-12. The proposed UPF site is not located within either the 100-year or 500-year floodplains.

Operation of the UPF at Y-12 would require about 105,000,000 gallons of water, as shown in Table 5.9.5-2. This represents approximately 5.2 percent of current water usage. Operation of the UPF would not increase water demands at the site because EU operations would be phased out in existing facilities once the UPF becomes operational. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits.

Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of pollutants being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operation of the UPF could use minimal amounts of groundwater. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

Geology and Soils

Construction of the UPF would have no impact on geological resources, and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other non-tectonic events are unlikely to affect the UPF site. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for the UPF.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not impact the construction and operation the UPF. The foundation soils are not susceptible to liquefaction during or after seismic events. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines.

Biological Resources

The UPF would be constructed on approximately 8 acres of land within the fenced, developed portion of Y-12. About 35 acres of land would be disturbed during construction. There would be some short-term disturbance to typical urban terrestrial species due to construction, construction vehicle traffic, and associated utility and parking relocation. Because the proposed location of the UPF is largely developed and paved, terrestrial biotic impacts resulting from construction and operation would be few.

Additionally, the BMAP would ascertain any impacts from the UPF on local biota. Mitigation measures could be used to minimize the impacts to biota that might result from operation of the UPF.

There are wetlands along the East Fork Poplar Creek located to the southeast of the proposed UPF site but stormwater management measures would help protect them from any impacts. The BMAP would monitor effects in both wetlands and waterways from the construction and operation of UPF and other Y-12 activities. Mitigation measures could be used to minimize adverse impacts to wetlands and aquatic resources that might occur during construction or operation of the UPF.

Because any acreage modified from construction would be in previous developed areas and is accessible via existing roads, impacts to threatened and endangered species would not be expected. On January 19, 2007, the NNSA conducted consultations with the USFWS to discuss the potential impacts of the UPF on the Indiana bat (*Myotis sodalist*) and gray bat *(Myotis grisescens)*. As a result of that consultation, NNSA agreed to prepare a biological assessment (BA) to specifically address the potential impacts to the habitats of these bats. That BA will be prepared in 2009.

Monitoring as part of the Biological Monitoring and Abatement Program would ensure that threatened and endangered species, other special status species, and wetlands and aquatic resources are not adversely impacted by UPF operations.

Cultural Resources

Construction and operation of the UPF would take place in a previously developed or disturbed area of Y-12, outside of a proposed historic district that would be comprised of historic properties associated with the Manhattan Project, development of Y-12 as a nuclear weapon component plant, and early nuclear activities. Construction and operation of the UPF is not expected to affect any historic properties.

Socioeconiomics

Y-12 has a total site employment of about 6,500 contract and federal employees. Labor force statistics for the ROI are summarized in Table 4.9.9-1. Existing socioeconomic characteristics for the ROI are described in Section 4.9.9.

The construction of the UPF would require 900 workers during the peak year of construction and would create about 3,780 indirect jobs in the ROI. The total new jobs would represent an increase of less than 2 percent in ROI employment. Income increases would be equal to less than 1 percent of the ROI income. Direct income would increase by $23.5 million. Indirect income would be about $113.4 million per year. Overall, these changes would be temporary, lasting only the duration of the 6-year construction period, and would be similar in magnitude to the impacts experienced at Y-12 with construction of the HEUMF.

The operational workforce for the UPF is expected to be smaller than the existing EU workforce due to efficiencies associated with the new facility. NNSA estimates that the total number of EU workers should decrease by approximately 35 percent, to 600, which is a reduction of 350 workers. The consolidation of the Protected Area from 150 acres to 15 acres is also expected to reduce the security forces at Y-12 by 200 workers. Coupled together with efficiency gains in remaining plant operations, the total workforce reduction would be approximately 20-30 percent of the total Y-12 workforce. These reductions are expected to be met through normal attrition and retirements.

For construction 1,350 new residents would be expected in the ROI, including direct and indirect workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

The total workforce reduction associated with operation of the UPF should be 550 workers (including security personnel). The UPF should have a minimal impact on the ROI population or housing sector.

There would be no impact to ROI community services because increases in the ROI population during construction would be less than 1 percent. Once operational, there would be no impact to ROI community services because any jobs lost from more efficient operations in the UPF would likely be met through retirements and normal attrition.

Environmental Justice

Section 4.9.10 presents the existing environmental justice characteristics of the ROI. Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation of the UPF at Y-12 are expected; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in to following section, Health and Safety, there are no large adverse impacts to any populations.

Health and Safety

No radiological risks would be incurred by members of the public from construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. The likelihood of exposure from such contamination is considered to be low. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA.

The potential risk of occupational injuries and fatalities to workers constructing the UPF would be expected to be bounded by injury and fatality rates for general industrial construction. Based on 900 construction workers for the UPF, the Total Recordable Cases are estimated to be 85, Total Lost Workday Cases 41, and Total Fatalities 0.02. These values are shown in Table 5.9.11-1.

No chemicals have been identified that would be a risk to members of the public from construction or operation of the UFP. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards. Facility design features that minimize the worker exposures during operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

NNSA expects minimal public health impacts from the radiological consequences of UPF operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public and corresponding incremental LCFs. The calculated dose to the MEI would be 0.8 mrem per year, which would correspond to 4.8×10^{-4} LCFs per year (i.e., about 1 chance in 2000 years of operation). The collective dose to the offsite population within 50 miles (80 kilometers) would be 10.8 person-rem per year, which would correspond to 6.5×10^{-3} LCFs per year.

The estimate of annual radiological doses to workers are provided in Table 5.9.11-3. Operations in the UPF would result in a total dose to workers of approximately 12.6 person-rem, which would result in 0.008 annual LCFs to the Y-12 workforce.

The potential risk of occupational injuries and fatalities to workers would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Based on 600 workers for the UPF, the Total Recordable Cases are estimated to be 26, Total Lost Workday Cases 14, and Total Fatalities 0.02. These values are shown in Table 5.9.11-4.

Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the UPF at Y-12. Because specific design information regarding the UPF is not available, the facility accident analysis is based on existing EU facilities. The UPF Alternative would decrease the overall Y-12 facility accident risks because new facilities such as the UPF would be constructed to current building design standards Additional details supporting the information presented here are provided in Appendix C.

The accident with the highest potential radiological consequences to the offsite population (see Table 5.9.12-4) is an aircraft crash into the EU facilities. Approximately 0.4 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a maximum dose of 0.3 rem, which would result in a 2×10^{-4} chance of developing a LCF, or about 1 in 5,000. This accident has a probability of occurring approximately once every 100,000 years.

NNSA estimated the impacts of the most severe potential chemical accident, the release of 10,500 kg of nitric acid (see Table 5.9.12-6). The impacts of such a release would be within acceptable limits (i.e., ERPG-2 protective concentration limits) 0.28 km from the accident site (see definition of ERPG values in the shaded box in section 5.9.12.2.2). The concentration at the site boundary would be 0.01 ppm.

Transportation

Construction of the UPF would result in increased traffic due to commuting workers and deliveries of materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12. Operation of the UPF would result in slightly lower worker commuter traffic due to the decrease in the number of employees.

Radiological transportation for the UPF would include transport of pits from Pantex to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. The impact of incident-free transportation associated with the UPF would be 1.45×10^{-3} LCF per year. Section 5.10 presents a detailed discussion of the impacts of radiological transportation.

Waste Management

Construction and operation of the UPF at Y-12 would generate small levels of LLW, Low Level Mixed Waste, hazardous waste, and non-hazardous solid waste. No TRU or mixed TRU waste would be generated by UPF operations.

Construction of the UPF is expected to generate 2.6 cubic yards of solid LLW, 4 cubic yards of mixed LLW, 4 tons of hazardous waste, and 800 tons of non-hazardous solid waste. All of these wastes are well within the capacity of the existing Y-12 waste management systems and facilities to handle.

Table 5.9.14-4 summarizes the estimated waste generation rates for the operation of the UPF at Y-12.

Operation of the UPF would generate about 7,800 cubic yards of solid LLW, 17.4 cubic yards of liquid LLW, 70 cubic yards of solid mixed waste, 3,616 gallons of liquid mixed low level waste, 15 tons of hazardous waste, 7,500 tons of solid non-hazardous waste, and 50,000 gallons of non-hazardous wastewater. These waste volumes appear, in some cases to approximately double the current volume of wastes generated at Y-12 but it is important to bear in mind that the UPF would replace the existing EU facilities. The estimates for the UPF waste volumes would replace current EU facilities waste generation. Existing Y-12 waste management systems or facilities would be able to handle the projected waste volumes from operation of the UPF.

5.20.1.3 *Assembly/Dissassembly/High Explosives Production and Manufacturing at Pantex*

The NNSA Preferred Alternative for Assembly/Dissassembly/High Explosives Production and Manufacturing is the No Action Alternative. Under the Preferred Alternative the following major missions would continue to be performed at Pantex: nuclear weapon assembly, disassembly, maintenance, and surveillance; research and development of chemical high explosives for nuclear weapons; fabrication of high-explosive components essential to nuclear weapon function; and interim storage of plutonium components from dismantled weapons.

Land Use

Under the Preferred Alternative, current and planned activities at Pantex would continue on the 15,977 acre site, as required to support the missions described in Section 3.2.5. No additional buildings or facilities would be built beyond current and planned, but not built, and no additional impacts on land use would occur at Pantex beyond those of existing and future activities that are independent of this action. Existing land use at Pantex is discussed in Section 4.3.1. Table 5.5.1-2 presents a summary of the facilities at Pantex associated with the Preferred (No Action) Alternative.

Visual Resources

The Pantex Plant is located on the Llano Estacado portion of the Great Plains at an elevation of approximately 3,500 feet. The topography at the Pantex Plant is relatively flat and characterized by rolling grassy plains and numerous natural playa basins. The developed areas at Pantex Plant are consistent with a Visual Resource Management Class IV designation. The remainder of Pantex is consistent with a Visual Resource Management rating of Class III or IV.

Under the Preferred Alternative, current and planned activities at Pantex would continue as required to support the missions described for No Action in Section 3.2.5. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. Existing visual resources at Pantex are discussed in Section 4.5.2.

Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.5.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this action. Baseline characteristics are described in Section 4.5.3. Pantex is expected to continue using about 81,850 MWh per year of electricity, well below the available site capacity of 201,480 MWh per year.

Air Quality and Noise

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM10) (40 CFR 81.344). Pantex is in compliance with all NAAQs. Existing air quality and noise resources are discussed in Section 4.5.4.

Water Resources

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Pantex is expected to continue using about 130 million gallons of water per year, which is drawn from the Ogallala Aquifer. Existing water resources are discussed in Section 4.5.5.

Geology and Soils

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to the Pullman and Randall soil series, or other geological and soil resources, beyond current and planned activities that are independent of this action. Existing geology and soils are discussed in Section 4.5.6.

Biological Resources

At least 13 species of mammals were recorded at the Pantex Plant in 2005 during routine activities such as bird surveys, nuisance animal actions, and incidental observations. There are six playas on DOE-owned or leased land at Pantex: Playas 1, 2, and 3 are on the main Pantex Site; Playas 4 and 5 are on land leased from Texas Tech University; and Pantex Lake is on a separate parcel of DOE-owned property, approximately 2.5 miles northeast of the main portion of the Pantex Plant. There are no federally designated Wild and Scenic Rivers onsite. The Pantex Plant provides habitat for several species protected by Federal and state endangered species. The current status of threatened and endangered (T&E) species known to appear on, or in the vicinity of the Pantex Plant is shown in Table 4.5.7-1. Five special status species have been observed at the Pantex Plant.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.5.7.

Cultural Resources

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no expected impacts to the 69 identified cultural and archaeological resources beyond current and planned activities that are independent of this action. Current cultural and archaeological resources are discussed in Section 4.5.8.

Socioeconomic Resources

Under the Preferred (No Action) Alternative, Pantex would be expected to continue employing approximately 3,800 employees in order to maintain current and planned activities as required to support the missions described in Section 3.2.5. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Existing socioeconomic characteristics are discussed in Section 4.5.9.

Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.5.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Under the Preferred Alternative, none of these impacts would change.

In 2000, minority populations comprised 30.1 percent of the ROI population surrounding Pantex. In 2000, minorities comprised 30.9 percent of the population nationally and 47.6 percent of the population in Texas. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 13 percent, which is higher than the 2000 national average of 12.4 percent but lower than the statewide figure of 15.4 percent.

Based on the analysis of impacts for resource areas, there are few high and adverse impacts from operation activities at Pantex. To the extent that any impacts may be high and adverse, the impacts affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.5.11, there are no large adverse impacts to any populations.

Health and Safety

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that Pantex would emit a dose to the MEI of 4.28×10^{-9} mrem per year. This is significantly below the EPA maximum permissible exposure limit to the public. Existing health and safety at Pantex is discussed in Section 4.5.11

Facility Accidents

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in Section 5.5.12.4.

Accidents associated with the A/D/HE Center, which are included under the No Action Alternative, are presented in Tables 5.5.12-7 through 5.5.12-9.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.876 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 3.6 rem. Statistically, this MEI would have a 0.002 chance of developing a LCF (i.e., about 1 chance in 460 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.5.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be $2\text{x}10^{-7}$, or approximately 1 in 5 million. For the population, the LCF risk would be approximately $9\text{x}10^{-5}$, or approximately 1 in 10,000.

For chemical accidents, NNSA estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.5.12–9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Transportation

Under the Preferred (No Action) Alternative, there would be no change in the transportation activities at Pantex, and impacts would remain unchanged from the baseline presented in Section 4.5.12.

Waste Management

The types of wastes generated at Pantex Plant include hazardous wastes, regulated under RCRA, universal waste, non-hazardous wastes, wastes regulated under TSCA, LLW, MLLW, and sanitary waste.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to waste management resources beyond current and planned activities. Table 5.5.14-1 presents annual waste generation volumes from Pantex Operations.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Pantex does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective, exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities. DOE/NNSA also routinely ship LLW to off-site commercial LLW disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted where necessary to address changes in the options available to DOE/NNSA for disposition of these wastes.

5.20.1.3 Consolidation of Category I/II SNM

This section analyzes the environmental impacts of consolidating Category I/II SNM as described in Section 3.7. The analysis focuses on the resources that are most likely to be affected. For removal of Category I/II SNM from LLNL, the analysis focuses on the: (1) transportation impacts of moving the Category I/II SNM from LLNL to SRS, LANL, and

WIPP; and (2) reductions in emissions, exposures, and wastes from the phase out of Category I/II SNM operations at Superblock, and socioeconomic impacts. For Category I/II SNM consolidation actions at Pantex, the analysis focuses on the potential construction impacts in Zone 12, the handling operations associated with the transfer of the Category I/II SNM on-site, and the decontamination and decommissioning impacts for vacated facilities in Zone 4.

Remove Category I/II SNM from LLNL

Transferring the LLNL Category I/II SNM includes Category I/II SNM operations at Superblock. This SPEIS describes the impacts from this phase-out in Section 5.12.2. As described in Section 3.7.1, all Category I/II SNM inventories at LLNL that are not waste would be transferred to LANL (or NTS for interim storage) and SRS as programmatic and surplus material respectively.

Table 5.12-1 provides a summary of the impacts of the 19 radioactive material shipments. The total dose to workers for shipments of all Category I/II materials would be 3.5 person-rem, resulting in 0.002 LCF. The incident-free dose to the public from these shipments would be 1.15 person-rem, resulting in a potential increase of 6.8×10^{-4} LCFs. The total exposure due to potential accidents is estimated to be 1.13×10^{-7} person-rem, resulting in less than 1×10^{-10} LCFs to the general population.

Table 5.12-2 provides a summary of the impacts of transporting the LLNL Category I/II SNM to NTS for interim storage at the DAF followed by transportation to LANL**.** The total dose to workers for shipments of all Category I/II materials would be approximately 1.1 person-rem, resulting in approximately 6.6×10^{-4} LCFs. The incident-free dose to the public from these shipments would be less than 2.5 person-rem, resulting in a potential increase of 1.3×10^{-3} LCFs.

Because there are no emissions of radionuclides from Superblock, phasing out Category I/II SNM would have no effect on population doses to the surrounding population.

The packaging and handling of LLNL’s materials would generate less than 90 pounds of TRU waste, representing less than one routine shipment to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The impacts of this shipment would be less than 1/8 – 1/10 of the impacts presented in Table 5.12-1 for LANL and SRS, respectively.

Phasing out the Category I/II SNM operations from the Superblock would reduce the material-at-risk (MAR) for plutonium in the Superblock, which would reduce the source term associated with potential accidents, thereby reducing potential accident impacts. Table 5.12-3 lists consequences of the bounding accident if the MAR in Superblock were reduced by approximately 60 percent. The dose to the public from such an accident would be reduced from 2,170 person-rem per year to 868 person-rem per year, with a corresponding reduction in LCFs from 1.30 to 0.52.

Initially, employment at the Superblock would be expected to increase because of the D&D work. After the D&D work is completed, it is expected that there would be some decrease in personnel at LLNL because the Category I/II SNM component of LLNL's plutonium mission would be located at LANL. However, personnel required to conduct R&D activities involving Category III quantities of SNM and maintaining the Superblock in a safe operating mode would be expected to be the same. It is expected that there would be some decrease in security personnel, but the decrease is unclear at this time.

After phase-out of Category I/II SNM the Superblock facilities would continue to operate with Category III quantities of SNM. During Complex Transformation the Superblock facilities would continue to perform machining, foundry operations, analytical chemistry, and materials characterization on SNM originating from LANL facilities. These activities involving Category III quantities of SNM are well within the bounds of impacts analyzed for Superblock facilities in LLNL SWEIS (DOE 2005a).

Transfer Category I/II SNM from Pantex Zone 4 to Zone 12

Consolidation of SNM at Pantex would entail the construction of a new storage facility in Zone 12, moving up to 60 metric tons of pits from Zone 4 to Zone 12, and the demolition of the old storage facilities in Zone 4 (see Figure 5.12-1 in Section 5.12.3).

Zone 12 is a highly developed area of Pantex which contains gravel gerties atop the assembly/disassembly bays and cells. The new storage facility would neither affect Pantex land use plans nor change the visual character of this area. In addition, cultural and biological resources (including threatened and endangered species) would not be affected by construction or operation of the proposed storage facility.

Construction or post-construction landscaping has the potential to disturb areas of soil contamination in Zone 12. Where possible, these soils would be avoided. If disturbance of contaminated soils were necessary, the soil would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately.

Construction of a new underground SNM storage facility in Zone 12 is not expected to have an appreciable negative impact on water resources at or near the Pantex Plant. The estimated construction water requirement would be 2,950,000 gallons over the five year construction period.

All storm water runoff would be managed in accordance with best management practices for soil erosion and sediment control, and in accordance with applicable permit requirements.

The proposed storage facility would replace an existing facility so it is not expected that there would be any increase in the present water use of the existing storage facility. As a result, wastewater generation volumes and water use should continue to be bounded by the levels forecast in the Pantex SWEIS.

Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. Noise from the construction would be audible primarily to the involved workers. Involved site workers would be required to wear appropriate personal protective equipment (PPE), including hearing protection.

The construction jobs would be filled by existing workers in the region. Therefore, there would be no effect on area population or increase in the demand for housing or public services in the Pantex ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in the immediate area.

If the peak construction period lasts for the entire five year construction period, no deaths (0.005) would be expected for the estimated 120 construction workers from construction or demolition-related activities.

Moving SNM material from Zone 4 to Zone 12, within the Pantex site would have an estimated total dose to involved workers of 1,100 person-rem, which would statistically translate into approximately 0.657 LCFs. Because the actual transportation of the SNM would be within Pantex, no doses to the public are anticipated.

The SNM would be managed in the new facility similar to the current method, albeit underground. The number of workers associated with storage operations would not change, although there would be a reduction in security force requirements. Table 5.12-5 displays the operational requirements associated with the new storage facility.

Table 5.12-6 displays the relevant information associated with the D&D of the Zone 4 facilities. Approximately 700 cubic yards of LLW would be generated over the 2-year D&D period. This LLW would be shipped to NTS for disposal. The annual LLW from this D&D would represent a short-term increase of approximately 350 percent compared to the 96.8 cubic yards of LLW generated by Pantex in 2005.

5.20.2 Restructuring R&D and Testing Facilities

In pursuit of a more responsive and cost-effective Complex, NNSA is considering a restructuring of the R&D and testing facilities within the Complex. For the proposed action to restructure R&D and test facilities, the alternatives focus on near-term actions to consolidate, relocate, or eliminate facilities and programs and improve operating efficiencies. The following functional R&D capabilities and capacities are evaluated:

- High Explosives R&D
- Tritium R&D
- NNSA Flight Test Operations
- Major Hydrodynamic Testing
- Major Environmental Testing

5.20.2.1 *High Explosives R&D*

Under the Preferred Alternative, NNSA would consolidate weapons HE R&D and testing at the following locations by 2010:

- Pantex would remain the HE production (formulation, processing, and testing) and machining center. All HE production and machining to support nuclear explosive package (NEP) development is performed at Pantex. HE experiments up to 22 kg HE could remain at Pantex;
- NTS would remain the testing center for large quantities of HE (greater than 10 kg);
- LLNL would be the HE R&D center for formulation, processing, and testing (processing capability to handle up to 15 kg and testing less than 10 kg) HE at the High Explosives Applications Facility (HEAF); formulation and processing of HE would be conducted either at a new HEAF Annex to be built adjacent to HEAF, or at existing Site 300 facilities;
- SNL/NM would remain the HE R&D center for non-nuclear explosive package components (less than 1 kg of HE) at the Explosive Components Facility (ECF); and
- LANL would produce war reserve main charge detonators, conduct HE R&D experimentation and support activates, and move towards contained HE R&D experimentation as defined by program plans.

Maintain one weapon program open-burn and one weapons program open detonation area at each site for safety and treatment purposes.

The Preferred Alternative for HE R&D incorporates the No Action Alternative for Pantex with a 22 kg limitation on the amount of HE that may be used in explosive testing. For LANL, production of HE detonators and conducting contained HE R&D (up to 10 kg) is considered as part of the No Action Alternative. Other aspects of the Preferred Alternative are with Alternative 2c, “Move open-air experiments using 1-15 kg HE from LANL and SNL/NM to LLNL HEAF and experiments using 10 kg-100 kg HE to LANL or NTS.”

Impacts of the Preferred Alternative for HE R&D at Pantex would not change from current conditions.

At SNL/NM, this alternative would not eliminate HE R&D experiments and testing using less than 1 kg of HE that are conducted at the ECF, nor would it decrease the laboratory space currently required to do this work. HE R&D that is conducted at SNL/NM under the Work for Others Program would not be affected.

At NTS, receiving the 15-100 kg shots could be accepted without additional environmental impacts. NTS would need to hire up to 5 individuals to meet these demands. However, none of these impacts would be consequential.

All activities under this alternative would be conducted within the parameters of the sites’ *Clean Air Act* permits and other applicable environmental requirements. Because these kinds of activities are already being conducted at these sites and no new construction would be required to accommodate the work, the environmental impacts would be less than or only minimally greater than they are currently.

5.20.2.2 *Tritium R&D*

This section analyzes the environmental impacts of consolidating tritium R&D at SRS, as described in Section 3.9. The analysis focuses on the resources that are most likely to be affected: emissions and exposures, which affect human health, socioeconomic impacts, and wastes.

Under this alternative, tritium R&D currently conducted at LLNL, (except for that associated with NIF targets) and LANL would be phased out and consolidated at SRS into existing facilities. Neutron generator target loading at SNL/NM would continue and not be included under this consolidation.

Potential Impacts of Consolidating Tritium R&D at SRS

Tritium emissions at SRS would increase by approximately 1,000 Curies per year, which would represent an increase of approximately 2.4 percent over current tritium emissions. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. In 2005, the collective 50-mile population dose was estimated at 2.5 person-rem. Increasing the tritium emissions by 2.4 percent would increase these doses to 0.0508 mrem per year to the MEI and to 2.541 person-rem per year to the collective population. These doses would be equivalent to 3.1×10^{-5} and 1.5×10^{-3} LCF per year, respectively.

The average exposure to a worker from tritium R&D would be approximately 4.3 mrem, resulting in a total worker dose 0.11 person-rem. The likelihood of a LCF to workers would be 6.6×10^{-5}.

At SRS, receiving the tritium R&D operations from LANL could produce additional consequences due to accidents that release tritium. For the 50-mile population surrounding SRS, the highest population dose from an accident would be expected to be less than 380 person-rem, which translates to an LCF risk of 0.22 (statistically, this means no LCFs are expected to result if the bounding accident were to occur).

Because no significant offsite health risks are associated with the tritium R&D operations, no environmental justice impacts are expected.

The addition of 25 new workers at SRS would increase the site workforce by much less than 1 percent and would not be noticeable in the ROI.

Consolidating tritium R&D at SRS would cause waste generation to increase slightly. Mixed waste would increase by 28 gallons, high activity waste by 330 gallons, compactable waste by 2.4 cubic meters, non-Compactable, less than 20 million Ci per cubic meter by 5 cubic meters, and mop water (low level liquid waste) by 3000 gallons. These wastes would represent less than 1 percent of current wastes generated at SRS and would be inconsequential.

Potential Impacts of Phasing Out Tritium R&D at LANL

Phasing out tritium R&D operations from the WETF at LANL would reduce tritium emissions, wastes, and exposure to personnel as shown in Table 5.14-1.

Tritium emissions at LANL would decrease by approximately 1,000 Curies, or 42 percent per year**.** Decreasing the tritium emissions at LANL by 42 percent would decrease the MEI dose to 0.0021 mrem per year with a likelihood of a LCF of 1.2×10^{-6} and the 50-mile population dose would decrease dose to 0.052 person-rem per year with a likelihood of a LCF of 3.1×10^{-5}.

Approximately 25 workers at LANL would be reassigned to new jobs. Assuming these workers would no longer receive a 4.3 mrem dose, total worker dose would decrease by 0.11 person-rem. The likelihood of a LCF to workers would decrease by 6.6 × 10-5.

Because the tritium R&D workers would be reassigned to other jobs at LANL, no socioeconomic impacts would result.

Wastes at LANL would decrease by approximately the same amount as they would increase at SRS.

Potential Impacts of Phasing Out Tritium R&D at LLNL

Current LLNL tritium R&D (primarily to support gas transfer system development) is very small and is only included here for completeness. Transferring the LLNL tritium R&D (not NIF tritium work) to SRS would basically amount to one glove box system, which could be accommodated in the SRS facilities without any significant changes.

5.20.2.3 *NNSA Flight Test Operations*

NNSA's Preferred Alternative for flight test operations would be to conduct the JTA tests at TTR on a campaign basis, bringing in employees from other NNSA sites to conduct tests. Under this alternative, NNSA would implement a "reduced footprint" option. About one-half of current staff would remain at TTR and be supplemented in a campaign mode by up to 20 personnel from other NNSA sites, such as SNL/NM, SNL/CA, and NTS. The area of TTR that would be included in the land use permit from the U.S. Air Force would be reduced from 280 square miles to potentially less than one square mile. Some mission-related equipment would be upgraded under this alternative. Security and site infrastructure maintenance responsibilities would be returned to the Air Force.

Conducting flight test operations at TTR in a campaign mode within a reduced permit area would result in essentially the same impacts as the No Action Alternative, except in the area of socioeconomic impacts. Operating in a campaign mode would result in the loss of approximately 70 jobs, but would create 20 jobs for security guards as the AF would take over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. This net loss of 50 jobs would have a noticeable impact on the community of Tonopah, Nevada. All aspects of the Tonopah economy would be affected. The loss of relatively high paying jobs would reduce the overall economic base of the community. Home ownership would be reduced by families relocating to find employment. The local public school system would be affected through reduction in the number of students, likely loss of some teachers (spouses of impacted employees), and the support provided by parent and other volunteers in the schools.

5.20.2.4 *Hydrodynamic Testing*

NNSA's Preferred Alternative for Hydrodynamic Testing includes elements of the Downsize in Place Alternative, Consolidation at LANL Alternative, and Consolidation at NTS Alternative. Under the Preferred Alternative:

Contained hydrodynamic testing (consisting of Integrated Weapons Experiments and Focused Experiments) would be the standard practice for LLNL at the Contained Firing Facility (CFF) and LANL at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility by the end of fiscal year 2008. In addition:

- Hydrotesting at CFF would be consolidated to a minimal footprint by 2015.
- Open-air hydrotests at LANL DARHT would be allowed if needed for national security requirements.
- Firing site operations for Defense Programs Focused Experiments required by the national hydrodynamic test program would be transitioned to contained firing at LANL as defined by program plans and allow open-air firing at LANL TA-36 until adequate radiographic capabilities and associated supporting infrastructure, are available for open-air firing at NTS.
- As the LANL DARHT facility approaches end of life in approximately 2025, plan for the next generation facility at the NTS to be available prior to DARHT closure, so long as the mission analysis and business case support this option.

The impacts of these elements of the Preferred Alternative are addressed in detail in Section 5.16 of this SPEIS and are summarized in this section.

Under the Preferred Alternative, the outdoor burn areas at Pantex and SNL/NM would not be closed. These facilities are used for other activities and would continue to be used for those activities. In addition, the smaller outdoor facilities at NTS would not close and the consolidation of hydrotesting at NTS is considered to be a next generation facility and would not occur until after 2025.

At LLNL, the Preferred Alternative would entail closing the Building 812 Complex and the Building 850 Complex. The Building 851 Complex would either be closed or turned over to other non-NNSA programs. The associated support facilities would probably not be impacted by this alternative as they are smaller, multi-purpose facilities which could be of use to other program activities.

Under this alternative LANL would close all hydrotesting facilities except for the DARHT and a few of the other smaller firing sites at LANL, which support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments.

There would be few changes at NTS. No facilities would be closed and high explosive experiments are currently conducted at BEEF and the U1a Complex. The number of experiments may increase but would remain within the limits previously analyzed in detail in the NTS Site-wide EIS (DOE 1996b). In addition, BEEF operates in accordance with the provisions of an Air Quality Operating Permit from the Nevada Bureau of Air Pollution Control.

Closure of facilities at LANL and LLNL would entail clean-up and D&D effort. Although not heavily contaminated, these facilities all have a substantial amount of reinforced concrete and steel structures designed to withstand sizeable HE explosions. There would be a total job loss of 31 (26 at LLNL and 5 at LANL). It is estimated that at least 10,000 gross square feet of hardened concrete and steel structures and soil immediately surrounding these structures would have to be dismantled, razed, dug up, undergo D&D, and disposed of. Table 5.16-1 presents the cumulative impacts of the Downsize-In-Place Alternative.

5.20.2.5 *Major Environmental Test Facilities*

Under the Preferred Alternative, NNSA would implement the Consolidate ETF Capabilities at One Site Alternative using SNL/NM as the preferred site. Section 5.17.4.2 contains a detailed analysis of the impacts of consolidating ETF capabilities at SNL/NM. A summary of the impacts incurred as a result of the closures required by the Consolidation of ETF Capabilities at SNL Option are shown in Table 5.20-1.

ETF functions currently performed in Building 334 at LLNL and at Building 834 Complex at LLNL Site 300 would be moved to an existing building at Pantex. This would require removal of equipment from Building 334 and for Building 834 Complex and the installation at Pantex of a measurement tower, a sealed source storage pit, and a 5-ton bridge crane. This installation would require only modification to the existing building at Pantex and no new construction. The impacts of this action would be inconsequential.

Table 5.20-1—Closure Impacts Resulting from ETF Consolidation at SNL

Facility	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	300	20	7,174	23	95	100,475	6	89,466*
SNL	5,100	37	8,700	42	107	48,880	16	26,235

[a] Assumes D&D of the SNL/Environmental Test Complex and attributes impacts to LLNL as this is physically where the impacts would be incurred.

Consolidation at SNL/NM would maintain the operation of the two NTS ETF facilities (at DAF and the U1a Complex) and allow for construction of an underground rocket sled track facility at NTS.

If an underground sled track complex were constructed and operated at the NTS, it would be sited in an existing tunnel complex and would have little direct impact on the environment. Existing site infrastructure is adequate to provide the required water and electrical capacities for both construction and operations. The number of employees required for construction would be less than about two percent of the existing workforce and the number of operational workers would be less than one percent. There would be no radiological air emissions and criteria and hazardous air pollutant emissions would not cause an exceedance of the limits in the NTS Air Quality Operating Permit. The amount of wastes generated by the facility would be inconsequential and easily managed by the ongoing NTS Waste Management Program. NNSA would ensure that sensitive animal species that may use the tunnel (i.e., bats) would not be harmed. Because of their association with the Cold War and nuclear weapon testing, some of the tunnels at the NTS may be considered historic properties. As part of planning for the sled track complex, NNSA would consult with the Nevada SHPO and complete all consultation requirements under Section 106 of the *National Historic Preservation Act*.

Chapter 6
CUMULATIVE IMPACTS

Chapter 6
CUMULATIVE IMPACTS

This chapter considers past, present, and reasonably foreseeable actions that could, along with the Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) alternatives, result in cumulative impacts to the environment. It considers other ongoing operations at the potentially-affected sites, reasonably foreseeable future actions at the sites, and reasonably foreseeable actions that are ongoing or planned within the Region of Influence of each site.

6.1 METHODOLOGY AND ANALYTICAL BASELINE

The Council on Environmental Quality (CEQ) regulations that implement the procedural provisions of the *National Environmental Policy Act* (NEPA) define cumulative impact as the "impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Part 1500-1508). Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity is taking the actions. The cumulative impact analysis in this chapter is based on continued operations at the potentially affected sites, reasonably foreseeable future actions at the sites, and reasonably foreseeable actions that are ongoing or planned within the Region of Influence of each site.

A cumulative impact analysis is only conducted for those resource areas with the greatest potential for cumulative impacts. Based on an analysis of the impacts presented in Chapter 5 of this SPEIS, these resource areas were considered to be land use, infrastructure (electricity availability), water use, transportation, socioeconomics, waste management, accidents, and health and safety. The analysis has been conducted in accordance with CEQ NEPA regulations and the CEQ handbook, Considering Cumulative Effects Under the *National Environmental Policy Act* (CEQ 1997a), on the preparation of cumulative impact assessments.

Cumulative impact assessment is based on both geographic (spatial) and time (temporal) considerations. Historical impacts at the potentially affected sites are captured in the existing No Action Alternative. Future impacts will be analyzed for the same timeframe as the alternatives analyzed in the Complex Transformation SPEIS—with any construction occurring in the future, and operations for approximately 40 years. Geographic boundaries vary by resource, depending on the time an effect remains in the environment, the extent to which the effect can migrate, and the magnitude of the potential impact.

6.2 POTENTIALLY CUMULATIVE ACTIONS

In addition to alternatives evaluated in this SPEIS, actions that may contribute to cumulative impacts include on- and off-site projects conducted by Federal, state, and local governments, private sector, or individuals that are within the ROIs of the actions considered in this SPEIS. Information on present and future actions was obtained from a review of site-specific actions and

NEPA documents to determine if current or proposed projects could affect the cumulative impact analysis at the potentially affected sites. For those actions that are speculative, not yet well defined, or are expected to have a negligible contribution to cumulative impacts, the actions are described but not included in the cumulative effects. The potentially cumulative actions discussed below are the major DOE projects that may contribute to cumulative impacts on or in the vicinity of the potentially affected sites.

6.2.1 Global Nuclear Energy Partnership (GNEP)

DOE is preparing a Programmatic Environmental Impact Statement (PEIS) for GNEP (DOE/EIS-0396). The GNEP PEIS is a programmatic document with no site-specific actions that could affect the site alternatives in this Complex Transformation SPEIS. The GNEP PEIS evaluates six domestic programmatic alternatives, which represent different nuclear fuel cycles. DOE could decide to support the demonstration and deployment of any of these alternatives or combinations thereof:

- Current uranium-based light water reactor fuel cycle activities described under the No Action Alternative
- Advanced spent nuclear fuel (SNF) separations and fast reactor transmutation technologies
- SNF separation with potential for both thermal and fast reactor transmutation
- Recycle of SNF through a dry thermal/mechanical separation process in which spent LWR fuel is used in a heavy water reactor (HWR)
- Thorium open fuel cycle
- Uranium-based once-through high temperature gas-cooled reactor or HWR fuel cycles.

The GNEP Program has been proposed in addition to the Yucca Mountain Repository mandated by the Nuclear Waste Policy Act, and does not change the planning for the Yucca Mountain Repository. Any decisions pursuant to the GNEP PEIS would not diminish in any way the need for the nuclear waste disposal program at one or more permanent geologic repositories, and under all alternatives spent nuclear fuel (SNF) and/or high-level waste would continue to be produced and require transportation to a disposal site. As such, only the impacts associated with radiological transportation are included in this cumulative impact assessment (see Section 6.3.2.3).

6.2.2 Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems

DOE is preparing the *Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems EIS* (hereafter, the "Pu-238 Consolidation EIS") to assess alternatives to consolidate radioisotope power systems (RPS) operations, which involve plutonium 238 (Pu-238) (DOE 2005e). RPSs provide electrical power to space and other systems through the conversion of heat (thermal energy) generated by the decay of plutonium-238 to electricity. For the past 4 decades, DOE has supplied RPSs, including plutonium-238 fueled radioisotope thermoelectric generators (RTGs) and plutonium-238-fueled light-weight radioisotope heater units (RHUs), as the source of electric power and heat for National

Aeronautics and Space Administration (NASA) and national security missions. The nuclear infrastructure required to produce an RPS comprises three major components: (1) the production of plutonium-238; (2) the extraction, purification, and encapsulation of plutonium-238 into a usable fuel form; and (3) the assembly, testing, and delivery of RPSs to Federal users. Currently, DOE RPS production operations exist, are planned, or proposed to exist, at three separate sites: Oak Ridge National Laboratory (ORNL), Tennessee; LANL, New Mexico; and Idaho National Laboratory (INL).

The Pu-238 Consolidation EIS evaluates the environmental impacts of two action alternatives (Consolidation) and a No Action Alternative. Under the No Action Alternative, Pu-238 would be produced in accordance with previous decisions, which, for purposes of the Complex Transformation SPEIS cumulative impact analysis, would mean that Pu-238 operations would continue at both LANL and ORNL. Under the Consolidation Alternatives, RPS nuclear operations currently assigned to facilities at ORNL and LANL would be consolidated at INL. As such, the actions in the Pu-238 Consolidation EIS could contribute to cumulative impacts at both LANL and Y-12.

6.2.3 Yucca Mountain Repository

DOE recently completed the following NEPA documents, related to Yucca Mountain:

1. *Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (Yucca Mountain SEIS) (DOE 2008a); and,

2. *Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada—Nevada Rail Transportation Corridor* (Nevada Rail Corridor SEIS) and *Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada*; (Rail Alignment EIS) (DOE 2008b).

These documents address the transportation and disposal of SNF and DOE high level wastes (HLW). The Yucca Mountain SEIS updates the analysis of the environmental effects associated with the proposed action to construct, operate, and monitor, and eventually to close, a geologic repository for the disposal of 70,000 metric ton of heavy metal (MTHM) of spent nuclear fuel (SNF) and HLW at Yucca Mountain. DOE would begin construction of the Yucca Mountain repository on receipt of the construction authorization from the NRC, with initial operations beginning no sooner than 2017. The Rail Alignment EIS assesses the construction and operation of a rail line to connect the repository site at Yucca Mountain to a new or existing rail line in the State of Nevada for the shipment of SNF and HLW, in the event that the Nuclear Regulatory Commission (NRC) authorizes construction of the repository and receipt and possession of these materials at Yucca Mountain. Actions associated with Yucca Mountain have the potential to cause cumulative impacts related to the transformation of the nuclear weapons complex (Complex) both locally at the Nevada Test Site (NTS) and nationally due to the transportation of nuclear materials.

6.2.4 Plutonium Disposition

The end of the Cold War created a legacy of surplus weapons-usable fissile materials in both the United States (U.S.) and Russia. The U.S. and Russia have been working together to reduce the threat of nuclear weapons proliferation worldwide by implementing programs for dispositioning surplus plutonium in a safe, secure, environmentally acceptable, and timely manner. Russia and the U.S. have issued numerous statements and agreements to this effect since the mid-1990s. The most recent agreement, signed in September 2000, provides that the U.S. and Russia will each dispose of 34 tons of ‘‘weapons-grade’’ plutonium, and allows for disposition either by immobilization, or by mixed-oxide (MOX) fuel fabrication and subsequent irradiation.

In November 1999, DOE published the *Surplus Plutonium Disposition Environmental Impact Statement* (DOE 1999b) (SPD EIS), which evaluated site-specific alternatives for the construction and operation of three facilities for disposition of up to 50 tons of surplus weapons-usable plutonium, a Pit Disassembly and Conversion Facility, a plutonium immobilization facility, and MOX Fuel Fabrication Facility. In the initial ROD for the Storage and Disposition PEIS (62 FR 3014), DOE determined to pursue a hybrid disposition approach that would have allowed for immobilization of surplus plutonium for eventual disposal in a geologic and use of MOX fuel in existing, domestic, commercial reactors. DOE also decided to transport pits from the Rocky Flats Environmental Technology Site (RFETS) to Pantex and non-pit plutonium materials to SRS, contingent on DOE selecting SRS as the site for the immobilization facility in a subsequent ROD. DOE further decided to upgrade storage facilities in Zone 12 at Pantex to store surplus pits already stored at Pantex plus surplus pits from RFETS.

DOE subsequently issued an amended ROD for the Storage and Disposition PEIS (63 FR 43386) announcing DOE’s decision to accelerate shipment of all non-pit surplus plutonium from RFETS to SRS beginning in 2000, provided, again, that SRS was selected as the immobilization site. To accommodate this, DOE decided to undertake modifications to Building 105–K at SRS (also known as the K-Area Materials Storage [KAMS] facility).

In the ROD for the SPD EIS (65 FR 1608), DOE decided to implement the hybrid approach for the disposition of up to 50 tons of surplus plutonium (by fabricating up to 33 tons into MOX fuel and immobilizing approximately 17 tons). SRS was selected as the location for all three disposition facilities: Pit Disassembly and Conversion Facility, a plutonium immobilization facility, and the MOX Fuel Fabrication Facility. In an April 15, 2002, ROD (67 FR 19432), NNSA amended its earlier ROD for the SPD EIS by deciding to (1) Cancel the immobilization portion of the disposition strategy; (2) Select the alternative of consolidated long-term storage at SRS of non-pit surplus plutonium; (3) Utilize the KAMS facility for consolidated long-term storage of surplus plutonium; and (4) Continue storage of surplus pits in Zone 4 at Pantex in lieu of storage in Zone 12.

In September 2007, DOE prepared *Plan for Alternative Disposition of Defense Plutonium and Defense Plutonium Materials that were Destined for the Cancelled Plutonium Immobilization Plant* (Plan). The Plan was prepared in accordance with section 3155 of the National Defense Authorization Act for Fiscal Year 2002 (Public Law 107-107) and addresses alternatives for disposition of up to 13 metric tons of defense plutonium materials that had been planned for disposition in the cancelled Plutonium Immobilization Plant. The surplus plutonium addressed in the Plan is in addition to the 34 tons of surplus plutonium that would be converted to MOX fuel under an April 15, 2002, ROD (67 FR 19432). Some portion of that 13 metric tons is suitable for processing into MOX fuel and some is not. DOE's preferred option in the Plan is to consolidate the surplus plutonium currently stored at the Hanford site, LLNL, and LANL to SRS and, along with surplus plutonium already stored at SRS, disposition the material utilizing up to three facilities: a proposed, small-scale plutonium vitrification process; the existing H-Canyon facility; and the planned MOX Fuel Fabrication Facility. NNSA is evaluating this preferred option in the Plan, along with alternative disposition paths for the 13 metric tons of surplus plutonium, in a supplement to SPD EIS (see Section 1.5.2.2).

The actions associated with plutonium disposition could produce local cumulative impacts at SRS, where the MOX fuel fabrication activities would occur, and nationally due to the transportation of plutonium from Pantex, where the bulk of U.S. surplus plutonium is stored, to SRS. A MOX Fuel Fabrication Facility is currently under construction at SRS (scheduled to commence operation in 2017) and a Pit Disassembly and Conversion Facility is scheduled to be constructed at SRS. The Pit Disassembly and Conversion Facility will disassemble surplus pits and provide the plutonium to the MOX facility. In addition, under Expanded Operations from the LANL Sitewide EIS (LANL 2008), LANL would produce up to 460 pounds (210 kg) of plutonium oxide would be polished annually and stored pending shipment to SRS for use at the Mixed Oxide Fuel Fabrication Facility. The ultimate disposition of the MOX fuel and the immobilized plutonium is the Yucca Mountain Repository, as evaluated in the Yucca Mountain SEIS. Therefore these impacts would be cumulative to those at NTS, however, they have been included in the Yucca Mountain SEIS impacts.

6.3 CUMULATIVE IMPACTS BY RELEVANT SITE

The following Complex Transformation sites could be potentially affected by the projects identified and described above: LANL, Nevada Test Site (NTS), Pantex Plant (Pantex), SRS, and Y-12. These five sites are also the same sites that could be affected by the programmatic alternatives in this Complex Transformation SPEIS. While this SPEIS acknowledges that other projects could create cumulative impacts at the other Complex Transformation sites (Lawrence Livermore National Laboratory [LLNL], Sandia National Laboratories, New Mexico [SNL/NM], Tonopah Test Range [TTR], and the Department of Defense's White Sands Missile Range [WSMR]), the impacts from Complex Transformation would be relatively minor at those sites.

The state of New Mexico hosts three DOE facilities: LANL, SNL/NM, and WIPP. In addition, a non-government radiological facility, the National Enrichment Facility, is being constructed in southeastern New Mexico and will produce enriched uranium to be used in fuel for commercial electrical power generation nuclear reactors. Because of the number of nuclear-related facilities located within the state, NNSA has prepared a cumulative analysis of the environmental impacts of the four facilities with and without implementation of Complex Transformation. That analysis is in Section 6.4.

6.3.1 Cumulative Impacts at LANL

LANL could be affected by decisions resulting from the Pu-238 Consolidation EIS, which are addressed in this section.

6.3.1.1 *Pu-238 Cumulative Impacts*

With respect to LANL, the Pu-238 Consolidation EIS assesses the alternative that would transfer the Pu-238 operations to the INL, in addition to the No Action Alternative that would maintain Pu-238 operations at LANL TA-55. Maintaining the Pu-238 operations at LANL is included as part of the No Action Alternative for LANL in the Complex Transformation SPEIS. As such, potential cumulative impacts focus on the transfer of Pu-238 operations.

The cumulative impacts of transferring Pu-238 operations from LANL to INL would tend to mitigate any added impacts from the Complex Transformation SPEIS alternatives that would add missions to LANL. Conversely, the cumulative impacts of transferring Pu-238 operations from LANL to INL would tend to exacerbate any impacts from the Complex Transformation SPEIS alternatives that would subtract missions from Los Alamos. For example, if LANL were selected as the site for a CPC (either a Greenfield CPC or one of the Upgrade Alternatives), or a CNPC, the transfer of the Pu-238 operations would mitigate the impacts of these additional impacts beyond the analysis in the Complex Transformation SPEIS (which assumes no change in Pu-238 operations at LANL). Alternatively, if Los Alamos were not selected as the site for a CPC or a CNPC, the transfer of the plutonium missions from LANL to the CPC/CNPC, coupled with the transfer of Pu-238 operations to INL, would create greater impacts than the analysis in the Complex Transformation SPEIS.

As discussed in the Pu-238 Consolidation EIS, the impacts of Pu-238 operations at LANL are not a significant contributor to impacts at LANL. For example, Pu-238 operations require minimal infrastructure support (less than 1 percent of LANL electricity, fuels, and water use). Pu-238 operations also produce small doses (less than 1 person-rem) to the maximally-exposed individual (MEI) and the 50-mile population surrounding LANL. With respect to workers, doses from Pu-238 operations result in approximately 240 millirem (mrem) per year to the average worker. For the approximately 80 people working on Pu-238 operations at LANL, the resultant dose (19 person-rem) would create a latent cancer fatality (LCF) risk of 0.011 (or the potential for one cancer every 87 years of operation). With respect to accidents, the bounding consequences associated with Pu-238 accidents would result in 1.1 LCFs to the 50-mile population surrounding LANL. With respect to wastes, Pu-238 operations at LANL create less than 3 percent of any waste type (DOE 2005e). Thus, transfer of Pu-238 operations from LANL to INL would mitigate any added Complex Transformation SPEIS impacts by the amounts shown above.

The more significant cumulative impact would result from the transfer of Pu-238 operations from LANL to INL, coupled with the transfer of LANL Pu missions to a CPC/CNPC if a site other than Los Alamos were chosen for the CPC/CNPC. In this case, the impacts from both missions would be additive. Relative to each other, the most significant contributor to these cumulative impacts would be impacts associated with the LANL pit production and plutonium

R&D missions, which are presented in Section 5.12 of this SPEIS. The cumulative impacts of transferring Pu-238 operations from LANL would add incremental impacts as described above.

6.3.2 Cumulative Impacts at NTS

Decisions related to the Yucca Mountain Repository could cause cumulative impacts in the NTS ROI and nationally (from transportation activities associated with a geologic repository). The potential cumulative impacts in the NTS ROI are discussed below, followed by potential cumulative impacts from transportation.

As discussed in Section 6.2.3, DOE recently completed NEPA documents related to the Yucca Mountain repository: the Yucca Mountain SEIS, the Nevada Rail Corridor SEIS, and the Rail Alignment EIS. Although decisions related to these EISs could affect the *implementation* of a national repository for the disposal of SNF and DOE HLW, they would not affect the prior decision to use Yucca Mountain as a geologic repository for the disposal of 70,000 metric tons of heavy metal (MTHM) of SNF and HLW. As such, the impacts of disposing of 70,000 MTHM of SNF and HLW at Yucca Mountain, including transportation, are included in this cumulative impact assessment for the Complex Transformation SPEIS.

DOE would start construction of the Yucca Mountain repository on receipt of the construction authorization from the NRC, with initial operations beginning no sooner than 2017. The cumulative impacts associated with Yucca Mountain and Complex Transformation are discussed below.

6.3.2.1 *Socioeconomics*

During construction activities for the repository, short-term socioeconomic impacts would occur in the Yucca Mountain region. There would be nearly 2,600 workers engaged (during the peak year) in construction of the repository in the two-county area around Yucca Mountain (Clark, and Nye Counties) (DOE 2008a). Repository construction could occur at the same time as construction for a CUC, with a peak workforce of 1,300, and a CPC, with a peak workforce of 850. Assuming a bounding approach (peak workforce of the repository, CUC, and a CPC at the same time), the total peak construction workforce of all three facilities would be 4,750. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 4,615 indirect jobs would be created, for a total of 9,365 jobs. This represents approximately 1 percent of the total ROI labor force. As such, no significant impacts to employment, housing or community services would be expected from construction activities.

6.3.2.2 *Human Health*

As stated in the Yucca Mountain SEIS (DOE 2008a), construction and operation of the repository would result in less than one worker fatality. In addition, for the entire 105 year period of repository construction, operations, monitoring, and closure, it is estimated that there would be about 3.5 LCFs among repository workers.

The maximum annual radiological dose to the MEI (i.e., a member of the public who resided continuously for 70 years at the site boundary location in the prevailing downwind direction) from repository operations would be about 7.6 mrem per year. Greater than 99.8 percent of the annual dose would be from radon-222 and its decay products in subsurface exhaust ventilation air. The pre-closure Public Health and Environmental Standard found in 10 CFR 63.204 is 15 mrem per year to a member of the public. Maximum annual doses from repository activities would be about one-half of this standard. The average individual in the United States receives 200 mrem per year from exposure to naturally occurring radon and its decay products, so Yucca Mountain releases would be expected to add less than 3 percent to the natural background dose from radon (DOE 2008a).

The MEI would have an increase in the probability of incurring a LCF of 0.0003 from exposure to radionuclides released from repository facilities. During the 50-year operation period of the repository, the estimated collective dose to the population living within 52 miles would be 6,400 person-rem, which correlates to 3.8 latent cancer fatalities. The estimated collective dose for the entire 105-year project duration would be 13,000 person-rem. This corresponds to 8 LCFs in the population (DOE 2008a). In addition, there would be a potential for very small impacts to vegetation and animals over the repository area as soil surface temperatures increased. Small impacts to other resources (for example, socioeconomics, biological resources, utilities and services) would occur.

For Complex Transformation, a maximum of 4.1 nonradiological fatalities would be associated with the construction of a CNPC, and less than 1 nonradiological fatality would be associated with operations. During operations, the maximum MEI dose would be 0.2 mrem per year from NNSA activities at NTS. Cumulatively, the maximum dose to the MEI from NNSA operations and Yucca Mountain operations would be 1.5 mrem per year. Statistically, this would equate to a LCF risk of 9.0×10^{-7}, a risk less than one in a million of developing a LCF. For Complex Transformation workers, approximately 386 person-rem would result annually from operations. Over 40 years of operations, this would equate to 15,440 person-rem. Based on a dose-to-risk factor of 0.0006 LCFs per person-rem, approximately 9.3 LCFs could be statistically expected to the workforce over 40 years of operation.

6.3.2.3 *Transportation*

The Yucca Mountain SEIS (DOE 2008a) includes a detailed analysis of the cumulative transportation impacts associated with past, present, and future radiological shipments (including spent nuclear fuel [SNF] associated with the Yucca Mountain repository). That analysis includes consideration of impacts from 1943 through 2073. Based on the Yucca Mountain SEIS cumulative impact analysis as well as estimated transportation impacts from the GNEP PEIS, NNSA estimated the cumulative impacts shown in Table 6.3.2-1.

The impacts of transporting SNF and HLW from commercial and DOE sites to the Yucca Mountain repository could be additive to the transportation impacts associated with Complex Transformation activities. For DOE's preferred transportation mode (mostly rail), Table 6.3.2-1 depicts these transportation impacts.

For Complex Transformation, as shown in Section 5.10, the maximum transportation impacts would result in less than one fatality from both radiological impacts and nonradiological impacts. As such, the cumulative transportation impacts would be essentially the same as for Yucca Mountain alone.

Table 6.3.2-1—Potential Cumulative Transportation Impacts

Category	Worker Dose		General Population Dose		Traffic Fatalities [a]
	person-rem	LCF	person-rem	LCF	
Collective dose and traffic fatalities of non-Complex Transformation transportation					
Historical DOE shipments and reasonably foreseeable actions [b]	28,000	17	49,000	29	94
General radioactive material transportation (1943 to 2073) [c]	350,000	210	300,000	180	28
Yucca Mountain estimated impacts [d]	5,600–5,900	3	1,100–1,200	1	3
GNEP estimated minimum and maximum impacts [e]	2,200-260,000	1-160	1,100-1,300,000	1-820	3-150
Total of non-Complex Transformation transportation impacts	390,000-640,000	230-390	350,000-1,700,000	210-1,000	130-280
Complex Transformation maximum impacts [f]	5,500	3	190	0.1	0.02
Total	400,000-650,000	230-390	350,000-1,700,000	210-1,000	130-280

Note: All numbers except "total"are rounded to two significant figures; therefore, totals may differ from sums.

[a] The values provided in this column represent the number of expected vehicular accident fatalities. Additional fatalities due to release of radioactive materials is less than one percent of these impacts; therefore, these are not included. For comparison, there could be 28 expected fatalities over the 131-year period (1943-2073) based on the NRC traffic fatality rate of 0.213 traffic fatalities per year from radioactive material shipments (DOE 2008a).

[b] The values provided in this row represent all known historical DOE shipments, starting in 1943 (the year operations began at the Hanford Site and Oak Ridge Reservation) and all reasonably foreseeable actions involving transportation of radioactive materials through 2073 (the assumed end date for Yucca Mountain shipments) provided in other NEPA documents. The values are based on in-transit impacts only. Table 8-14 of DOE 2008a is the source of the data provided.

[c] This row represents a estimated collective dose due to transport of eight categories of radioactive materials [(1) industrial, (2) radiography, (3) medical, (4) fuel cycle, (5) research and development, (6) unknown, (7) waste, and (8) other.].. The values are based on in-transit impacts only. Source: DOE 2008a, Table 8-14.

[d] The range provided represents the minimum value for the Yucca Mountain Supplemental EIS proposed action, and the maximum value related to the transportation of Module 2A. The values are based on in-transit impacts only. Source: DOE 2008a, Table 8-14.

[e] The All-High Temperature Gas-Cooled Option, All-Truck Scenario represents the maximum estimated transportation impacts of the programmatic alternatives analyzed in the GNEP PEIS. The values are based on in-transit impacts only. The No Action Alternative represents the minimum estimated transportation impacts of the programmatic alternatives analyzed in the GNEP PEIS. The values are based on in-transit impacts only. Source: GNEP Preliminary Draft PEIS.

[f] From this Complex Transformation SPEIS. Data are for the CNPC Alternative.

The analysis in the GNEP PEIS accounts for the transportation impacts to support a nuclear electricity capacity of 100 to 400 GWe, which would be up to four times greater than the existing nuclear electricity infrastructure in the United States. As such, the radiological transportation analysis in the PEIS is comprehensive and cumulative with respect to commercial radiological transportation activities in the future. Based on the PEIS radiological transportation analysis for 200 GWe, up to 1.7 million radiological shipments could be required. The impacts of radiological shipments could result in up to approximately 980 incident-free latent cancer fatalities (LCFs) and approximately 150 collision fatalities over the operational period between 2010 and approximately 2060–2070, as shown in Table 6.3.2-1.

Complex Transformation transportation would contribute approximately 3 LCFs to workers, less than 1 LCF to the public. Consequently, the transportation-related impacts of Complex Transformation are relatively small and would not significantly increase the cumulative transportation impacts.

6.3.3 Cumulative Impacts at Pantex

Cumulative impacts at Pantex could result from Complex Transformation activities and the plutonium disposition activities. The maximum cumulative impacts would be associated with transportation of plutonium from Pantex to SRS. Under the plutonium disposition program, up to 34 tons of surplus plutonium would be transported from Pantex to SRS for conversion to MOX fuel. Under the Complex Transformation CNPC alternative, up to 60 metric tons of plutonium could be shipped from Pantex to SRS. Based on the analysis in Section 5.10, the impacts of transporting up to 60 metric tons of plutonium from Pantex to SRS would be as shown in Table 6.3.3-1.

Table 6.3.3-1—Radiological Transportation Impacts Associated with the Transportation of Pits from Pantex to the CNPC Site

CNPC Site	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
SRS	Pits	3.46×10^{-9}	0.0584	0.0584

Source: Dimsha 2007.

Assumptions

- All materials in metal form
- ES-3100 or similar container used
- Shipments of Pu from Pantex to the CNPC would require 10 shipments for every ton of plutonium
- Release and aerosol fractions based on *West Valley Demonstration Project EIS (WVDP EIS)* values

Using these same assumptions, the impacts of transporting an additional 34 tons would be as shown in Table 6.3.3-2.

Table 6.3.3-2—Radiological Transportation Impacts Associated with the One-Time Transportation of 34 Tons of Plutonium from Pantex to SRS

MOX Site	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
SRS	Pits	2.50×10^{-9}	0.0422	0.0422

Source: Dimsha 2007.

Using the same assumptions as discussed above, the cumulative impacts of transporting up to 94 metric tons would be as shown in Table 6.3.3-3.

Table 6.3.3-3—Radiological Transportation Impacts Associated with the One-Time Transportation of up to 94 Metric Tons of Plutonium from Pantex to SRS

MOX Site	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
SRS	Pits	5.96×10^{-9}	0.101	0.101

Source: Dimsha 2007.

The cumulative impacts associated with the transfer of Category I/II SNM from Zone 4 to Zone 12 would not cause any significant impacts at Pantex (less than 1 LCF due to handling operations). As such, this alternative would not contribute to any significant cumulative impacts.

6.3.4 Cumulative Impacts at SRS

As discussed in Section 6.2.4, SRS could be affected by plutonium disposition activities, including the transportation of surplus plutonium (see Section 6.3.3), and the operation of PDCF and a MOX fuel fabrication facility. Based on current plans, PDCF would start construction in late 2010 and begin operations in 2019. PDCF operations would last approximately 8 years. The MOX Fuel Fabrication Facility started construction in August, 2007 and is expected to begin operations in 2016. Operations would last approximately 13 years. As such, for purposes of this cumulative impact assessment, the bounding assumption is: peak construction of the PDCF and MOX Fuel Fabrication Facility occurs at approximately the same time as the peak construction of the CUC and CPC. Operationally, the bounding assumption is: SRS operates the PDCF, MOX Fuel Fabrication Facility, and CNPC simultaneously.

Based on these assumptions, the potential cumulative impacts at SRS would be as follows.

6.3.4.1 *Construction*

If the CNPC were located at SRS, approximately 545 acres could be affected. The PDCF and MOX Fuel Fabrication Facility are expected to disturb approximately 77 acres (DOE 1999). Together, the CNPC, PDCF, and MOX Fuel Fabrication Facility would disturb approximately 622 acres. On a site as large as SRS (approximately 198,400 acres, of which 90 percent [191,000 acres] are undeveloped), the disturbance of 622 acres would be less than 1 percent of the available land.

During construction, the most significant potential cumulative impact would involve socioeconomics. The PDCF and MOX Fuel Fabrication Facility are estimated to need a peak construction workforce of 1,968, with an additional 1,580 indirect jobs created (DOE 1999). If one were to assume a bounding approach in which the peak workforce of the PDCF and the MOX Fuel Fabrication Facility occurred at the same time as the peak workforce of a CUC and a CPC, the total peak construction of all three facilities would be 4,118. In addition to the direct jobs created by the construction of these three facilities, additional jobs would be created in other supporting industries.

It is estimated that approximately 3,122 indirect jobs would be created, for a total of approximately 7,240. This represents approximately 3.9 percent of the total ROI labor force. It is estimated that many of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period. A 3.9 percent increase in ROI employment would not significantly stress housing and community services in the ROI. In 2000, there were approximately 18,000 vacant housing units in the ROI.

6.3.4.2 *Operations*

Once operational, the PDCF and MOX Fuel Fabrication Facility would create impacts similar to many of the existing operations at SRS. The potential cumulative impacts are addressed below.

6.3.4.3 *Electricity*

Cumulatively, this bounding analysis assumes that a CNPC would be located at SRS along with the PDCF and MOX Fuel Fabrication Facility. The most recent data shows a peak load of approximately 70 MWe from SRS operations, compared to a site capacity of 330 MWe. The addition of 9.2 MWe from the PDCF and MOX Fuel Fabrication Facility and 41 MWe from a CNPC would be well within the site electrical capacity.

6.3.4.4 *Water Use*

In 2005, SRS used approximately 3.5 billion gallons of water. If the CNPC were located at SRS, water use would increase by approximately 395 million gallons to approximately 3.90 billion gallons per year. The PDCF and MOX Fuel Fabrication Facility would use approximately 29 million gallons of water annually. The total water use would be well within the site capacity.

6.3.4.5 *Socioeconomics*

SRS currently employs approximately 15,100 people and there are approximately 184,646 people employed in the ROI. If the CNPC were located at SRS, operational employment would increase by approximately 3,466 at SRS. When added to the approximately 1,120 new employees that would be required to operate the PDCF and MOX Fuel Fabrication Facility (and 2,003 additional indirect workers), the total jobs created would be 11,089, an increase of approximately 6 percent in the ROI.

6.3.4.6 *Human Health*

Workers at SRS currently receive approximately 121.3 person-rem of radiation dose from normal operations. If the CNPC were located at SRS, the cumulative operational dose to workers would increase by approximately 386 person-rem. When added to the approximately 456 person-rem to workers at the PDCF and MOX Fuel Fabrication Facility, the total worker dose would be 980.3 person-rem. Statistically, this would result in 0.59 LCFs to the SRS workforce, meaning that 1 additional LCF could be expected to occur for every 1.7 years of SRS operation.

With respect to the public, PDCF and MOX Fuel Fabrication operations would produce small doses to the public (less than 7.4×10^{-3} mrem to the MEI and approximately 1.8 person-rem to the 50-mile population surrounding SRS) (DOE 1999). The CNPC would also produce small doses to the public (3.39×10^{-3} mrem to the MEI and approximately 0.429 person-rem to the 50-mile population surrounding SRS). The total dose to the population from PDCF, MOX Fuel Fabrication, and CNPC would be: 1.08×10^{-2} mrem to the MEI and approximately 2.2 person-rem to the 50-mile population surrounding SRS.

6.3.4.7 *Waste Management*

SRS currently does not currently generate any HLW, but still has substantial quantities of HLW from former operations. NNSA is preparing a Surplus Plutonium Disposition Supplemental EIS and has preliminarily identified a potential total of 20,402 cubic meters of HLW that may be generated by reasonably foreseeable actions (Grainger 2008) The CNPC would add 955 cubic yards of TRU, an increase of nearly 10 times the amount generated at SRS in 2004. The CNPC would also double the LLW currently generated, and increase mixed LLW by approximately four times the current amount generated. With respect to a PDCF and a MOX Fuel Fabrication Facility, those 2 facilities could generate approximately 500 cubic yards of TRU, 270 cubic yards of LLW, and 6.5 cubic yards of mixed LLW. As such, the total wastes at SRS would increase by the amounts shown in Table 6.3.4-1.

Table 6.3.4-1—Cumulative Waste Generation–SRS

Waste type	Current and Reasonably Foreseeable Actions	CNPC	PDCF and MOX	Total
High-level, cubic yards	26,684	0	0	26,684[b]
Transuranic, cubic yards	88	955	500	1,543
Low-level, cubic yards	4,900	12,964 +[a]	270	18,134+[a]
Mixed , cubic yards	20	306	6.5	332.5

[a] approximately 9,000 gallons of liquid LLW would be generated and would need to be solidified.

[b] HLW from Spent Nuclear Fuel Management (14,385 cubic yards), Salt Waste Processing Facility (5,940 cubic yards), and Tank Closure (6356 cubic yards) (Grainger 2008).

6.3.5 Cumulative Impacts at Oak Ridge Reservation (Y-12 Location)

The Oak Ridge Reservation (ORR), of which Y-12 and the ORNL are two of the principal facilities, could be affected by the Pu-238 Consolidation EIS. The potential cumulative impacts associated with the Pu-238 Consolidation EIS are addressed below.

6.3.5.1 *Pu-238 Cumulative Impacts*

DOE analyzed the need for reestablishment of plutonium-238 production capability in the *Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility* (NI PEIS), issued in December 2000 (DOE 2000b). On the basis of the analysis in the NI PEIS, DOE issued a ROD on January 26, 2001 (66 FR 7877), to reestablish plutonium-238 production capability at ORNL using the Radiochemical Engineering Development Center (REDC) for the fabrication of neptunium-237 targets and extraction of plutonium-238 from the irradiated targets.

With respect to ORR, the Pu-238 Consolidation EIS assesses the alternative that would transfer the Pu-238 operations to INL, in addition to the No Action Alternative that would maintain Pu-238 operations at ORNL. The cumulative impacts of transferring Pu-238 operations from ORNL to INL would tend to mitigate any added impacts from the Complex Transformation SPEIS alternatives that would add missions to Y-12. For example, if Y-12 were selected as the site for a CPC or a CNPC, the transfer of the Pu-238 operations would mitigate the impacts of these additional impacts beyond the analysis in the Complex Transformation SPEIS (which assumes no change in Pu-238 operations at ORNL). On the flip side, if Y-12 were not selected as the site for a CNPC, the transfer of the HEU missions from Y-12, coupled with the transfer of Pu-238 operations to INL, would create greater impacts beyond the analysis in the Complex Transformation SPEIS.

As discussed in the Pu-238 Consolidation EIS, the impacts of Pu-238 operations at ORNL are not a significant contributor to impacts at ORR. For example, Pu-238 operations require minimal infrastructure support (less than 1 percent of ORR electricity, fuels, and water use). Water use (0.76 million gallons) per year at REDC is well within the capacity of the ORNL water supply system, which can deliver 2.6 billion gallons annually. Electrical use is inconsequential.

Target fabrication and post-irradiation processing of neptunium-237 targets at REDC requires about 41 workers (DOE 2000). These jobs represent less than 0.1 percent of the ORNL workforce and have no noticeable impact on socioeconomic conditions in the ORNL ROI.

Pu-238 operations produce small doses to the public (less than 4.5×10^{-6} mrem to the MEI and less than 1.5×10^{-4} person-rem the 50-mile population surrounding ORR). With respect to workers, doses from Pu-238 operations result in approximately 170 mrem per year to the average worker, resulting in a total worker dose of less than 12 person-rem. This creates a LCF risk of 7.2×10^{-3} (or the potential for one cancer every 581 years of operation). With respect to accidents, for REDC target fabrication and processing accidents, the annual increased risk of an LCF to the offsite MEI and a noninvolved worker was estimated to be 1.6×10^{-6} and 1.0×10^{-5}, respectively. The annual accident risk in terms of the increased number of LCFs in the surrounding population was estimated to be 4.5×10^{-3}. With respect to wastes, Pu-238 operations at ORNL create less than 1 percent of any waste type. Thus, transfer of Pu-238 operations from ORNL to INL would mitigate any Complex Transformation SPEIS added impacts by the amounts shown above.

6.4 CUMULATIVE IMPACTS OF MAJOR NUCLEAR-RELATED FACILITIES IN NEW MEXICO

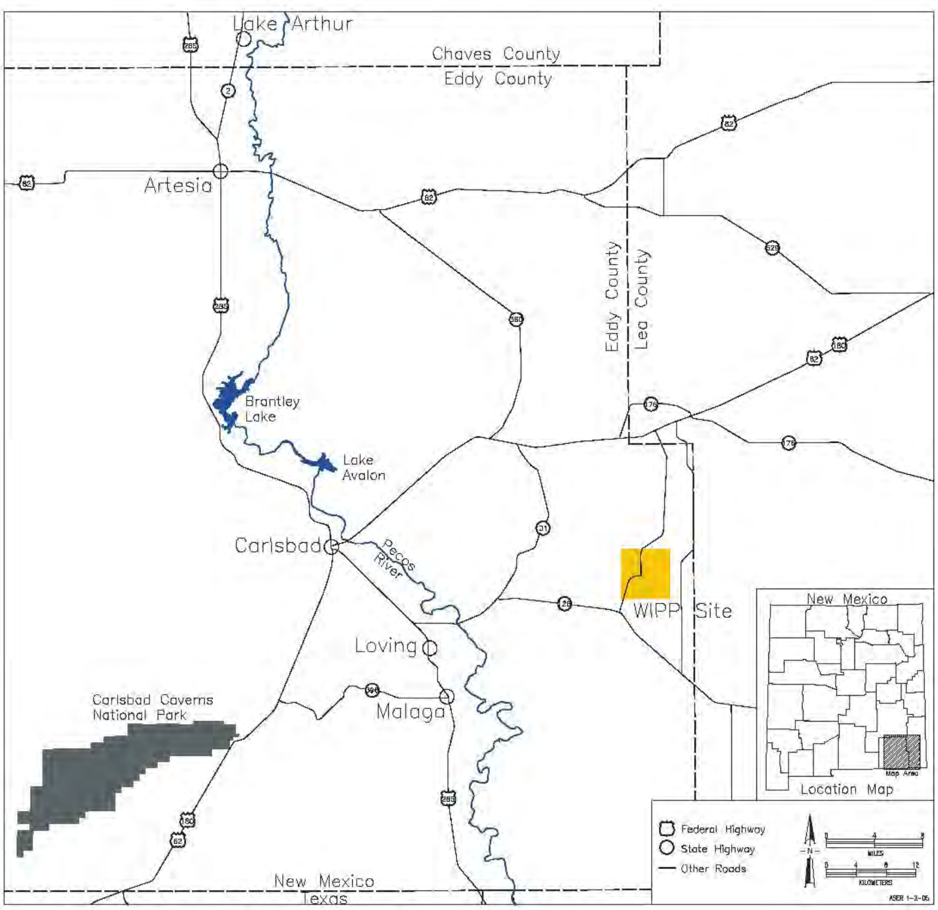
This section addresses the cumulative impacts of the following major facilities located in the state of New Mexico: LANL, Los Alamos, NM; SNL/NM, Albuquerque, NM; WIPP, near Carlsbad, NM; and the National Enrichment Facility (NEF), near Eunice, NM. LANL, and SNL/NM, are described in detail in Chapter 4 of this SPEIS.

6.4.1 Description of WIPP and NEF

6.4.1.1 *Description of WIPP*

The WIPP facility is the nation's first underground repository permitted to safely and permanently dispose of transuranic (TRU) radioactive and mixed waste generated through Defense-related activities and programs. Over the planned 35-year operational lifetime, the WIPP facility is expected to receive approximately 37,000 shipments of waste from locations across the United States (WIPP 2007).

The WIPP disposal site is located 26 miles east of Carlsbad, in Eddy County in the Chihuahuan Desert of southeastern New Mexico (Figure 6.4-1). The WIPP site encompasses 16 square miles (mi^2). This part of New Mexico is relatively flat and is sparsely inhabited, with little surface water.



Source: WIPP 2007.

Figure 6.4-1—Location of WIPP in Eddy County, New Mexico

In 1999, WIPP received its first TRU waste shipment. In October of that year the New Mexico Environment Department (NMED) issued the WIPP Hazardous Waste Facility Permit (HWFP), which allows contact-handled (CH) TRU mixed waste to be managed, stored, and disposed at the

WIPP facility. In October 2006, NMED issued a revised HWFP allowing the WIPP facility to receive remote-handled (RH) TRU mixed waste (WIPP 2007).

The *Waste Isolation Pilot Plant Land Withdrawal Act* (Public Law 102-579) was signed into law on October 30, 1992. With the exception of facilities within the boundaries of the posted 0.463 mi^2 Exclusive Use Area, the surface land uses remain largely unchanged from pre-1992 uses, and are managed in accordance with accepted practices for multiple land use. The majority of the lands in the immediate vicinity of WIPP are managed by the U.S. Department of the Interior Bureau of Land Management (BLM). Land uses in the surrounding area include livestock grazing; potash mining; oil and gas exploration and production; and recreational activities such as hunting, camping, hiking, and bird watching.

There are 25 residents living within 10 miles of the WIPP site. The population within this area is associated with ranching, oil and gas exploration/production, and potash mining. There are two nearby ranch residences. The majority of the local population within 50 miles of WIPP is concentrated in and around the communities of Carlsbad, Hobbs, Eunice, Loving, Jal, Lovington, and Artesia, New Mexico. The estimated population within this radius is 100,944. The nearest community is the village of Loving (estimated population 1,326), 18 miles west-southwest of the WIPP site. The nearest major populated area is Carlsbad, 26 miles west of the WIPP site. The estimated population of Carlsbad is 25,625.

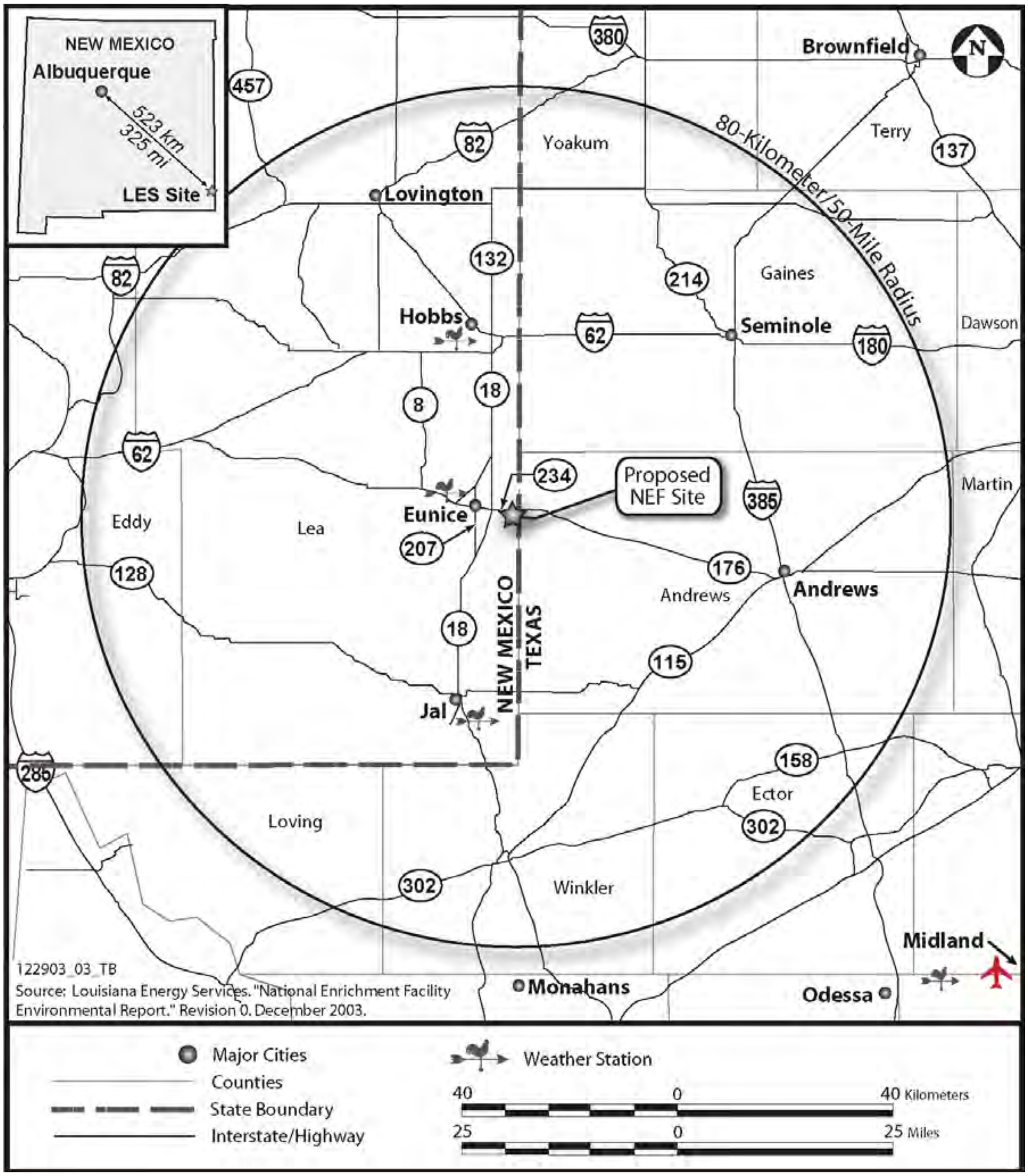
The DOE policy is to conduct its operations in compliance with applicable environmental laws and regulations, and to safeguard the integrity of the southeastern New Mexico environment. The DOE conducts effluent monitoring, environmental surveillance, land management, and assessments to verify that these objectives are met and to provide data necessary to demonstrate compliance with applicable environmental protection regulations.

6.4.1.2 *Description of NEF*

Construction of the NEF began in August 2006 and the first phase (the first of six cascade halls) of the plant is scheduled to become operational in 2009. Once operational, NEF will produce enriched uranium-235 up to 5 weight percent by the gas centrifuge process. Production of enriched uranium fluoride product would increase from approximately 85 tons initially to a maximum of 882 tons at full production (LES 2005). Uranium enrichment is a step in the nuclear fuel cycle in which natural uranium is converted and fabricated so it can be used as nuclear fuel in commercial nuclear power plants. A detailed description of the NEF and the uranium enrichment process may be found in the *Environmental Impact Statement for the National Enrichment Facility in Lea County, New Mexico*.

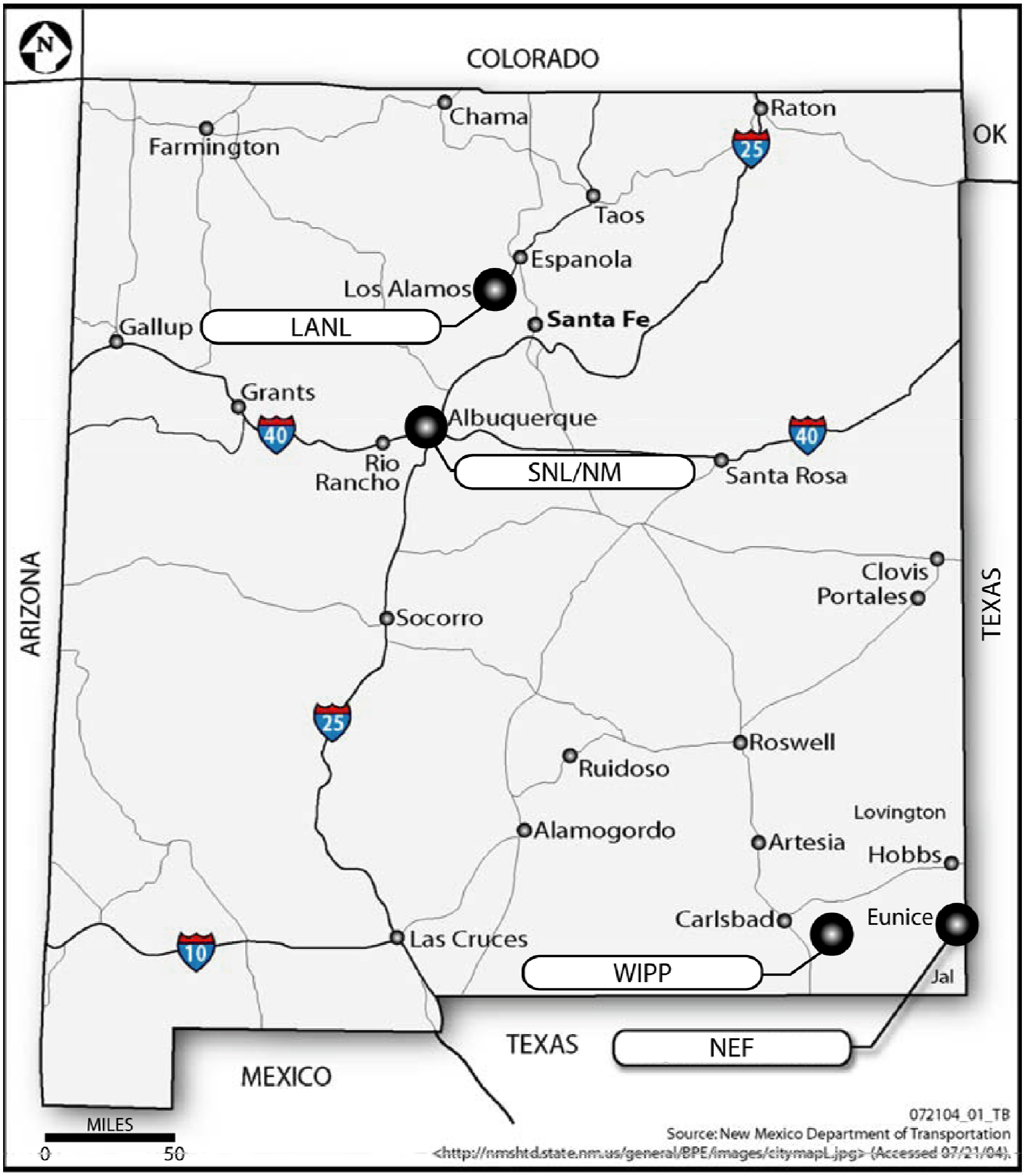
The NEF is located on 543 acres of previously undeveloped land that was used for cattle grazing in Lea County in southeastern New Mexico, approximately 20 miles south of Hobbs, New Mexico; 8 5 miles east of Eunice, New Mexico; and about 0.5 mile from the New Mexico/Texas State line (Figure 6.4-2). Eunice is the closest population center (NRC 2005a).

The nearest permanent resident is 2.6 miles west of the site near the junction of New Mexico Highway 234 and New Mexico Highway 18. There is no permanent surface water on the site, and appreciable groundwater reserves are deeper than 1,115 feet. NEF receives all of its water supply from the Eunice and/or Hobbs municipal water supply systems. The local municipalities obtain water from groundwater sources in the Ogallala Aquifer near the city of Hobbs (NRC 2005a).



Source: NRC 2005a.

Figure 6.4-2—Location of the National Enrichment Facility



Source: New Mexico Department of Transportation <http://nmshtd.state.nm.us/general/BPE/images/citymapL.jpg> (Accessed 07/21/04).

Figure 6.4-3—Location of All Four Major Facilities Addressed

6.4.2 Cumulative Impacts

This cumulative impact assessment considers nuclear weapons complex facilities and other large nuclear facilities in the state of New Mexico, as shown in Figure 6.4-3. Those resources with site-specific impacts that would not result in a significant adverse cumulative impact are not addressed in this assessment, including geology and soils, biological/ecological, cultural, surface and groundwater quality, and nonradiological air quality. The resources addressed in this assessment are socioeconomics, utilities (water and electricity), transportation, worker and public health, and management of radioactive waste. For purposes of this cumulative impact assessment, the Consolidated Centers of Excellence Alternative was used for Complex Transformation impacts because it has the greatest environmental impacts and would thus bound the analysis. NNSA's Preferred Alternative does not include implementation of the CNPC Option at any of its sites. The impacts for each of the four major facilities are displayed in Table 6.4-1.

LANL is the only one of the four facilities addressed in this cumulative impact assessment that could experience significant changes under Complex Transformation. In Table 6.4.1, the impacts of LANL with and without Complex Transformation are displayed.

The NEF is currently under construction. This cumulative impact assessment evaluates only the estimated operational impacts of NEF; it does not address construction-related impacts.

6.4.2.1 *Socioeconomic Resources*

Once NEF becomes fully operational the four major nuclear facilities in New Mexico will directly employ a total of 23,467 people. The estimated total income from those jobs is over $1.32 billion. The maximum number of direct jobs that could be created by Complex Transformation is 4,500. The total estimated income including direct jobs from Complex Transformation would be over $1.53 billion.

In addition to the income from direct employment, there is a substantial amount of income that is created indirectly or is induced. It is estimated that there are a total of 49,230 indirect jobs created by economic activity generated by employment at the major nuclear facilities in New Mexico. Total salaries and wages from indirect and induced employment resulting from activities of these nuclear facilities is estimated to be almost $2.3 billion Indirect employment resulting from Complex Transformation would generate an estimated additional $286,200,000 in salaries and wages each year, increasing the total indirect income to almost $2.6 billion. Direct and indirect/induced employment in the four major nuclear facilities generates a total of about $3.8 billion in the state of New Mexico.

Further, each of the facilities generates jobs and economic activity in New Mexico through contracting and procurements from local business. These activities at SNL/NM, WIPP, and NEF would generate almost $1.1 billion each year.

The total economic impact of the major nuclear facilities to the state of New Mexico exceeds $4 billion each year.

6.4.2.2 *Utilities*

The total amount of water used at the four facilities is about 941 million gallons per year. This amount of water usage does not exceed the capabilities of the various water suppliers for the facilities. Cumulative water usage with implementation of the most severely impacting Complex Transformation alternative would be about 1.34 billion gallons per year. Implementation of the

CNPC Option at LANL would cause water usage at that site to exceed LANL's current water rights; however, it would not exceed the capability of the water supply.

Table 6.4-1—Cumulative Impacts of Major Nuclear Facilities in New Mexico

	Facility			
	LANL[a]	**SNL/NM[a]**	**Waste Isolation Pilot Plant**	**National Enrichment Facility[b]**
Resource	**Impacts of Facilities**			
Socioeconomic Employment	13,504 direct jobs 14,314 indirect jobs Complex Transformation: 4,500 direct jobs 4,770 indirect jobs	8,658 direct jobs[c] 32,300 indirect jobs[d] Complex Transformation would not have an appreciable effect on jobs at SNL/NM	1,095 direct jobs[e] 2,443 indirect jobs[e]	210 direct jobs 173 indirect jobs
Economic	Direct salaries/wages: $637,388,800 Indirect salaries/wages: $858,840,000 Disbursements to New Mexico businesses in 2007: $788 million[f] Annual income increase from Complex Transformation: Direct $212,400,000 Indirect $286,200,000 Total $498,600,000	Direct salaries/wages: $603,000,000[c] Indirect salaries/wages: $1,332,630,000[d] Contract payments to NM businesses in 2003: $245 million[c]	Direct salaries/wages: $70,000,000[g] Indirect salaries/wages: $75,000,000[e] Contract and procurement spending in New Mexico: $42.8 million[g]	Direct salaries/wages: $10,900,000 Indirect salaries/wages: $5,800,000 Local annual spending on goods and services: $9.9 million
Utilities Water Use (gallons per year)	380 million Complex Transformation: 395 million Total 775 million	555.3 million	3.516 million [h]	23.1 million
Electricity Use	391,096 MWh Complex transformation: 264,000 MWh	207,672 MWh	20,992 MWh[h]	262,800 MWh

Table 6.4-1—Cumulative Impacts of Major Nuclear Facilities in New Mexico (continued)

	Facility			
	LANL[a]	**SNL/NM[a]**	**Waste Isolation Pilot Plant**	**National Enrichment Facility[b]**
Resource	**Impacts of Facilities**			
Health and Safety Workers	156 person-rem/yr; 0.094 LCF/yr Complex Transformation dose: 386 person-rem/yr; 0.23 LCF/yr Combined worker dose: 542 person-rem/yr; 0.324 LCF/yr	8.5 person-rem/yr; 0.0051 LCF/yr Complex Transformation would not substantially affect radiological exposure rates at SNL/NM.	0.9 person-rem/yr[i]; 0.00058 LCF/yr	General office worker >5 mrem/yr Operations/Maintenance Technician 100 mrem/yr Cylinder handler 300 mrem/yr Assuming all workers at facility receive 300 mrem annual dose; collective dose for entire worker population would be 63 person-rem, and $3.78\text{x}10^{-2}$ LCF/yr.
Public	**Maximally Exposed Individual:** 1.7 mrem/yr; $1.0\text{x}10^{-3}$ LCF/yr Complex Transformation dose: 0.046 mrem/yr; $2.8\text{x}10^{-5}$ LCF/yr Combine estimated dose: 1.73 mrem/yr; $1.0\text{x}10^{-3}$ LCF/yr **Collective Dose to the Public:** 2.5 person-rem/yr; $1.5\text{x}10^{-3}$ LCF/yr Collective dose to the public from maximum Complex Transformation operations: 0.379 person-rem/yr; $2.3 \text{ x } 10^{-4}$ LCF/yr Combine estimated collective dose: 2.839 person-rem/yr; $1.71\text{x}10^{-3}$ LCF/yr	**Maximally Exposed Individual:** $4.9\text{x}10^{-6}$ mrem/yr; $2.9\text{x}10^{-9}$ LCF/yr Complex Transformation would not substantially affect radiological exposure rates to the maximally exposed individual near SNL/NM. **Collective Dose to the Public:** $1.7\text{x}10^{-4}$ person-rem/yr; $1.0\text{x}10^{-7}$ LCF/yr Complex Transformation would not substantially affect radiological exposure rates to the public in the region around SNL/NM.	**Maximally Exposed Individual:** $3.9\text{x}10^{-6}$ mrem/yr; $2.4\text{x}10^{-9}$ LCF/yr[i] **Collective Dose to the Public:** $1.2\text{x}10^{-5}$ person-rem/yr[i]; $7.1\text{x}10^{-9}$ LCF/yr	**Maximally Exposed Individual:** 1.3×10^{-3} mrem/yr 7.8×10^{-8} LCF/yr **Collective Dose to the Public:** 1.4×10^{-2} person rem/yr 8.4×10^{-6} LCF/yr
Transportation Number of Shipments	Total estimated annual shipments of radioactive materials and waste 2,800 to 12,244[j]	Total estimated annual shipments of radioactive materials and waste 3,006[k] Complex Transformation would not substantially affect transportation at SNL/NM.	Total estimated number of radioactive waste shipments 10,778 per year.	Total estimated shipments of radioactive materials and waste 2,190 per year
Nonradiological	Number of fatalities: 2.96/yr Complex Transformation: Number of fatalities: 0.000108/yr.	Traffic fatalities /yr. 1.9 Complex Transformation would not substantially affect transportation at SNL/NM.	Traffic fatalities 0.14/yr.	Traffic fatalities 0.6

Table 6.4-1—Cumulative Impacts of Major Nuclear Facilities in New Mexico (continued)

	Facility			
	LANL[a]	**SNL/NM[a]**	**Waste Isolation Pilot Plant**	**National Enrichment Facility[b]**
Resource	**Impacts of Facilities**			
Radiological	Incident free: Occupational-- 91 person-rem/yr.; 0.055 LCF/yr Public—28.7 person-rem/yr.; 0.17 LCF/yr. Complex Transformation: Occupational and Public: 0.6 person-rem/yr; 3.58×10^{-4} LCF/yr.	Incident free: Occupational—93.72 person-rem/yr; 0.056 LCF/yr Public—586.8 person-rem/yr; 0.352 LCF/yr. Complex Transformation would not substantially affect transportation at SNL/NM.	Incident free: Occupational—1.5 person-rem/yr; 0.0009 LCF/yr.[m] Public—15 person-rem/yr.; 0.09 LCF/yr.	Incident Free: Occupational—50 person-rem/yr.; 0.03 LCF/yr. Public—1.5 person-rem/yr.; 0.009 LCF /yr
Radioactive Waste Management (cubic meters per year)	LLW 5,986 Mixed waste 122 TRU 146 Mixed TRU 84 Complex Transformation: LLW 8,944 Mixed waste 73 TRU 650 Mixed TRU 237	LLW 268 Mixed waste 3.34 TRU None Mixed TRU None Complex Transformation would not substantially affect generation of radioactive waste at SNL/NM.	LLW 1[n] Mixed waste <1[n] TRU (disposed) 5,984[o] Mixed TRU (included in TRU)	LLW 3,842[p] Mixed waste None analyzed TRU None Mixed TRU None

[a] Unless otherwise noted, information is derived from this SPEIS.
[b] Source of National Enrichment Facility impacts is NRC 2005.
[c] Direct employment at SNL/NM is derived from DOE 2006a.
[d] Indirect salaries/wages for SNL/NM calculated using a multiplier of 2.21 (DOE 1999c)
[e] DOE 1997a
[f] Source: Withers 2008
[g] Source: McClausin 2008a
[h] Source: McClausin 2008b
[i] Source: McClausin 2008c
[j] Source: WIPP 2007.
[k] LANL Transportation number of shipments based on Expanded Operations Alternative in 2008 LANL SWEIS, averaged over 10 years.
[l] Source: DOE 1999c
[m] Note: The occupational LCF for WIPP transportation, 0.009 LCF/yr. is from the 1997 WIPP EIS. Based on actual dose measurements of TRU waste drivers between 1999 and 2006, the average dose to drivers was 0.1465 person-rem/yr. This dose equates to $8.79\text{x}10^{-5}$ LCF/yr.
[n] McClausin 2008d
[o] Mc Clausin 2008e
[p] Note: NRC 2005 reported potential radioactive waste by weight. In order to convert to volume, it was assumed that all LLW would be DUF6 transported in 48Y containers. The volume (4.04 cubic meters) and maximum net weight (12,501 kilograms) of the 48Y container was obtained from *Interim Guidance for the Safe Transport of Reprocessed Uranium* (IAEA-TECDOC-750). The net weight of the 48Y container was converted to tons (13.78 tons). The weight of LLW projected in NRC 2005 (13,100 tons) was divided by 13.78 to determine the number of 48Y containers that would be shipped with DUF6 (951). The number of containers was then multiplied by 4.04 cubic meters to obtain an overall volume of LLW.

The current cumulative electricity requirement for the four sites is approximately 882,560 MWh per year. The servicing electrical providers are capable of providing this amount of power in addition to providing service to their other customers. Electricity requirements with Complex Transformation would be about 1,146,5610 MWh per year. The increase in electrical requirements for the Complex Transformation CNPC Alternative at LANL would potentially use approximately 96 percent of the peak power capacity that is available within the power pool.

6.4.2.3 *Health and Safety*

The release of radioactive materials and the potential level of radiation doses to workers and the public from operation of NNSA facilities are regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order also requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, EPA dose requirements in *National Emission Standards for Radionuclides Other than Radon from Department of Energy Facilities* (40 CFR Part 61, Subpart H) limit exposure to the offsite MEI from all air emissions to 10 mrem per year.

The doses for all four facilities were summed for the population within 50 miles. The consequences, expressed as latent cancer fatalities (LCFs) were also summed. Similarly, the doses and consequences for facility workers were summed. The results of these calculations are displayed in Table 6.4-2. In calculating doses to workers, the NEF FEIS only addressed the dose to an individual in a class of worker (i.e., general office worker, operation/maintenance technician, and cylinder handler). For this analysis, the dose rate for the class of employee with the greatest exposure was used to develop the collective dose for the entire worker population at the NEF.

Table 6.4-2—Cumulative Health Impacts in New Mexico from Major Nuclear Facilities

	Public	**Workers**
Current Conditions	Dose: 2.5 person-rem/yr Effect: 1.49×10^{-3} LCF/yr	Dose: 228.5 person-rem/yr Effect: 0.14 LCF/yr
With Complex Transformation	Dose: 2.9 person-rem/yr Effect: 1.72×10^{-3} LCF/yr	Dose: 228.9 person-rem/yr Effect: 0.14 LCF/yr

These accumulated doses are well within all of the applicable standards for radiation exposure to the public.

6.4.2.4 *Transportation*

There would be about 28,212 shipments involving radioactive material or waste each year for all four facilities. Many of those would be transporting LLW and MW out of the state to treatment and disposal facilities. All radioactive materials transportation activities are conducted in compliance with applicable DOT, NRC, and DOE requirements.

Statistically, 5.6 fatalities due to traffic accidents would occur nationwide each year associated with shipments to and from the four facilities. The actual number of traffic fatalities associated with these shipments would likely be significantly less than 5.6 per year. This number of fatalities is based on statistical analysis of all traffic accidents nationwide regardless of the cargo or carrier. DOE has a very good record for radiological shipments. For instance, since 1975, NNSA's Office of Secure Transportation has accumulated over 100 million miles transporting DOE cargo with no accidents causing a fatality or release of radioactive material.

The cumulative occupational dose from transportation of radioactive materials would be 236 person-rem/yr. This would result in a cumulative LCF rate of 0.14 per year. The cumulative dose to the population along transportation routes nationwide would be 632 person-rem per year. This would result in a cumulative LCF rate of 0.38 per year. It is important to note that the population dose assessment for transportation assumes that the same population will be in the same relative location to the route throughout the period of time covered.

6.4.2.5 *Waste Management*

Currently, radioactive waste is generated at the four facilities in the following estimated amounts:

LLW	10,097 m^3
Mixed Waste	126.3 m^3
TRU	146 m^3 generated at LANL; 5,984 m^3 of TRU and Mixed TRU disposed of at WIPP
Mixed TRU	84 m^3 generated at LANL; Mixed TRU disposed at WIPP included with TRU

The largest portion of the LLW and mixed waste are generated at LANL. LANL disposes of most of its LLW onsite at TA-54, Area G. The other three facilities considered in this cumulative assessment dispose LLW at appropriately permitted off-site disposal facilities, located outside of the state of New Mexico. Mixed waste generated at these facilities is transported to permitted treatment and/or disposal facilities at off-site locations outside of the state of New Mexico.

TRU waste and mixed TRU waste generated at LANL is shipped to WIPP for disposal. The total amount of TRU waste and mixed TRU waste disposed of at WIPP each year includes waste shipments from LANL.

Complex Transformation would generate the following amounts of radioactive waste:

LLW	8,944 m^3
Mixed Waste	73 m^3
TRU	650 m^3
Mixed TRU	237 m^3

These wastes would be handled in the same manner as currently generated waste.

6.5 LLNL SITE 300 OPEN-AIR DETONATION EXPERIMENTS

Apart from the alternatives analyzed in this SPEIS, LLNL had sought (now since withdrawn) a permit application that would allow larger open-air detonation experiments at Site 300. If granted, the permit would have governed all open-air explosives activities that are currently performed under an exemption to permitting in the San Joaquin Valley Air Pollution Control District's Rule 2020. Much of this work would have supported activities of the Departments of Defense and Homeland Security. Additional environmental review, including NEPA, would be performed, if needed, based on the specifics of proposed future open air detonation experiments.

The permit would have allowed larger open-air detonation experiments and activities (up to 350 lbs net explosives weight) to be performed that could have included:

- evaluation the effectiveness of countermeasures to potential terrorist devices and actions;
- training on countermeasures for other government agencies;
- study of explosively-driven electro-magnetic pulse generators;
- development of effective conventional (non-nuclear) munitions for use by the Department of Defense such as enhanced-effects an low-collateral damage explosives and devices;
- study of blast effects damage to structures and equipment from accidental and deliberate explosions;
- measurement of explosives shock, directional effects, heat transfer and fragmentation within and near explosives devices;
- development of explosives containment/confinement vessels;
- equipment testing such as explosives shipping containers;
- study of the explosives dispersal of surrogates for hazard materials; and,
- studies of the explosives reaction rates.

The permit application contained specific limits on metals that are hazardous air pollutants (HAPs). Currently, LLNL performs outdoor detonation experiments that produce HAPs emissions below that allowed under the exemptions. If the permit were granted, beryllium (used extensively in outdoor experiments from the late 1950's to 2002) would no longer be allowed in outdoor experiments.

The Livermore Site emits approximately 90 kilograms per day of criteria air pollutants from both permitted and exempt sources. The largest sources at Site 300 are internal combustion engines, boilers, a gasoline-dispensing operation, open burning of brush for fire hazard management, paint spray booths, drying ovens, and soil vapor extraction operations (DOE 2005a). Emission rates at Site 300 are less than one-half of the thresholds of 7 tons per year for a single hazardous air pollutant (HAP) or 15 tons per year for a combination of HAPs (DOE 2005a). This was not expected to change as a result of the permitting process to enable larger open-air detonation experiments at Site 300.

Table 6.5-1 presents estimates of expected open-air detonations releases of radiological materials associated with the permitting process to enable larger open-air detonation experiments at Site 300. Recognizing that NNSA has now withdrawn this permit application, this analysis is provided in the event NNSA were to re-submit this permit application.

The potential impacts of these radiological releases would be as follows:

- Dose to the 50-mile population surrounding Site 300: 0.23 person-rem.
- Dose to the maximally exposed individual (MEI): 0.076 mrem/yr

Statistically, these doses would result in approximately 1.3x10^{-4} latent cancer fatalities (LCFs) annually to the 50-mile population and 4.5x10^{-8} LCFs annually to the MEI (Tetra Tech 2008).

Table 6.5-1—Expected Annual and Per-Test Emissions

Material	Maximum annual emission[a]	Maximum per test emission
Depleted Uranium[b]	U-234 – 5.8×10^{-3} Ci U-235 – 8.0×10^{-4} Ci U-238 – 6.2×10^{-2} Ci	U-234 – 2.81×10^{-4} Ci U-235 – 3.89×10^{-5} Ci U-238 – 3.02×10^{-3} Ci
Tritium	194 Ci	194 Ci

[a] Limited by the 2005 SWEIS for LLNL.

[b] Accepted isotopic composition for reporting per 40 CFR 61, Subpart H assumes U-238 is 0.998 of the mass fraction of depleted uranium.

Chapter 7
UNAVOIDABLE ADVERSE IMPACTS

Chapter 7
UNAVOIDABLE ADVERSE IMPACTS

This chapter presents the unavoidable adverse environmental impacts associated with the major programmatic actions that could result from decisions based on this document. As a result of such actions, the siting, construction, and/or operation of facilities located at Y-12 National Security Complex (Y-12) in Oak Ridge, Tennessee; Savannah River Site (SRS) in Aiken, South Carolina; Pantex Plant (Pantex) in Amarillo, Texas; Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, Sandia National Laboratories in Albuquerque, New Mexico; Nevada Test Site (NTS) in Las Vegas, New Mexico; Tonopah Test Range (TTR) in Tonopah, Nevada; Lawrence Livermore National Laboratory (LLNL) in Livermore, California; and White Sands Missile Range (WSMR) in Las Cruces, New Mexico could result in adverse environmental impacts.

The analysis presented in this document has identified potential adverse impacts. In addition, mitigative measures that could be taken to either avoid or minimize these impacts have been identified. The residual adverse impacts of actions remaining after mitigation are considered to be unavoidable and the bounding case impacts of all potential alternatives are discussed below. The largest impacts for each of these facilities, except for LLNL, TTR, and WSMR, would come from the construction and operation of a Consolidated Nuclear Production Center (CNPC).

Construction of a CNPC at Y-12, the SRS, Pantex, NTS, or LANL would disturb approximately 600 acres. This land requirement represents two thirds of the 800 acres at Y-12.For SRS, this 600 acres site represents less than one percent of the total 198,420 acre site. For Pantex, 600 acres represents about 3.75 percent of the 15,977 acre site. For NTS, 600 acres is an insignificant portion of the 879,990 acre site. For LANL, 600 acres represents a little less than four percent of the 15,600 acre site. Although construction of a CNPC would change the existing land use, the proposed CNPC would be compatible and consistent with the land use plans of all of the potential sites and would be compatible with the current land use designations.

The proposed reference location at each of the candidate sites, except for LANL, is located in a highly developed and previously disturbed area; therefore, there would be no loss of habitat or impacts to biological, cultural or archaeological resources. At LANL, construction of a CNPC would take place at a site located within TA-16, some of which is developed. Wildlife and vegetation present at TA-16 are characteristic of species adapted to built environments with open settings, i.e., non-forested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and is comprised primarily of small mammals, lizards, and birds. In addition to the impacts associated with the Consolidated Plutonium Center (CPC) and Consolidated Uranium Center (CUC), approximately 300 acres of low value vegetation and habitat would be affected during construction of the Assembly/Disassembly/High Explosive (A/D/HE) Center. These collectively make up the CNPC impacts. During site clearing activities, highly mobile wildlife species, such as other small mammals and birds, would be able to relocate to adjacent, less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and other small mammals), direct mortality could occur during the actual construction event or ultimately result from stress related to habitat alteration. Potential hunting habitat for raptors and other predators would be lost as acreage is used for development.

Construction impacts for all potential sites would be minor and the appropriate soil and erosion mitigation measures would minimize any adverse impacts. No Federal- and state-threatened and endangered species and other species of special interest are known to occur or may occur at any of the potential CNPC sites. However, TA-16, the candidate site at LANL, does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging and hunting. The proposed CNPC at LANL would have minimal effect on the core and buffer area for the Mexican spotted owl as it is proposed for construction in a partially developed environment.

For each of the candidate sites, use of water is unavoidable. It is estimated that 145 million gallons per year of groundwater would be required to operate a CNPC at SRS, Y-12 NTS or LANL. This amount of water is not an issue for any of the candidate sites just noted. However, at Pantex 15,427,000 gallons of groundwater per year would be required for operation. This would amount to a 12 percent increase in groundwater usage for Pantex.

For NTS, there would be a significant impact to site electrical power requirements. Electrical energy requirements would exceed available site electrical energy capacity by approximately 42 percent. Available peak electrical load would be exceeded by approximately 33 percent. NTS would have to procure additional power. Currently, NTS does not use natural gas or coal which are necessary for the production of steam for heating. Coal would have to be transported to the site or a natural gas pipeline installed, to serve as fuel sources for the generation of steam. Impacts to liquid fuel and process gases would be negligible. Likewise at Pantex, there would be a significant impact to site electrical power requirements. Electrical energy requirements at Pantex would be approximately 53 percent of the site capacity. Available peak electrical load would be approximately 89 percent. It is expected that additional electrical capacity could be procured from the electric power provider to support the increased requirements. Impacts to fuel and process gases would be negligible for all candidate sites.

During construction there would be no in-migration at any CNPC candidate site. However, for operation of a CNPC there would be in-migration to all candidate sites to fill the 1,785 new jobs required to operate the CNPC. In most cases, vacancies in the existing housing stock would be sufficient. An increase in vehicle traffic associated with construction and operation would affect the roads and transportation network surrounding the alternative sites. The resulting impacts in traffic, congestion, and road accidents resulting from socioeconomic growth is unavoidable, but could be eased through upgrades to existing road systems.

During normal operations, a minimal amount of radioactive material and activation products would be released to the environment. However, any radiation dose received by a member of the public from emissions from the construction and operation of a CNPC would be too small to distinguish from naturally occurring background radiation. During normal operation, even with a strong as-low-as-reasonably-achievable (ALARA) program, workers would be exposed to an increased risk of cancer as a result of occupational exposure to radiation over an extended period.

Details about occupational exposure can be found in Chapter 5 in the Health and Safety Section for each candidate site.

In addition, because hazardous and toxic chemicals would be routinely handled at the various facilities, some worker exposure to these chemicals would be unavoidable. However, no onsite chemical concentrations would exceed the Occupational Exposure Limit guidelines. Analysis has shown that chemical pollutant emissions would be of minimal consequence and would not pose a danger to the public.

Operations at the facilities would generate a variety of wastes (including radioactive, hazardous, mixed, and sanitary) as an unavoidable result of normal operations. Although these sites use pollution prevention and waste avoidance measures, generation of chemical and radioactive wastes would be unavoidable. The sites would continue to further reduce hazards and potential exposures through the continued success of pollution prevention and waste avoidance measures. Details regarding waste generation, as well as other environmental impacts, are presented in Chapter 5.

If a site other than LANL is selected as the candidate site for a CNPC, plutonium operations at LANL’s TA-55 would be phased out with a resulting job loss of 610 persons, and Category I/II special nuclear material (SNM) moved to the CNPC. This would reduce the radiation dose to workers by 220 person-roentgen equivalent in man (person-rem). It would also reduce waste generation at LANL by approximately 11 percent for low level waste (LLW), 14 percent for mixed LLW, and 80 percent for transuranic (TRU) waste.

If TTR were to be closed, there would be major socioeconomic impacts for the town of Tonopah, Nevada. A loss of 120 jobs would pose a problem for the local economy, the existing school system, and the local housing market. If flight test operations were to be transferred to WSMR, there would be an increase in employment, although not the 120 lost from TTR, as existing staff at WSMR would be utilized. Additional information is discussed in Chapter 5.

Chapter 8

RELATIONSHIP BETWEEN SHORT-TERM AND LONG TERM USES

Chapter 8
RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM USES

In accordance with the *National Environmental Policy Act* (NEPA) (42 *United States Code* §4321 *et seq.)* requirements, this section discusses the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. It also examines long-term adverse cumulative impacts, with a focus on impacts that may narrow the range of options for future use. Potential impacts of the alternatives at the candidate sites are discussed in Chapter 5, and cumulative impacts are identified in Chapter 6. The use of land on any of the candidate sites for new programmatic-decision facilities would not affect the long-term productivity adversely since these facilities would all be constructed on disturbed land. In fact, since the new facilities would be technologically more advanced, they would be less polluting and generate less waste, thereby reducing the future need for use of additional land for the disposal of radiological and hazardous materials. At the same time, such facilities represent long-term research and development (R&D) and production functions compatible with historic nuclear weapons support.

Several of the project-specific alternatives could require the construction of new facilities at Nevada Test Site (NTS). These proposed facilities could compromise long-term habitat productivity. The range of the endangered desert tortoise lies in the southern third of NTS. Construction and operation of facilities associated with Flight Test Operations or Environmental Test Facilities have the potential to impact the habitat of the Federal-listed threatened desert tortoise. Measures designed to avoid impacts to the desert tortoise from previous projects at NTS have been implemented with mitigation measures developed in consultation with U.S. Fish and Wildlife Service (USFWS). These measures have proven to be effective. In addition, long-term effects are especially delicate at facilities located in the western United States such as Sandia National Laboratories (SNL), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and NTS, where biological communities recover very slowly from disturbances, and are particularly susceptible to soil erosion.

Losses of other terrestrial and aquatic habitat from natural productivity to accommodate new facilities and temporary disturbances required during construction are possible. Land clearing and construction activities resulting in large numbers of personnel and equipment moving about an area would disperse wildlife and temporarily eliminate habitat. Although some destruction would be inevitable during and after construction, these losses would be minimized by selection and through environmental reviews at the site-specific level. In addition, short-term disturbances of previously undisturbed biological habitat from the construction of new facilities could cause long-term reductions in the biological productivity of an area.

Potential termination of nuclear weapons activities at the Tonopah Test Range (TTR), Pantex Plant (Pantex) or Y-12 National Security Complex (Y-12) as well as reduced operations at other sites offer the possibility of restoring existing facilities at these sites to other purposes. Environmental restoration activities could have minor or short-term impacts similar to those normally associated with construction activities such as habitat disturbance and soil erosion. If contaminated structures were removed and site areas restored to a natural state, these areas could provide improved but not pristine conditions for the long-term.

Chapter 9
IRREVERSIBLE AND IRRETRIEVABLE RESOURCE COMMINTMENTS

Chapter 9
IRREVERSIBLE AND IRRETRIEVABLE RESOURCE COMMITMENTS

Operations at the alternative candidate site would require an irreversible and irretrievable commitment of resources. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. For example, as a landfill receives waste, the primary impact is a limit on waste capacity. The secondary impact is a limit on future land use options. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. This section discusses four major resources: land, energy, material, and water that have the potential to be committed irreversibly or irretrievably under the Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) alternatives.

9.1 LAND

The land requirements in support of Complex Transformation construction would be modest in relation to the existing nuclear weapons facilities and would represent an irreversible commitment of the land. Most of the larger facilities would be constructed on disturbed land. For the aboveground construction alternatives, the land would not be restored to its original condition and the land would not be available or suitable for other uses. The same is true of associated access roads. Once these facilities end their useful life, they could be returned to open space uses if the buildings, roads and other structures were removed, areas cleaned up, and the land revegitated. Alternatively, the facilities could be modified for use in other nuclear programs. Therefore, the commitment of this land is not completely irreversible.

However, land rendered unfit for other purposes, such as that set aside for radiological and hazardous chemical waste disposal facilities, or facilities which have experienced leaks or other such unplanned releases, represent an irreversible commitment because wastes and other radioactive or hazardous chemical substances in below-ground settings or disposal areas may not be completely removed at the end of the project’s useful life. It is possible that the land could not be restored to its original condition or even to minimum cleanup standards, nor could the site feasibly be used for any other purposes following closure of the disposal facility. This land could be permanently unusable because the substrata would not be available for other potential intrusive uses such as mining, utility infrastructure, or foundations for other buildings. However, the surface area appearance and biological habitat lost during construction and operation of the facilities could be restored to a large extent.

9.2 ENERGY

The irretrievable commitment of resources during construction and operation of the facilities would include the consumption of fossil fuels used to generate heat and electricity for the sites. Energy would also be expended in the form of diesel fuel, gasoline, and oil for construction equipment and transportation vehicles. The amounts of irretrievable energy required to construct and operate new or modified facilities are estimated in Chapter 3. Resource requirements for the larger construction alternatives are shown in Table 9.2-1 and Table 9.2-2.

Table 9.2-1—Irreversible and Irretrievable Construction Commitments

Requirement	Stand-alone CPC at SRS, Y-12, Pantex, NTS	CPC at LANL	LANL Upgrade TA-55/PF4	UPF at Y-12	CUC	AD/HE
Electrical Energy (MWh)	6,600	6,000	.3/1.5	26.4	30	277
Concrete (cubic yards)	308,000	280,000	3,715/32,750	200,000	230,000	324,500
Steel (tons)	44,000	40,000	401/3,850	27,500	29,500	18,050
Liquid Fuels (million gals)	4.8	4.4	0/0	.25	.325	21.35
Gases (cubic yards)	19,800	18,000	0/450	NA	NA	NA
Water (million gals)	20.9	20.9	2.1/.55	4	5.2	2.35
Total (worker years)	2900	2,650	1100/430	2,900	4000	6,800
Peak (workers)	850	770	300/190	900	1300	3,800

NA – Not Applicable

Table 9.2-2—Irreversible and Irretrievable Operation Commitments

Resources	CPC at LANL [200 pits per year (ppy) (surge)]	CPC at SRS, Y-12, Pantex, NTS [200 ppy (surge) plus R&D]	LANL Upgrade	UPF at Y-12	CUC	AD/HE
Electrical Consumption (MWh)	48,000	48,000	44,000	168,000	168,000	52,000
Peak Electrical (MWe)	22.0	24.0	10	18.4	18.4	11.9
Diesel Fuel (gallons)	21,000	23,000	NA	NA	NA	367
Nitrogen[c] (yd^3)	81,000	89,000	NA	NA	NA	NA
Argon[c] (yd^3)	2,000	2,200	NA	NA	NA	NA
Domestic Water (million gals)	14	15.5	10	.105	.105	130
Total workers	1,173	1,780	680	600	935	1,785
Radiation workers	675	1,150	458	315	490	400

NA – Not Applicable

9.3 MATERIAL

The irreversible and irretrievable commitment of material resources during the entire lifecycle of the existing or proposed facilities for Complex Transformation includes construction materials that cannot be recovered or recycled, materials that are rendered radioactive but cannot be decontaminated, and materials consumed or reduced to unrecoverable forms of waste. Where construction is necessary, materials required include wood, concrete, sand, gravel, plastics, steel, aluminum, and other metals. At this time, no unusual construction material requirements have been identified either as to type or quantity. The construction resources, except for those that can be recovered and recycled with present technology, would be irretrievably lost. However, none of these identified construction resources is in short supply and all are readily available in the vicinity of the locations being considered for new construction. The commitment of materials to be manufactured into new equipment that cannot be recycled at the end of the project's useful lifetime is irretrievable. Consumption of operating supplies, miscellaneous chemicals, and gases, while irretrievable, would not constitute a permanent drain on local sources or involve any material in critically short supply in the United States as a whole. Materials consumed or reduced to unrecoverable forms of waste, such as uranium, are also irretrievably lost. However, strategic and critical materials, or resources having small natural reserves, are of such value that economics promotes recycling. Plans to recover and recycle as much of these valuable, depletable resources as is practical would depend upon need. Each item would be considered individually at the time a recovery decision is required. Some of the larger material needs for construction and operation of the major proposed facilities are shown in Table 9.2-1 and Table 9.2-2.

9.4 WATER

Water is a scarce resource in many parts of the United States, and must not be taken for granted. Many of the Complex Transformation new construction alternatives have large water requirements, even though they have used all existing conservation technology available and designed product fabrication practices to minimize water needs. To the extent water is recoverable it has been designed into the facility planning process. None of the water requirements for any of the new construction alternatives and alternative siting locations pose any issues. Water requirements for construction and operation of the larger alternative new construction facilities are shown in Table 9.2-1 and Table 9.2-2.

Chapter 10

COMPLIANCE, REGULATORY REQUIREMENT, PERMITS

Chapter 10
COMPLIANCE, REGULATORY REQUIREMENT, PERMITS

This chapter provides information concerning the environmental standards that regulate or guide proposed plans presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement *(SPEIS). This section presents primary environmental compliance requirements that would result from implementation of the proposed action or alternatives. These requirements are found in Federal and State statutes, regulations, permits, approvals, and consultations, and in Executive and U.S. Department of Energy (DOE) orders, consent orders, and a Federal Facility Agreement. These citations identify the standards to be used for evaluating the ability of the alternative actions to meet the environmental, safety, and health requirements and for obtaining required Federal and state permits and licenses.*

10.0 INTRODUCTION

As mandated by the *National Environmental Policy Act* (NEPA), the *Complex Transformation Supplemental Programmatic Environmental Impact Statement* (SPEIS) must assess whether the proposed action and alternatives would result in a violation of a Federal, State, or local law or requirement imposed for the protection of the environment (40 Code of Federal Regulations [CFR] 1508.27), or necessitate a permit, license, or other entitlement (40 CFR 1502.25). This chapter provides a baseline summary assessment of the environmental, safety and health (ES&H) requirements that apply to the proposed action and alternatives, to the extent necessary to assist in making programmatic-level decisions. These requirements include Federal and State statutes, regulations, permits, approvals, and consultations, as well as executive orders and DOE orders, consent orders, Federal Facility Agreements, Federal Facility Compliance Agreements (FFCA), and agreements in principle that identify the standards against which the proposed action and alternatives will be evaluated to ensure compliance with all applicable ES&H requirements, and to obtain the required Federal, State, and local permits, licenses, and approvals.

The remainder of this chapter explains the concept of shared Federal and State enforcement, provides historical background on environmental protection at nuclear weapons production facilities, and summarizes the ES&H requirements associated with proposed action and alternatives.

10.1 PURPOSE

Federal and State governments mandate ES&H requirements for operations at current DOE facilities and newly constructed or proposed facilities. These requirements originate with the U.S. Congress, Federal agencies, Executive orders, State legislatures, State agencies, and local governments. In general, Federal statutes establish national policies, create broad legal requirements, and authorize Federal agencies to create regulations that conform to statutes. These statutes are delegated to various Federal agencies, including the DOE, U.S. Environmental Protection Agency (EPA), and the U.S. Department of Transportation (DOT), which promulgate implementing regulations. Executive orders are issued by the President and establish policies and requirements for Federal agencies, but do not have the force of law of regulations. State legislatures issue their own statues to authorize and mandate promulgation of State regulations. State statutes, like Federal statues, establish broad legal requirements. State regulations are then promulgated by State agencies to enforce State statutes.

The FFCA waives sovereign immunity from enforcement of the *Resource Conservation and Recovery Act* (RCRA) at Federal facilities and thereby gives States the authority to assess fines and penalties under certain conditions. It further requires DOE to develop plans and enter into agreements with States as to specific management actions for particular mixed waste streams. Such agreements could have a direct effect on the wastes generated as a result of the implementation of the proposed action and alternatives, yet such an effect cannot be determined until such time as these agreements are approved according to the terms of the FFCA.

Some environmental regulatory programs are enforced through review, approval, and permitting requirements that attempt to minimize the negative impacts from releases of pollutants to the environment by limiting activities to established standards. Federal and State agencies share environmental regulatory authority over DOE facility operations when Federal legislation delegates permitting or review authority to qualifying States. Some examples are the following: National Emission Standards for Hazardous Air Pollutants (NESHAP) and the Prevention of Significant Deterioration under the *Clean Air Act* (CAA); the Water Quality Standards and the National Pollutant Discharge Elimination System (NPDES) under the *Clean Water Act* (CWA); the Hazardous Waste Programs under RCRA; and the Drinking Water and Underground Injection Control Programs under the *Safe Drinking Water Act* (SDWA). When Federal legislation allows delegation of enforcement authority, States must set standards equal to or more stringent than those required by Federal law to obtain such authority. Where the Federal regulatory agency has delegated its authority, the State or local regulations set the governing standards; however, when Federal legislation does not provide for delegation of enforcement authority to the States (e.g., the *Toxic Substances Control Act* [TSCA]), the standards are administered and enforced solely by the Federal Government.

The health and safety of all workers associated with the proposed action and alternatives is a primary consideration in the programmatic decision resulting from this Supplemental PEIS. A comprehensive nuclear and occupational safety and health initiative was announced by the Secretary of Energy on May 5, 1993, entailing closer consultation with the Occupational Safety and Health Administration (OSHA) regarding regulation of worker safety and health at DOE contractor-operated facilities. Regulation of worker health and safety at DOE contractor-operated facilities will gradually shift from DOE to OSHA. The *Occupational Safety and Health Act* of 1970 (Public Law 91-596) establishes Federal requirements for ensuring occupational safety and health protection for employees. DOE facilities also comply with the *Emergency Planning and Community Right-To-Know Act* (EPCRA) (42 U.S.C. 11001), which requires facilities to report the release of extremely hazardous substances and other specified chemicals; to provide material safety data sheets or lists thereof; and to provide estimates of the amounts of hazardous chemicals onsite. The reporting and emergency preparedness requirements are designed to protect both individuals and communities.

10.2 BACKGROUND

Since a large number of the facilities in the Nation's Nuclear Weapons Complex (Complex) were constructed in the 1940s and 1950s, before the advent of most ES&H requirements, national security requirements played a dominant role in the design and operation of those facilities. However, with the emerging awareness of environmental and health-related issues and the enactment of environmental and worker safety and health programs, DOE began shifting its resources into programs designed to achieve compliance with all applicable Federal, State, and local ES&H requirements. Today, many government agencies at the Federal, State, and local levels have regulatory authority over DOE facility operations. DOE has entered into enforceable compliance agreements with the regulators at most of its facilities. These agreements detail specific programs, funding levels, and schedules for achieving compliance with applicable ES&H statutory and regulatory requirements.

10.3 FEDERAL ENVIRONMENTAL, SAFETY & HEALTH STATUTES, REGULATIONS, ORDERS, AND AGREEMENTS

The *Atomic Energy Act* of 1954, as amended, directs DOE to protect public health and minimize dangers to life or property with respect to activities under its jurisdiction. The EPA, under authority of the *Atomic Energy Act*, has set radiation protection standards for workers and the public. EPA has also promulgated Federal environmental regulations and implemented statutes to protect the environment and to control the generation, handling, treatment, storage, and disposal of hazardous materials and waste substances.

Because of their length, and for ease of reading, the tables in this chapter are presented consecutively at the end of the text. Table 10.4-1 lists the applicable Federal environmental statutes, regulations, and Executive Orders, and also identifies the associated permits, approvals, and consultations generally required to site, construct, or operate stockpile stewardship and management facilities. Except for limited presidential exemptions, Federal agencies must comply with all applicable provisions of Federal environmental statutes and regulations, in addition to all applicable State and local requirements. Table 10.4-2 lists selected DOE ES&H orders that apply to all sites, but which may affect each site differently.

DOE has entered into agreements with regulatory agencies on behalf of all of DOE facilities being considered in this Supplemental Programmatic Environmental Impact Statement (SPEIS). These agreements normally establish a schedule for achieving full compliance at these DOE facilities. Table 10.4-3 lists those environmental agreements and consent orders that DOE has with Federal and State regulatory agencies. These agreements and consent orders are generally available from the regulatory agency that is a party to the agreement, normally the State environmental department or EPA region, and also from the local DOE information resource center or reading room.

10.4 STATE ENVIRONMENTAL, SAFETY & HEALTH REQUIREMENTS

Table 10.4-4 lists the potential requirements imposed by the major State environmental statutes and regulations applicable to the proposed action and alternatives. These requirements apply to

Federal activities within the jurisdiction of the enforcing authority. Just as Table 10.4-1 identifies requirements based on Federal laws, Table 10.4-4 identifies the permits, approvals, and consultations generally required to site, construct, or operate DOE facilities in accordance with state statutes and regulations.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
Air and Noise	*Clean Air Act* of 1970, as amended	42 U.S.C. 7401 *et seq.*	EPA	Requires sources to meet standards and obtain permits to satisfy; National Ambient Air Quality Standards, State Implementation Plans, Standards of Performance for New Stationary Sources, National Emission Standards for Hazardous Air Pollutants, and Prevention of Significant Deterioration.
	National Ambient Air Quality Standards/State Implementation Plans	42 U.S.C. 7409 *et seq.*	EPA	Requires compliance with primary and secondary ambient air quality standards governing sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter and emission limits/reduction measures as designated in each State's implementation plan.
	Standards of Performance for New Stationary Sources	42 U.S.C. 7411	EPA	Establishes emission standards and recordkeeping requirements for new or modified sources specifically addressed by a standard.
	National Emissions Standards for Hazardous Air Pollutants	42 U.S.C. 7412	EPA	Requires sources to comply with emission levels of carcinogenic or mutagenic pollutants; may require a preconstruction approval depending on the process being considered and the level of emissions that will result from the new or modified source.
	Prevention of Significant Deterioration	42 U.S.C. 7470 *et seq.*	EPA	Applies to areas that are in compliance with National Ambient Air Quality Standards. Requires comprehensive preconstruction review and the application of Best Available Control Technology to major stationary sources (emissions of 100 tons/yr) and major modifications; requires a preconstruction review of air quality impacts and the issuance of a construction permit from the responsible State agency setting forth emission limitations to protect the Prevention of Significant Deterioration increment.
	Noise Control Act of 1972, as amended	42 U.S.C. 4901 *et seq.*	EPA	Requires facilities to maintain noise levels that do not jeopardize public health and safety.
Water	*Clean Water Act*, as amended	33 U.S.C. 1251 *et seq.*	EPA	Requires EPA or state-issued permits and compliance with provisions of permits regarding discharge of effluents (pollutants) to surface waters.
	National Pollutant Discharge Elimination System (section 402 of the CWA)	33 U.S.C. 1342	EPA	Requires permit to discharge effluents and storm waters to surface waters; permit modifications are required if discharge effluents are altered.
	Dredged or Fill Material (section 404 of the CWA), *Rivers and Harbors Appropriations Act* of 1899	33 U.S.C. 1344/ 33 U.S.C. 401 *et seq.*	U.S. Army Corps of Engineers (USACE)	Requires permits to authorize the discharge of dredged or fill material into navigable waters or wetlands and to authorize certain work in or structures affecting navigable waters.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
Water (*cont'd*)	*Wild and Scenic Rivers Act* of 1968	16 U.S.C. 1271 *et seq.*	U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), U.S. Forest Service (USFS), National Park Service (NPS)	Consultation required before construction of any new Federal project associated with a river designated as wild and scenic or under study in order to minimize and mitigate any adverse effects on the physical and biological properties of the river.
	Safe Drinking Water Act of 1974, as amended	42 U.S.C. 300f *et seq.*	EPA	Requires permits for construction/operation of underground injection wells and subsequent discharging of effluents to ground aquifers.
	Executive Order 11988: Floodplain Management	3 CFR, 1977 Comp., p. 117	Water Resources Council, Federal Emergency Management Agency (FEMA), Council on Environmental Quality (CEQ)	Requires consultation if project impacts a floodplain.
	Executive Order 11990: Protection of Wetlands	3 CFR, 1977 Comp., p. 121	USACE, USFWS	Requires Federal agencies to avoid the long- and short-term adverse impacts associated with the destruction or modification of wetlands.
	Compliance with Floodplain/Wetlands Environmental Review Requirements	10 CFR 1022	DOE	Requires DOE to comply with all applicable floodplain/wetlands environmental review requirements.
Hazardous Wastes and Soils	*Resource Conservation and Recovery Act*/Hazardous and Solid Waste Amendments of 1984	42 U.S.C. 6901 *et seq.*/PL 98-616	EPA	Requires notification and permits for operations involving hazardous waste treatment, storage, or disposal facilities; changes to site hazardous waste operations could require amendments to hazardous waste permits.
	Comprehensive Environmental Response, Compensation, and Liability Act of 1980/*Superfund Amendments and Reauthorization Act* of 1986	42 U.S.C. 9601 *et seq.*/PL 99-499	EPA	Requires cleanup and notification if there is a release or threatened release of a hazardous substance; requires DOE to enter into Interagency Agreements with the EPA and State to control the cleanup of each DOE site on the National Priorities List.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
Hazardous Wastes and Soils (*cont'd*)	Executive Order 12580: Superfund Implementation	3 CFR, 1987 Compilation., p. 193	EPA	DOE shall comply with the National Contingency Plan in addition to the other requirements of the order, as amended.
	Community Environmental Response Facilitation Act of 1992	PL 102-426	EPA	Amends the *Comprehensive Environmental Response, Compensation, and Liability Act* to establish a process for identifying, prior to the termination of Federal activities, property that does not contain contamination. Requires prompt identification of parcels that will not require remediation to facilitate the transfer of such property for economic redevelopment purposes.
	Farmland Protection Policy Act of 1981	7 U.S.C. 4201 *et seq.*	Soil Conservation Service	DOE shall avoid any adverse effects to prime and unique farmlands.
	Federal Facility Compliance Act of 1992	42 U.S.C. 6961	States	Waives sovereign immunity for Federal facilities under the *Resource Conservation and Recovery Act* and requires DOE to develop plans and enter into agreements with states as to specific management actions for specific mixed waste streams.
Biotic	*Fish and Wildlife Coordination Act* of 1934	16 U.S.C. 661 *et seq.*	USFWS	Requires consultation on the possible effects on wildlife if there is construction, modification, or control of bodies of water in excess of 10 acres (4 hectares) surface area.
	Bald and Golden Eagle Protection Act of 1973, as amended	16 U.S.C. 668 *et seq.*	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, DOE must obtain a permit prior to moving any nests due to construction or operation of project facilities.
	Migratory Bird Treaty Act of 1918, as amended	16 U.S.C. 703 *et seq.*	USFWS	Requires consultation to determine if there are any impacts on migrating bird populations due to construction or operation of project facilities. If so, DOE will develop mitigation measures to avoid adverse effects.
	Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds	66 FR 3853	USFWS	DOE shall take measures to develop and implement a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service that shall promote the conservation of migratory bird populations.
Biotic (*cont'd*)	*Wilderness Act* of 1964	16 U.S.C. 1131 *et seq.*	Department of Commerce (DOC), Department of Interior (DOI)	DOE shall consult with the Department of Commerce and Department of the Interior (DOI) and minimize impacts.
	Wild Free-Roaming Horses and Burros Act of 1971	16 U.S.C. 1331 *et seq.*	DOI	DOE shall consult with the DOI and minimize impacts.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
	Endangered Species Act of 1973	16 U.S.C. 1531 *et seq.*	USFWS, National Marine Fisheries Service (NMFS)	Requires consultation to identify endangered or threatened species and their habitats, assess DOE impacts thereon, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations.
Cultural	*National Historic Preservation Act* of 1966, as amended	16 U.S.C. 470 *et seq.*	President's Advisory Council on Historic Preservation	DOE shall consult with the State Historic Preservation Office prior to construction to ensure that no historical properties will be affected.
	Executive Order 13007: Indian Sacred Sites	61 FR 26771	DOE	DOE shall accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.
	Executive Order 13175: Consultation and Coordination With Indian Tribal Governments	65 FR 67249	DOE	DOE shall establish regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies with tribal implications, strengthen U.S. government-to-government relations with Indian tribes, and reduce imposition of unfunded mandates upon Indian tribes.
	Archaeological and Historical Preservation Act of 1974	16 U.S.C. 469 *et seq.*	DOI	DOE shall obtain authorization for any disturbance of archeological resources.
	Archaeological Resources Protection Act of 1979	16 U.S.C. 470aa *et seq.*	DOI	DOE shall obtain authorization for any excavation or removal of archeological resources.
	Antiquities Act of 1906	16 U.S.C. 431-33	DOI	DOE shall comply with all applicable sections of the act.
	American Indian Religious Freedom Act of 1978	42 U.S.C. 1996	DOI	DOE shall consult with local Native American Indian tribes prior to construction to ensure that their religious customs, traditions, and freedoms are preserved.
	Native American Graves Protection and Repatriation Act of 1990	25 U.S.C. 3001	DOI	DOE shall consult with local Native American Indian tribes prior to construction to guarantee that no Native American graves are disturbed.
	Executive Order 11593: Protection and Enhancement of the Cultural Environment	3 CFR 154, 1971-1975 Compilation, p. 559	DOI	DOE shall aid in the preservation of historic and archeological data that may be lost during construction activities.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
Worker Safety and Health	*Occupational Safety and Health Act* of 1970	5 U.S.C. 651	Occupational Safety and Health Administration	DOE shall comply with all applicable worker safety and health legislation (including guidelines of 29 CFR Part 1960) and prepare, or have available in the workplace, Material Safety Data Sheets.
	Hazard Communication Standard	29 CFR 1910.1200	OSHA	DOE shall ensure that workers are informed of, and trained to handle, all chemical hazards in the DOE workplace.
Other	*Atomic Energy Act* of 1954, as amended	42 U.S.C. 2011	EPA and DOE	DOE shall follow its own standards and procedures to ensure the safe operation of its facilities.
	National Environmental Policy Act of 1969, as amended	Under the authority of 42 U.S.C. 4321 *et seq.* and in accordance with 10 CFR Part 1021	CEQ and DOE	DOE shall comply with NEPA implementing procedures.
	Uranium Mill Tailings Radiation Control Act of 1978	42 U.S.C. 7901 *et seq.*	EPA	DOE shall enforce and implement health and environmental standards and acquire licenses when required.
	Toxic Substances Control Act of 1976	15 U.S.C. 2601 *et seq.*	EPA	DOE shall comply with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals; TSCA imposes strict limitations on use and disposal of polychlorinated biphenyl-contaminated equipment.
	Hazardous Materials Transportation Act of 1975, as amended	49 U.S.C. 1801 *et seq.*	DOT	DOE shall comply with the requirements governing hazardous materials and waste transportation.
	Hazardous Materials Transportation Uniform Safety Act of 1990	49 U.S.C. 1801	DOT	Restricts shippers of highway route-controlled quantities of radioactive materials to use-only permitted carriers.
	Emergency Planning and Community Right-To-Know Act of 1986	42 U.S.C. 11001 *et seq.*	EPA	Requires the development of emergency response plans and reporting requirements for chemical spills and other emergency releases, and imposes right-to-know reporting requirements covering storage and use of chemicals which are reported in toxic chemical release forms.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
	Pollution Prevention Act of 1990 under the provision of the *Superfund Amendments and Reauthorization Act* (SARA).	42 U.S.C. 13101 and section 313 of SARA	EPA	Establishes a national policy that pollution should be reduced at the source and requires a toxic chemical source reduction and recycling report for an owner or operator of a facility required to file an annual toxic chemical release form under section 313 of SARA .
Other (*cont'd*)	Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations as amended by Executive Order 12948	3 CFR, 1994, Compilation, p. 859 February 11, 1994 amended January 30, 1995	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
	Executive Order 12088: Federal Compliance with Pollution Control Standards, as amended by Executive Order 12580 added "Superfund Implementation" to the end of Executive Order 12088	3 CFR, 1978 Compilation, p. 243	Office of Management and Budget (OMB)	Requires Federal agencies landlords to submit to OMB an annual plan for the control of environmental pollution and to consult with EPA and State agencies regarding the best techniques and methods.
	Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management	72 FR 3919 January 26, 2007	DOE, CEQ,OMB and the Federal Environmental Executive	Requires Federal agencys to employ a range of actions to reduce energy and water consumption, use of efficient vehicles and energy conservation in new buildings
	Executive Order 11514: Protection and Enhancement of Environmental Quality	3 CFR, 1966-1970 Compilation., p. 902	CEQ	Requires Federal agencies to demonstrate leadership in achieving the environmental quality goals of NEPA; provides for DOE consultation with appropriate Federal, State, and local agencies in carrying out their activities as they affect the environment.

Table 10.4-1—Federal Environmental, Safety & Health Statutes, Regulations, and Orders (continued)

Resource Category	Statute/Regulation/Order	Citation	Responsible Agency	Potential Applicability
	Nuclear Waste Policy Act of 1982	Under the authority of 42 U.S.C. 108 10101 *et seq.* and in accordance with 40 CFR Part 191	EPA	DOE shall dispose of radioactive waste.
	Low-Level Radioactive Waste Policy Act of 1954	42 U.S.C. 2021b-2021d	DOE	DOE shall dispose of low-level radioactive wastes in accordance with the States in which it operates.

Table 10.4-2—Selected Department of Energy Orders

DOE Order	Title
231.1A	Environmental Safety and Health Reporting
414.1C	Quality Assurance
420.1B	Facility Safety
430.1B	Real Property Asset Management
430.2.B	Renewable Energy and Transportation Management
435.1	Radioactive Waste Management
440.1B	Worker Protection Management for DOE Federal and Contractor Employees
450.1A	Environmental Protection Program
451.1B	National Environmental Policy Act Compliance Program
460.1B	Packaging and Transportation Safety
460.2B	Departmental Materials Transportation and Packaging Management
461.1A	Packaging and Transfer or Transportation of Materials of National Security Interest
470.4A	Safeguards and Security Program
5400.5	Radiation Protection of the Public and Environment
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.19	Conduct of Operations Requirements for DOE Facilities

Table 10.4-3—Agreements With Federal and State Environmental Regulatory Agencies

DOE Facility	Resource Category	Parties	Scope of Agreement	Effective Date
LANL	Water	DOE/EPA	CWA-NPDES compliance agreement	1991
	Water/Soil	DOE/NMED	The Compliance Order on Consent pertains to waste site investigations, corrective actions, and monitoring. IV.A.5 of the Order relates to Firing Sites, specifically deferring investigation or corrective action at active firing sites.	2005
LLNL, SNL/CA	Water	DOE/EPA/CA-RWQCB, CA-Dept. Health Services	Federal Facility Agreement-Regulates groundwater cleanup activities at LLNL under CERCLA/SARA Section 120	1988
	Water/Soil	DOE/EPA/CAEPA Department of Toxic Substances Control/RWQCB	CERCLA-Federal Facility Agreement describes the groundwater and soil investigations to be conducted at Site 300 and specifies reporting dates.	1992
	Air/Soil	DOE/EPA/CAEPA Department of Toxic Substances Control	Hazardous Waste Compliance Agreement 92/93-031 governing open burning of explosives wastes at Site 300.	1992
SNL/NM	Soil	DOE/NM	RCRA-Groundwater monitoring at chemical waste landfill	1989
SRS	Air	DOE/EPA	CAA-FFCA, Radionuclide NESHAP	1991
	Soil	DOE/SC	RCRA-Settlement Agreement 87-52-SW with amendment, Part B application deficiencies; groundwater monitoring	1987, 1991
	Soil	DOE/EPA	RCRA-FFCA for land disposal restrictions, with amendment 1, Docket No. 91-01-FFR	1991, 1992
	Soil	DOE/EPA/SC	CERCLA/RCRA-Federal Facility Agreement	1993
	Cultural	DOE/SHPO ACHP	Programmatic Memorandum of Agreement–Management of Archaeological Sites	1990

Table 10.4-3—Agreements With Federal and State Environmental Regulatory Agencies (continued)

DOE Facility	Resource Category	Parties	Scope of Agreement	Effective Date
ORR, Y-12	Air	DOE/EPA	CAA-FFCA, Radionuclide NESHAP	1992
	Soil	DOE/EPA/TN	CERCLA-Federal Facility Agreement	1992
	Soil	DOE/EPA	RCRA-FFCA for storage of mixed waste subject to land disposal restrictions	1992
	Soil	DOE/EPA/TN	Federal Facility Compliance Act Commissioners Order ORR Site-Specific Treatment Plan for Mixed Waste	1995
	All except Radiological	DOE/TN Dept. of Environment and Conservation	Oversight of environmental monitoring programs	1991
	Cultural	DOE/TN	DOE commitment to prepare a cultural resource management plan for ORR and to conduct a survey to identify significant historical properties located within the ORR; interim programmatic exclusions from Section 106 review	1994
NTS	Air/Water	DOE/NV	Agreement in Principle for DOE to provide funding to Nevada for oversight of environmental, safety and health activities	1990
	Soil	DOE/NV	RCRA-Settlement Agreement-TRU mixed waste	1992
	Cultural	DOE/NV	Programmatic Agreement-Archaeological and Historic Preservation activities	1993
	Water/Soil	DOE/NV/DoD	Federal Facility Agreement and Consent Order outlines a schedule for cleanup and monitoring commitments	1996
Pantex	Soil	DOE/EPA	RCRA-Section 3008 (h) Administrative Order on Consent	1990
TTR	Soil	DOE/NV/DoD	FFCA	1996
WSMR	Cultural	DOE/NM	As per an agreement between WSMR and the State Historic Preservation Office (SHPO) construction of new permanent structures is not permitted within the boundaries of the Trinity National Historic Landmark.	
	Biotic	U.S. Army/National Parks Service/U.S. Fish and Wildlife Service/New Mexico Department of Game and Fish	Cooperative agreement for protection and maintenance of the White Sands pupfish	1994

Table 10.4-4—State Environmental, Safety & Health Requirements

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
		New Mexico (LANL, SNL, WSMR)		
Air	*New Mexico Air Quality Control Act*	NM Stat., Title 74, Article 2	NM Environment Department	Permit required prior to the construction or modification of an air contaminant source.
	New Mexico Air Quality Standards and Regulations	NM Air Quality Control Regulations, 100	NM Environment Department	Permit required prior to the construction or modification of an air contaminant source.
Water	*New Mexico Water Quality Act*	NM Stat., Title 74, Article 6	NM Water Quality Control Commission	Permit required prior to the construction or modification of a water discharge source.
	New Mexico Water Quality Regulations	NM Water Regulations	NM Water Quality Control Commission	Permit required prior to the construction or modification of a water discharge source.
Hazardous Wastes and Soils	*New Mexico Solid Waste Act*	NM Stat., Chap. 74, Article 8	NM Environment Department	Permit required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Solid Waste Management Regulations	NM Solid Waste Mgmt. Regulations	NM Environment Department	Permit required prior to the construction or modification of a solid waste disposal facility.
	New Mexico Hazardous Waste Management Regulations	NM Hazardous Waste Mgmt. Regulations	NM Environment Department	Permit required prior to the construction or modification of a hazardous waste disposal facility.
	New Mexico Underground Storage Tank Regulations	NM Underground Storage Tank Regulations	NM Environment Department	Permit required to comply with tank requirements prior to the construction or modification of an underground storage tank.
Biotic	*New Mexico Wildlife Conservation Act*	NM State Act 1978, Sections 17-2-37 through 17-2-46	NM Department of Game and Fish	Permit and coordination required if a project may disturb habitat or otherwise affect threatened or endangered species.
	New Mexico Endangered Plant Species Act	NM State Act 1978, Sections 75-6-1	NM State Forestry Department	Coordination with the department required.
Cultural	*New Mexico Cultural Properties Act*	NM State Act 1978, Sections 18-6-1 through 18-6-23	NM State Historic Preservation Office	Established State Historic Preservation Office and requirements to prepare an archaeological and historic survey and consult with the State Historic Preservation Office.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
California (LLNL)				
Air	*California Clean Air Act*	CA Health and Safety Code, Sections 39000 *et seq.*	CA Environmental Protection Agency, Air Resources Board and local districts	Permit required prior to construction or modification of an air contaminant source.
	Air Toxics "Hot Spots" Information and Assessments Act	CA Health and Safety Code, Sections 44300 *et seq.*	CA Environmental Protection Agency, Air Resources Board and local districts	Screening Risk Assessment required to estimate human health impacts to a resident living near the boundary of the site.
	California Global Solutions Act of 1966	AB32	CA Environmental Protection Agency, Air Resources Board and local districts	Establishes a comprehensive program of regulatory and market mechanisms to achieve reductions of greenhouse gas emissions.
	California Environmental Quality Act	CA Public Resources Code, section 21081.6	CA Environmental Protection Agency	Requires evaluation of environmental impacts associated with permitting decisions.
Water	*California Porter-Cologne Water Quality Act*	Water Code, Sections 13000 *et seq.*	CA Environmental Protection Agency, Water Resources Control Board and Regional Water Quality Control Boards	Permit required prior to construction or modification of water discharges sources.
	California Environmental Quality Act	CA Public Resources Code, section 21081.6	CA Environmental Protection Agency	Requires evaluation of environmental impacts associated with permitting decisions.
Hazardous Wastes and Soils	*California Hazardous Waste Control Act*	CA Health and Safety Code, Sections 25100 *et seq.*	CA Environmental Protection Agency, Department of Toxic Substances Control	Permit required prior to construction or modification of hazardous waste management facility.
	The Hazardous Waste Source Reduction and Management Review Act of 1989	CA Health and Safety Code, Sections 25244.12 *et seq.*	CA Environmental Protection Agency, Department of Toxic Substances Control	Requires reports and plans describing how mandatory percentage reductions in waste streams will be achieved.
	"Hazardous Materials" Department of the California Highway Patrol	13 C.C.R, Chapter 6	CA Highway Patrol	Defines routes, stopping places, and rules of the road for transportation of hazardous materials.
	California Environmental Quality Act	CA Public Resources Code, section 21081.6	CA Environmental Protection Agency	Requires evaluation of environmental impacts associated with permitting decisions.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
Biotic	*California Endangered Species Act*	CA Fish and Game Code, Sections 2050-2098	CA Department of Fish and Game	States that agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species or result in destruction or adverse modification of habitat essential to the continued existence of those species if conservation alternatives are reasonable and prudent.
Cultural	*California Environmental Quality Act*	CA Public Resources Code, Section 21083.2	CA Office of Planning and Research	Requires consideration of the effects of a project on prehistoric and historic cultural resources.
		South Carolina and Georgia (SRS)		
Air	*South Carolina Pollution Control Act*/South Carolina Air Pollution Control Regulations and Standards	SC Code, Title 48, Chapter 1	SC Dept. of Health and Environmental Control (SCDHEC)	Permit required prior to construction or modification of an air contaminant source.
	Augusta-Aiken Air Quality Control Region	40 CFR 81.114	SC and GA	Requires SRS and surrounding communities in the 2-state region to attain National Ambient Air Quality Standards (NAAQS).
	South Carolina Atomic Energy & Radiation Control Act	SC Code, Title 13, Chapter 7	SCDHEC	Establishes standards for radioactive air emissions.
Water	*South Carolina Pollution Control Act*	SC Code, Title 48, Chapter 1	SCDHEC	Permit required prior to construction or modification of a water discharge source.
	South Carolina Water Quality Standards	SC Code, Title 61, Chapter 68	SCDHEC	Permit required prior to construction or modification of a water discharge source.
	South Carolina Safe Drinking Water Act	SC Code, Title 44, Chapter 55	SCDHEC	Establishes drinking water standards.
Hazardous Wastes and Soils	*South Carolina Underground Storage Tanks Act*	SC Code, Title 44, Chapter 2	SCDHEC	Permit required prior to construction or modification of an underground storage tank.
	South Carolina Solid Waste Regulations	SC Code, Title 61, Chapter 60	SCDHEC	Permit required to store, collect, dispose, or transport solid wastes.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
Hazardous Wastes and Soils	South Carolina Industrial Solid Waste Disposal Site Regulations	SC Code, Title 61, Chapter 66	SC Pollution Control Authority	Permit required for industrial solid waste disposal systems.
	South Carolina Hazardous Waste Management Act	SC Code, Title 44, Chapter 56	SCDHEC	Permit required to operate, construct, or modify a hazardous waste treatment, storage, or disposal facility.
	South Carolina Solid Waste Management Act	SC Code, Title 44, Chapter 96	SCDHEC	Establishes standards to treat, store, or dispose of solid waste.
Biotic	*South Carolina Nongame and Endangered Species Conservation Act*	SC Code, Title 50, Chapter 15	SC Department of Natural Resources	Consult with SC Wildlife and Marine Resources Department and minimize impact.
Cultural	South Carolina Institute of Archaeology and Anthropology	SC Code, Title 60, Chapter 13-210	SC State Historic Preservation Office	Consult with SC State Historic Preservation Office and minimize impact.
Tennessee (Y-12)				
Air	Tennessee Air Pollution Control Regulations	TN Rules, Division of Air Pollution	TN Air Pollution Control Board	Permit required to construct, modify, or operate an air contaminant source; sets fugitive dust requirements.
Water	*Tennessee Water Quality Control Act*	TN Code, Title 69, Chapter 3	TN Water Quality Control Board	Authority to issue new or modify existing NPDES permits required for a water discharge source.
Hazardous Wastes and Soils	Tennessee Underground Storage Tank Program Regulations	TN Rules, Chapter 1200-1-15	TN Division of UST Programs	Permit required prior to construction or modification of an underground storage tank.
	Tennessee Hazardous Waste Management Act	TN Code, Title 68, Chapter 46	TN Division of Solid Waste Management	Permit required to construct, modify, or operate a hazardous waste treatment, storage, or disposal facility.
	Tennessee Solid Waste Processing and Disposal Regulations	TN Rules, Chapter 1200-1-7	TN Division of Solid Waste Management	Permit required to construct or operate a solid waste processing or disposal facility.
Biotic	Tennessee State Executive Order on Wetlands	TN State Executive Order	TN Division of Water Quality Control	Consultation with responsible agency.
	Tennessee Threatened Wildlife Species Conservation Act of 1974	TN Code, Title 70, Chapter 8	TN Wildlife Resources Agency	Consultation with responsible agency.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
	Tennessee Rare Plant Protection and Conservation Act of 1985	TN Code, Title 70, Chapter 8-301 *et seq.*	TN Wildlife Resources Agency	Consultation with responsible agency.
	Tennessee Water Quality Control Act	TN Code, Title 69, Chapter 3	TN Division of Water Quality Control	Permit required prior to alteration of a wetland.
Cultural	Tennessee Desecration of Venerated Objects	TN Code, Title 39, Chapter 17-311	TN Historical Commission	Forbids a person to offend or intentionally desecrate venerated objects including a place of worship or burial.
	Tennessee Abuse of Corpse	TN Code, Title 39, Chapter 17-312	TN Historical Commission	Forbids a person from disinterring a corpse that has been buried or otherwise interred.
	Native American Indian Cemetery Removal and Reburial	TN Comp. Rules and Regulations, Chapter 400-9-1	TN Historical Commission	Requires notification if Native American Indian remains are uncovered.
	Tennessee Protective Easements	TN Code, Title 11, Chapter 15-101	TN State Government	Grants power to the state to restrict construction on land deemed as a "protective" easement.
		Nevada (NTS, TTR)		
Air	Nevada Air Pollution Control Law	NV Statutes, Title 40	NV State Environmental Commission	Permit required prior to construction or modification of an air contaminant source.
	Nevada Air Quality Regulations	NV Admin. Code, Chapter 445	NV State Environmental Commission	Permit required prior to construction or modification of an air contaminant source.
Water	Nevada Water Pollution Control Law	NV Statutes, Title 40, Chapter 445	NV Division of Environmental Protection	Permit required prior to construction or modification of a water discharge source.
	Nevada Water Pollution Control Regulations	NV Admin. Code, Chapter 445	NV Division of Environmental Protection	Permit required prior to construction or modification of a water discharge source.
Hazardous Wastes and Soils	Nevada Underground Storage Tank Rules	NV Admin. Code, Chapter 459	NV Division of Environmental Protection	Permit required prior to construction or modification of an underground storage tank.
Hazardous Wastes and Soils (cont'd)	Nevada Solid Waste Disposal Law	NV Statutes, Title 40, Chapter 444	NV Division of Environmental Protection	Permit required prior to construction or modification of a solid waste disposal facility.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
	Nevada Solid Waste Disposal Regulations	NV Admin. Code, Chapter 44	NV Division of Environmental Protection	Permit required prior to construction or modification of a solid waste disposal facility; permit for septage hauling may be required.
	Nevada Hazardous Waste Disposal Law	NV Statutes, Title 40, Chapter 459	NV Division of Environmental Protection	Permit required prior to construction or modification of a hazardous waste disposal facility.
	Nevada Hazardous Waste Facility Regulations	NV Admin. Code, Chapter 444	NV Division of Environmental Protection	Permit required prior to construction or modification of a hazardous waste disposal facility.
Biotic	*Nevada Non-Game Species Act*	NV Admin. Code, Title 45, Chapter 503	NV Department of Wildlife	Consult with NV Department of Wildlife and minimize impact.
Cultural	Historic Preservation and Archaeology Regulations	NV Statutes, Title 26, Chapters 381-383	NV Advisory Board for Historic Preservation and Archaeology	Permit required prior to the investigation, exploration, or excavation of a historic or prehistoric site.
Texas (Pantex)				
Air	Texas Air Pollution Control Regulations	TX Admin. Code, Title 30, Chapter 101-125, 305	TX Natural Resource Conservation Commission	Permit required prior to construction or modification of an air contaminant source.
Water	Texas Water Quality Standards	TX Admin. Code, Title 30, Chapter 305, 308-325	TX Natural Resource Conservation Commission	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.
	Texas Consolidated Permit Rules	TX Admin. Code, Title 30	TX Natural Resource Conservation Commission	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.
Hazardous Wastes and Soils (cont'd)	*Texas Water Quality Acts*	TX Code, Title 30, Chapter 290	TX Natural Resource Conservation Commission	Permit may be required prior to any modification of waters of the state including stream alteration for the construction of intakes, discharges, bridges, submarine utility crossings, etc.

Table 10.4-4—State Environmental, Safety & Health Requirements (continued)

Resource Category	Legislation	Citation	Responsible Agency	Potential Applicability
	Texas Underground Storage Tanks Rules	TX Admin. Code, Title 30, Chapter 334	TX Natural Resource Conservation Commission	Permit required prior to construction or modification of an underground storage tank.
	Texas Solid Waste Management Regulations	TX Admin. Code, Title 30, Chapter 305, 335	TX Natural Resource Conservation Commission	Permit required prior to construction or modification of a solid waste disposal facility.
	Texas Solid Waste Disposal Act	TX Admin. Code, Title 30, Chapter 305, 334, and 335	TX Natural Resource Conservation Commission	Permit required prior to construction or modification of a solid waste disposal facility.
Biotic	Texas Parks and Wildlife Regulations	TX Parks and Wildlife Code, Chapter 67, 68, and 88	TX Parks and Wildlife Department	Permit required by anyone who possesses, takes, or transports endangered, threatened, or protected plants or animals.
Cultural	Antiquities Code of Texas	TX Statutes, Volume 17, Article 6145	TX State Historical Survey Committee	Permit required for the examination or excavation of sites and the collection or removal of objects of antiquity.

10.5 ALTERNATIVE-SPECIFIC INFORMATION

10.5.1 Additional Requirements

Under any alternative, new or modified permits would be needed prior to construction or operation of the proposed facilities. These permits regulate many aspects of facility construction and operations, such as treatment and storage of hazardous waste and discharges of airborne or liquid effluents to the environment. Permits would be obtained through the appropriate Federal, State, or local agencies. As with consultations, a more detailed analysis of the required permits and/or approvals would occur as part of the second-tiered SPEIS that DOE will prepare after a decision is made based on the siting alternatives evaluated in this SPEIS. In addition to permitting, the following sections discuss site-specific requirements that would apply to construction and operation of the proposed facilities.

10.5.1.1 *Los Alamos Site Alternative*

Hazardous waste facility permit. The New Mexico Environment Department (NMED) issued the original RCRA permit for Los Alamos National Laboratory's (LANL's) waste management operations at technical areas (TA)-50, -54, and -16 on November 8, 1989, for a term of 10 years. On January 15, 1999, LANL submitted an application for a permit renewal for TA-54. That application also covered the hazardous waste container storage areas at TA-3 and TA-16, and at TA-54's Area G, Area L, and TA-54 west; hazardous waste treatment by solidification, cementation, and vitrification at TA-55; and hazardous waste treatment by burning and detonation at TA-14 and burning at TA-16. It includes general statements that corrective action will be conducted for releases of hazardous wastes and hazardous constituents at these areas. The original permit expired after 10 years, but was administratively continued pending the NMED review of LANL's permit renewal application. LANL continues to work on the application process to renew its Hazardous Waste Facility Permit and to respond to information requests from NMED about the history of hazardous waste generation and management at LANL.

LANL is not listed on EPA's National Priorities List (NPL) but it follows some *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) guidelines for remediating sites that contain hazardous substances not covered by RCRA and/or that may not be included in Module VIII of the Hazardous Waste Facility Permit.

***Resource Conservation and Recovery Act* corrective action.** On November 26, 2002, NMED issued a final order to DOE and the University of California pursuant to New Mexico Statutes Annotated 1978 Sections 74-4-10.1 and 74-4-13 of the *New Mexico Hazardous Waste Act* and the New Mexico Hazardous Waste Management Regulations 20.4 New Mexico Administrative Code. The order contains investigation and cleanup requirements and a schedule for implementation of cleanup measures at LANL. In the draft order issued on May 2, 2002, NMED made a determination that the past or present handling, storage, treatment, and/or disposal of solid or hazardous wastes at the LANL may present an imminent and substantial endangerment to health and the environment. LANL challenged that determination. LANL also commented that the Endangerment Determination and order seek to regulate source, special nuclear, and byproduct material, as defined in the *Atomic Energy Act* of 1954, which are exempt from regulation under RCRA and the *New Mexico Hazardous Waste Act*. DOE is pursuing legal challenges to the endangerment finding and regulatory authority issue.

The proposed facilities would not be expected to impact ongoing LANL remediation activities.

Site Treatment Plan. In October 1995, the State of New Mexico issued a Federal Facility Compliance Order to LANL requiring compliance with a Site Treatment Plan. The LANL Site Treatment Plan, which is updated annually, provides overall schedules for achieving compliance with RCRA land disposal restriction (LDR) storage and treatment requirements for mixed waste at LANL.

If LANL were selected as the site for a Consolidated Plutonium Center (CPC), DOE would include mixed transuranic (TRU) waste and mixed low level waste (MLLW) associated with proposed facilities operations in a future update to the LANL Site Treatment Plan.

10.5.2 Nevada Test Site Alternative (NTS)

NTS is subject to several formal compliance agreements with various regulatory agencies. Agreements with the State of Nevada include a memorandum of understanding covering releases of radioactivity; a Federal facility agreement and consent order, an agreement in principle covering environment, safety, and health activities; a settlement agreement to manage mixed TRU waste; and a mutual consent agreement on management of mixed low dose radiation (LDR) wastes, among others. A brief description of these agreements and their relationship to the proposed facilities follows.

Settlement Agreement. The Settlement Agreement, which was signed by DOE and the Nevada Department of Environmental Protection in June 1992, authorizes the temporary storage of only NTS's current inventory of mixed TRU waste. The storage of additional mixed TRU waste would require a permit. Mixed TRU waste is not normally generated at NTS; the majority of mixed TRU waste stored at NTS was generated offsite.

DOE would be required to seek a permit for storage of TRU waste associated with proposed facilities operations.

Federal facility agreement and consent order. The agreement is a triparty agreement with DOE, the State of Nevada, and the Department of Defense (DoD). The agreement, effective in May 1996, addresses environmental restoration of inactive contaminated sites at NTS and other sites in Nevada. The parties agreed to negotiate to address needed environmental restoration. The Order outlines a process for identifying, prioritizing, investigating, and remediating contaminated sites. It also establishes a technical strategy for cleanup activities, maximizes the opportunity to complete multiple corrective actions, and provides a mechanism for public involvement.

The proposed facilities would not be expected to impact NTS remediation activities under the Federal Facility Agreement and Consent Order.

***Federal Facility Compliance Act* consent order.** The State of Nevada and DOE approved the order and its associated NTS Site Treatment Plan in March 1996. The order and plan address treatment of legacy mixed waste streams at NTS. Under a June 1998 revision to the order, new milestones and deadlines for mixed waste treatment must be proposed through annual updates to the Site Treatment Plan.

If NTS were selected as the site for the proposed facilities, DOE would include mixed TRU waste and mixed LLW associated with proposed facilities operations in a future update to the NTS Site Treatment Plan.

Mutual Consent Agreement. The Mutual Consent Agreement was signed by Nevada Operations Office and the State of Nevada in January 1994 and modified in June 1995 and 1998. The Mutual Consent Agreement authorizes the storage of newly identified mixed waste at the NTS Area 5. State of Nevada approval of a Treatment and Disposal Plan is required for mixed waste stored for greater than nine months.

DOE would manage MLLW generated from proposed facilities operations in accordance with the Mutual Consent Agreement. A Treatment and Disposal Plan would be prepared if storage of this waste for greater than nine months were required.

Agreement in principle. This agreement includes commitments with regard to DOE technical and financial support to the State of Nevada for environmental, safety, and health oversight and associated monitoring activities. The DOE Nevada Operations Office/State of Nevada Joint LLW Oversight Agreement was incorporated as an appendix to the agreement in principle. This appendix is a cooperative oversight arrangement between DOE and the State of Nevada and grants the State an increased role in monitoring the management of LLW generated at the NTS, as well as LLW generated elsewhere and disposed at NTS. By entering into the agreement, DOE and the State of Nevada agree to share information concerning waste types and quantities, in addition to general information that allows the State to conduct detailed oversight of NTS waste disposal operations.

Under this Agreement, the State of Nevada would oversee the disposal of LLW associated with proposed facilities operations. This would occur under the NTS alternative, where LLW is generated and disposed of at NTS, as well as alternatives where LLW resulting from the operation of the proposed facilities is shipped to NTS for disposal (e.g., Pantex WIPP [Waste Isolation Pilot Plant]).

10.5.3 Pantex Site Alternative

Site Treatment Plan. DOE has prepared a Site Treatment Plan (known as the Compliance Plan) for mixed waste at Pantex, which identifies how DOE proposes to obtain commercial treatment or develop technologies for the site's MLLW. The Compliance Plan provides overall schedules for achieving compliance with LDR requirements for mixed wastes at Pantex and is enforceable under an Agreed Order issued by the Texas Natural Resource Conservation Commission (Texas Natural Resource Conservation Commission, now called the Texas Commission on Environmental Quality [TCEQ]). DOE provides annual updates to the Compliance Plan to the State for review and comment.

If Pantex were selected as the site for the proposed facilities, DOE would include mixed TRU waste and MLLW associated with operation of the proposed facilities in a future update to the Pantex Site Treatment Plan.

Hazardous waste permit. Pantex was included on the NPL in 1994. Corrective action requirements for environmental restoration at Pantex are included in the RCRA Hazardous Waste Operating Permit (HW-50284) administered jointly by EPA and the TCEQ. Pantex has identified 249 release sites within 144 Solid Waste Management Units (SWMUs) for investigation and remediation activities. RCRA facility investigations have been completed for all SWMU groupings. Remediation activities are performed to reduce contamination of soils and groundwater sufficiently to achieve a No Further Action designation under the Texas Risk Reduction Standards Guidance. The State has approved 93 release sites as requiring no further action.

Under the current baseline, DOE would complete environmental restoration and decontamination activities and turn over the Pantex facilities for long-term stewardship by FY2014. DOE recently proposed to accelerate these activities to completion by the end of FY2008 (DOE 2002j). Under this accelerated schedule, these activities would be completed prior to the start of the construction of the proposed facilities. Under either schedule, the proposed facilities would not be expected to impact ongoing Pantex remediation activities.

10.5.4 Savannah River Site (SRS) Alternative

Federal facility agreement. SRS was placed on the NPL in 1989. In August 1993, SRS entered into the Federal Facility Agreement with EPA Region IV and the South Carolina Department of Health and Environmental Control (SCDHEC). The Federal facility agreement addresses RCRA corrective action and CERCLA requirements applicable to cleanup at SRS. The agreement governs the corrective/remedial action process from site investigation through site remediation. It also describes procedures for setting annual work priorities, including schedules and deadlines, for that process.

The proposed facilities would not be expected to impact SRS remediation activities under the Federal Facility Agreement.

Site Treatment Plan. On September 20, 1995, SCDHEC approved the Site Treatment Plan for SRS. SCDHEC issued a consent order, signed by DOE, requiring compliance with the plan on September 29, 1995. The Site Treatment Plan provides overall schedules for achieving compliance with RCRA LDR storage and treatment requirements for mixed waste at SRS. DOE provides SCDHEC with annual updates to the information in the SRS Site Treatment Plan.

If SRS were selected as the site for the proposed facilities, DOE would include mixed TRU waste and MLLW associated with operation of the proposed facilities in a future update to the SRS Site Treatment Plan.

10.5.5 Current Capacity Limitations at WIPP

The total disposal capacity at WIPP is limited to 6,180,000 cubic feet under the *WIPP Land Withdrawal Act*. (Of this total, DOE Consultation and Cooperation Agreement with the State of New Mexico limits the volume of remote-handled TRU waste to 250,000 cubic feet.) The preferred alternative in DOE's 1997 *WIPP Supplemental EIS II* (WIPP SEIS II) estimated a basic inventory of 6,004,000 cubic feet of TRU waste that would be disposed of at WIPP over a 35-year operating period. This alternative formed the basis for DOE's 1998 Record of Decision to open WIPP (63 FR 3624).

Nevertheless, the WIPP SEIS II acknowledged, and DOE continues to recognize, that the amount of TRU waste to be disposed of could exceed the volumes identified in the WIPP SEIS II preferred alternative. This could occur in the future for a number of reasons. For example, DOE sites continue to improve the accuracy of their inventories, the nature of sites' missions may change over time, waste processing decisions being made for existing waste forms can generate additional TRU waste, and several sites have missions expected to extend beyond WIPP's currently planned operating period. The proposed facilities would fall into this latter category in that it would be fully operational in 2020 and for a subsequent period of 50 years.

If additional disposal capacity were needed but not readily available post-treatment, storage of waste would be needed until that additional capacity became available. The WIPP SEIS II analyses under Action Alternative 1 examined the impacts of storage and disposal of 11,018,000 cubic feet of TRU waste. This alternative included lag storage for a period of up to

160 years at all of the sites being considered for the proposed facilities. The analyses under WIPP SEIS II Alternative 1 indicated that potential impacts to the public, involved workers, and noninvolved workers from lag storage would be small. The latent cancer fatalities (LCF) would be one or less than one, and no cancers from potential exposure to hazardous chemicals would be expected.

DOE conducted a comprehensive inventory of TRU waste stored and projected to be generated at 27 sites over the 35-year performance lifetime of the WIPP. The results of this inventory are published in the *Annual Transuranic Waste Inventory Report—2007* (DOE 2007c). This document found that over the 35-year life of the WIPP, the capacity would be sufficient to handle existing stored TRU waste and projected TRU waste generated by 27 sites: "The volume of anticipated (stored plus projected) and emplaced (Contact Handled and Remote Handled) waste reported by the DOE TRU waste sites in support of this report is less than the design capacity for WIPP" (DOE 2007c).

In the future, if inventory projects show a need for additional disposal capacity for TRU waste, DOE would initiate the development of strategies for expanding such capacity at an appropriate time. However, because DOE has made no plans to date regarding the location or design of a waste disposal facility for TRU waste beyond WIPP's current capacity, this SPEIS assumed WIPP as the disposal location for TRU waste generated under each alternative, for the purposes of transportation analysis only.

10.6 COMPLIANCE HISTORY

The following sections describe recent compliance activities at each of the alternative sites. This information was taken from the 2006 Annual Site Environmental Report for each of the sites. These reports have a substantial amount of detail concerning environmental problems, permits and remediation activities. The following Web site is a good reference for obtaining these reports, online: www.hss.energy.gov/nuclearsafety/nsea/oepa/reports/aser/aserlinks

10.6.1 Los Alamos Site Alternative

Clean Water Act* and *Safe Drinking Water Act. In 2005, LANL was in compliance with its NPDES permit liquid discharge requirements in 100 percent of the samples from its sanitary effluent outfalls and in 99.9 percent of the samples from its industrial effluent outfalls. DOE reported one exceedance of the water quality parameters for industrial outfalls. Corrective actions were taken to address these permit noncompliances. LANL obtains its drinking water under an arrangement with Los Alamos County, and in 2005, LANL's drinking water system was within Federal and State drinking water standards.

Clean Air Act. In 1994, Concerned Citizens for Nuclear Safety filed a lawsuit against DOE and the Director of LANL alleging violations of the radionuclide NESHAP (40 CFR Part 61, Subpart H) provisions of the CAA. The parties settled the lawsuit out of court on January 25, 1997. DOE and LANL entered into a consent decree and a settlement agreement to resolve the lawsuit. Under the settlement provisions of the consent decree, up to four comprehensive independent audits of LANL's radioactive air emissions compliance program will be performed to verify whether LANL is in full compliance with the CAA (40 CFR 61, Subpart H).

The first audit assessed LANL's compliance for 1996 and concluded that LANL meets the dose standard for radioactive air emissions but does not meet several technical requirements of 40 CFR Part 61, Subpart H. LANL implemented most of the technical recommendations contained in the assessment report. The second audit determined that LANL was in compliance with the Federal regulations governing radioactive air emissions for the year 1999. The third audit confirmed that LANL's radioactive air emissions in 2001 were less than one fifth of what is allowed by the CAA and that LANL's air-monitoring processes will ensure future compliance with the law. In 2005, in compliance with its operating permit, LANL submitted an Annual Compliance Certification Report in which it demonstrated full compliance with the permits terms, conditions, and reporting requirement deadlines (LANL 2006b).

Resource Conservation and Recovery Act. LANL staff frequently interact with regulatory personnel on RCRA and *New Mexico Hazardous Waste Act* requirements and compliance activities. NMED conducted an annual hazardous waste compliance inspection at LANL from February 23 to March 28, 2005, and NMED issued a Notice of Violation to the University of California and DOE as a result of that inspection. The Notice of Violations identified four alleged violations. The types of issues described ranged from waste determinations, generator's control of waste, exceeding waste storage time, incompatible chemical storage, training, emergency response, waste manifesting, mixed waste management under the Site Treatment Plan, waste piles, and prevention of releases. The University of California and DOE responded to the Notice of Violation.

LANL met all of its Site Treatment Plan deadlines and milestones during 2005 (LANL 2006b).

Price-Anderson Amendments Act. Since 1996, LANL has been the subject of five enforcement actions under the DOE Price-Anderson Enforcement Program. Most recently, in February 2007, National Nuclear Security Administration (NNSA) issued a preliminary notice of violation asserting that LANL had violated nuclear safety rules in the areas of work planning and control, adequacy of procedures, training, quality improvement, assessment programs, safety basis, and radiological and contamination controls. The violations involve improper waste handling procedures resulting in small intakes of radioactive materials by workers.

10.6.2 Lawrence Livermore National Laboratory

Comprehensive Environmental Response, Compensation and Liability Act. Ongoing groundwater investigations and remedial actions at LLNL fall under the jurisdiction of CERCLA, Title I of the *Superfund Amendment and Reauthorization Act* (SARA). CERCLA is commonly referred to as the Superfund law.

The Livermore site became a CERCLA sit in 1987 when it was placed on the NPL. The Livermore Site Ground Water Project (GWP) complies with provisions specified in a Federal

Facility Agreement entered into by EPA, DOE, and the State of California's Department of Toxic Substance Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board.

Significant GWP restoration activities began in 2006, including the installation of 7 dual (groundwater and soil vapor) extraction wells, 2 groundwater extraction wells, 2 groundwater monitoring wells, 11 soil vapor wells and 1 anode well; decommissioning 3 wells; and conducting 2 hydraulic tests, 3 soil vapor extraction tests, and 4 dual extraction tests. LLNL met all regulatory and DOE milestones on schedule by constructing or upgrading treatment facilities and beginning remediation at Treatment Facility D East Traffic Circle North Source Area, Building 419 Source Area, Treatment Facility C Hotspot, buildings 511/514 Source Area, and Treatment Facility 5475 South. LLNL completed 87 of the milestones specified in the Remedial Action Implementation Plan.

In 2006, LLNL operated 27 groundwater treatment facilities. The 92 groundwater extraction wells and 34 dual extraction wells produced nearly 1.1 billion liters of groundwater and removed approximately 78 kilograms of volatile organic compounds (VOCs).

Investigations and remedial activities are ongoing at Site 300, which became a CERCLA site in 1990 when it was placed on the NPL. Common VOCs (primarily TCE) are the main contaminants at Site 300. High explosives (HE), tritium, depleted uranium (DU), organosilicate oil, nitrate, and perchlorate are also found in the groundwater. During 2006, 19 treatment facilities at Site 300 were in operation. At these facilities, 40 groundwater extraction wells and 18 dual phase extraction wells extracted about 116 million liters of groundwater in 2006. The 18 dual phase extraction wells and 2 soil vapor extraction wells together removed 2.25 million cubic meters of soil vapor.

In 2006, 20 boreholes were drilled at Site 300—five were drilled to collect soil and rock for chemical analysis, four were completed as guard wells to monitor down-gradient of contaminant plumes, an eight were completed as monitoring wells for tracking of groundwater contaminant plumes.

***Resource Conservation and Recovery Act* and related State laws.** RCRA provides the framework at the Federal level for regulating the generation, storage, treatment, and management of solid wastes, including wastes designated as hazardous. Subtitle C of RCRA controls all aspects of the management of hazardous waste, from the point of generation to its ultimate disposal. Hazardous waste generators must follow specific requirements for handling these wastes. In addition, owners and operators of hazardous waste treatment, storage, and disposal facilities are required to obtain permits that include a plan for the long-term post-closure care of the facility. The *California Hazardous Waste Control Act* (HWCA) and Title 22 of *the California Code of Regulations* set requirements for managing hazardous wastes and implementing RCRA in California. RCRA and HWCA also regulate permit requirements.

The hazardous waste management facilities at the Livermore site consist of permitted units in Area 612 and buildings 693, 695, and 696 of the Decontamination and Waste Treatment Facility (DWTF). Permitted waste management units include container storage, tank storage, and various treatment processes. During 2005–2006, LLNL also submitted several Class 1, Class 1*, and Class 2 permit modification requests to DTSC.

A final closure plan for Building 419 Interim Status Facility was submitted to DTSC in February 2001. DTSC is continuing its review of this closure plan. LLNL has provided additional information requested by DTSC, including responding to Building 419 Notices of Deficiency that DTSC issued in November 2004.

The hazardous waste management facilities at Site 300 consist of three operational RCRA-permitted facilities. The Explosives Waste Storage Facility and Explosives Waste Treatment Facility are permitted respectively to store and treat explosives waste only. The Building 883 Container Storage Area is permitted to store routine, facility-generated waste such as spent acids, bases, contaminated oil, and spent solvents.

Clean Air Act. Air permits are obtained from the Bay Area Air Quality Management District (BAAQMD) for LLNL and from the San Joaquin Valley Air Pollution Control District (SJVAPCD) and BAAQMD for Site 300. Both agencies are overseen by the California Air Resources Board.

In 2006, LLNL operated 1,182 permitted air emission sources at the Livermore site and 43 permitted air emission sources at Site 300. During the year, BAAQMD performed two Livermore site source inspections and 44 emission sources and the SJVAPCD performed one Site 300 source inspection of one emission source. Both the BAAQMD and the SJVAPCD found all inspected sources in compliance with applicable air emission regulations and permit conditions.

In 2006, several potentially significant air pollutant emission sources at the Livermore site were eliminated to reduce overall pollutant emissions. In addition, LLNL obtained approvals to construct and alternative fuel dispensing facility at the Livermore site.

National Emission Standards for Hazardous Air Pollutants, radionuclides. To demonstrate compliance with 40 CFR Part 61, Subpart H (NESHAPs for radiological emissions from DOE facilities), LLNL is required to monitor certain air release points and evaluate the maximum possible dose to the public. In 2006, LLNL continuously monitored radionuclide emissions from the Tritium Facility, the Plutonium Facility, and portions of five other facilities. Using ambient air monitoring, LLNL also continuously monitored releases of DU used in explosives testing at Site 300. There was one unplanned incident at the Livermore site in 2006 that had the potential to result in a small release of tritium to air. However, because LLNL personnel with the most exposure did not receive any measurable dose attributable to the incident, any potential dose to a member of the public would have been negligible. There were no unplanned atmospheric releases at Site 300 in 2006.

Clean Water Act. The NPDES under the *Clean Water Act* (CWA) (33 U.S.C. 1251 *et seq.*) establishes permit requirements for discharges into waters of the United States. In addition, the State of California, under the *Porter-Cologne Water Control Act*, requires permits, known as Waste Discharge Requirements (RWQCBs) and the State Water Resources Control Board.

Several other State and local government entities also require discharge permits. The *Safe Drinking Water Act* (Public Law 99-339) requires registration with EPOA and management of injection wells to protect underground sources of drinking water.

At Site 300, LLNL completed the construction of two culverts at Round Valley and Oasis. A habitat pool built at Round Valley served in part to compensate for the loss of habitat that was a result of two drainage improvement projects. These projects were authorized under nationwide permits and certified by the Central Valley RWQCB. To satisfy a concern that the cooling tower blowdown from Building 801 at Site 300 might reach a surface water tributary during winter storms, LLNL constructed a new percolation pit and registered it as a Class V injection well with the EPA. The new system was put into service on October 9, 2006.

10.6.3 Nevada Test Site Alternative

NTS continues to fulfill its requirements of the agreements discussed in Section 10.5.2. Compliance issues related to specific programs are noted in the following paragraphs.

Clean Water Act. There are no NPDES permits for NTS because there are no wastewater discharges directly to onsite or offsite surface waters. However, discharges to sewage lagoons and ponds are regulated by the State of Nevada under a State general permit. NTS has maintained compliance with permit requirements. However, downsizing of NTS operations has resulted in low flow conditions at several sewage lagoon systems, which has reduced the efficiency of the lagoons to properly treat effluents. DOE plans to install septic tank systems in these areas (NTS 2007).

Safe Drinking Water Act. During 2006, the four public drinking water systems at NTS were in compliance with regulatory limits. Onsite water wells and select offsite wells are monitored in accordance with Federal and State SDWA regulations (NTS 2007).

Resource Conservation and Recovery Act. No noncompliance incidents were reported in 2006. Violations were cited during those inspections (NTS 2007).

Clean Air Act. Criteria air pollutants emitted at NTS include particulates from construction, aggregate production, surface disturbances, and fugitive dust from vehicles traveling on unpaved roads; various pollutants from fuel-burning equipment, incineration, and open burning and volatile organics from fuel storage facilities. Emissions of hazardous air pollutants from current NTS sources are below regulatory requirements. During 2006, three pieces of equipment failed their performance emissions test and were shut down (NTS 2007).

Ambient air quality at NTS is not currently monitored for criteria pollutants or hazardous air pollutants, with the exception of radionuclides. As with all previous years that the NESHAP report was produced, the estimated annual dose to the public from radiological emissions during 2005 was well below the 10 millirem dose per year limit (40 CFR 61.92) (NTS 2007).

Comprehensive Environmental Response, Compensation, and Liability Act. Other than reporting requirements, there is no formal CERCLA program at NTS (NTS 2007).

Price-Anderson Amendments Act. NTS has not been subject to any enforcement actions under the DOE Price-Anderson Enforcement Program.

10.6.4 Tonopah Test Range (TTR)

Comprehensive Environmental Response, Compensation and Liability Act. CERCLA defines assessment activities and reporting requirements for inactive waste sites at Federal facilities. As required by CERCLA, a Preliminary Assessment was submitted in 1988 for all facilities listed on the Federal agency hazardous waste compliance docket. Sites with significant contamination were put on the NPL for cleanup. There are no NPL or Superfund sites located at TTR.

SARA Title III amended CERCLA requirements for reportable quantity releases and chemical inventory reporting. SNL at TTR was in full compliance with CERCLA/SARA in 2006. SARA also requires reporting for chemical releases exceeding certain thresholds. The TTR Firing Range released approximately 5,832 pounds of nonrecovered lead in 2006. This amount exceeds the reporting limit and will be reported in the 2007 report.

***Resource Conservation and Recovery Act* and related State laws.** RCRA provides the framework at the Federal level for regulating the generation, storage, treatment, and management of solid wastes, including wastes designated as hazardous. Subtitle C of RCRA controls all aspects of the management of hazardous waste, from the point of generation to its ultimate disposal. Hazardous waste generators must follow specific requirements for handling these wastes. In addition, owners and operators of hazardous waste treatment, storage, and disposal facilities are required to obtain permits that include a plan for the long-term post-closure care of the facility.

Under the RCRA Hazardous Waste Permit Program (40 CFR Part 270), TTR is permitted as a “small quantity generator.” Under this designation, hazardous waste can only be stored onsite for 180 days before it must be shipped offsite for treatment and disposal at an EPA-permitted facility. Sanitary solid waste, also regulated by RCRA, is disposed of at landfills onsite. There is one Class II sanitary landfill in operation at TTR operated by the U.S. Air Force (USAF) Operations and Maintenance contractor.

The last of five underground storage tanks, two gas and two diesel tanks from a former gas station in Area 3, and one diesel tank from Area 9, were removed in 1995. There are no above ground storage tanks that require registration with the State of Nevada, at TTR.

***Clean Air Act* and *Clean Air Act* amendments of 1990.** CAA requirements are regulated by the State of Nevada air quality regulations. Air emissions from nonradionuclide sources, such as a screening plant or a portable screen, are permitted under a Class II Air Quality Permit. SNL tracks emissions and pays a fee to the State of Nevada based on the total standard tons emitted. SNL met all air quality permit conditions in 2006.

National Emission Standards for Hazardous Air Pollutants, radionuclides. To demonstrate compliance with 40 CFR Part 61, Subpart H (NESHAPs for radiological emissions from DOE facilities), TTR is required to monitor certain air release points and evaluate the maximum possible dose to the public. EPA retains compliance authority for all radionuclide air releases.

The Clean Slate sites, former nuclear material test sites, have been the only source of radionuclide air emissions at TTR. Continuous air monitoring was conducted from February 22, 1996, to February 25, 1997 (SNL 1997). The TTR airport was determined to be the location of the maximally exposed individual (MEI). The result of 0.024 millirem per year was below the threshold of 0.1 millimrem per year, for which continuous air monitoring would be required, and approximately 400 times less than the EPA standard of 10 millirem per year.

Clean Water Act. NPDES under the *Clean Water Act* (CWA) establishes permit requirements for discharges into waters of the United States. Wastewater effluents and potable water supplies are regulated under the CWA and the State of Nevada water pollution and sanitary waste systems regulations. The State of Nevada, Bureau of Health Protection Services, and the Nevada Department of Environmental Protection administer regulations relevant to wastewater discharges. At TTR, wastewater is discharged to the sewer system that is connected to the USAF sewage lagoon and to six separate septic tank systems. There were no excursions or other permit violations in 2006 with respect to wastewater discharges.

10.6.5 Pantex Alternative

The TCEQ routinely conducts RCRA, CAA, and drinking water compliance inspections. Overall, Pantex is in compliance with the applicable environmental laws and regulations. However, since this facility existed prior to the promulgation of many current environmental laws and regulations, both EPA and the State of Texas have allowed DOE to continue operations while taking actions to achieve full compliance with all applicable environmental regulatory requirements. Pantex has reported minor noncompliances pursuant to its State of Texas and EPA permits, but no cases of noncompliance that could have impacted human health or the environment have occurred.

Compliance agreements and orders. In 1994, Pantex was placed on the NPL based on the presence of contamination due to past practices. DOE, TNRCC, and EPA Region 6 developed a Federal Facility Compliance Agreement to address CERCLA issues at Pantex.

EPA has issued two administrative orders to address prior noncompliance with Pantex’s NPDES permit. DOE also entered into a FFCA (No. VI-98-1210) (DOE 1999a) with EPA Region 6 relating to the same issues. As of the end of 2000, all corrective actions contained in the administrative orders and the FFCA were on schedule.

Groundwater protection. Pantex conducts soil and groundwater monitoring in accordance with the corrective action provisions (CP-50284) of its Hazardous Waste Permit No. HW-50284. Nonradiological contamination was found in the perched groundwater beneath the Zone 12 operations area (metals, explosives, and organic solvents), in the soil near operations areas (traces of metals and explosives), and in the ditches and playas that form Pantex’s drainage system (metals and explosives). Some contaminants were also found in the perched aquifer on properties neighboring Pantex to the south and southeast.

Trichloroethene was detected with results above the drinking water standard in an Ogallala Aquifer monitoring well sample taken in May 1999. This aquifer is the primary source of drinking water for the surrounding landowners and the cities of Amarillo and Panhandle. A study concluded than an improperly constructed monitoring well was allowing trichloroethene to migrate from the upper vadose into the well and down into the Ogallala Aquifer. Corrective measures eliminating the contaminant pathway into the Ogallala Aquifer have been completed.

Antimony, cadmium, chromium, manganese, and thallium were also detected in a small number of samples in a few selected Ogallala Aquifer monitoring wells at levels that exceeded drinking water standards. These exceedances may be attributed to corrosion of the stainless steel well screens, casings, and pumps. It is Pantex's intent to plug wells that have become badly corroded. Monitoring for these constituents will continue.

Price-Anderson Amendments Act. Since 1996, Pantex has been the subject of four enforcement actions under the DOE Price-Anderson Enforcement Program. Most recently, in May 2005, DOE issued a preliminary notice of violation asserting that Pantex had failed to maintain and control the operation of safety equipment in its nuclear facilities. The notice included violation of facility safety basis requirements, work process and training procedures, and quality improvement requirements that contributed to the unplanned HE cracking during the disassembly of a retired nuclear weapon.

10.6.6 Sandia National Laboratories

Comprehensive Environmental Response, Compensation, and Liability Act. Ongoing groundwater investigations and remedial actions at SNL fall under the jurisdiction of CERCLA, Title I of SARA. CERCLA is commonly referred to as the Superfund law. A preliminary assessment/site inspection was performed at SNL/New Mexico (SNL/NM) in 1988. This inspection confirmed that SNL/NM does not own any sites that would qualify for the NPL. Therefore, with respect to inactive hazardous waste sites, SNL has no CERCLA reporting requirements. Amendments under SARA require additional reporting in the event of a reportable quantity release of certain substances. SNL was in full compliance with CERCLA/SARA in 2006.

Resource Conservation and Recovery Act **and related State laws.** RCRA provides the framework at the Federal level for regulating the generation, storage, treatment, and management of solid wastes, including wastes designated as hazardous. Subtitle C of RCRA controls all aspects of the management of hazardous waste, from the point of generation to its ultimate disposal. Hazardous waste generators must follow specific requirements for handling these wastes. In addition, owners and operators of hazardous waste treatment, storage, and disposal facilities are required to obtain permits that include a plan for the long-term post-closure care of the facility. The RCRA program was delegated to the State of New Mexico. SNL has RCRA permits for the Hazardous Waste Management Facility, the Thermal Treatment Facility, the High Bay Waste Storage Facility, and the Radioactive Mixed Waste Management Facility. A new application to include the Auxiliary Hot Cell has been made. During 2006, SNL requested minor modifications to the existing permits for the Hazardous Waste Management Facility to reflect changes in personnel and operations. These modifications were approved, along with modifications requested, in 2005.

Clean Air Act. The objectives of the CAA and the CAA amendments of 1990 are to protect and enhance the Nation's air quality. EPA is responsible for describing and regulating air pollutants from stationary and mobile sources and for setting ambient air quality standards. In 2006, SNL was in compliance with all CAA requirements.

National Emission Standards for Hazardous Air Pollutants, Radionuclides. To demonstrate compliance with 40 CFR Part 61, Subpart H (NESHAPs for radiological emissions from DOE facilities), SNL is required to monitor certain air release points and evaluate the maximum possible dose to the public. As required by the regulations, SNL calculates an annual dose from actual or calculated emissions to potentially exposed members of the public. In 2006, the MEI was located at the Kirkland Storage Site. The dose at this location was 0.0016 millirem per year; the result, primarily, of releases of argon-41 from the annular core research reactor and the Sandia pulsed reactor, both located in TA-V. The offsite MEI was located at the Eubank Gate Area. The dose at this location was 0.00079 millirem per year; the result, primarily, of releases of tritium from the Neutron Generator Facility located in TA-I. Both doses are well below the EPA standard of less than 10 millirem per year.

Clean Water Act. NPDES under the CWA establishes permit requirements for discharges into waters of the United States. At SNL/NM, the CWA applies to sanitary and septic system effluents, storm water runoff, and surface water discharges. The CWA is implemented and administered by State, local, and Federal entities. Surface discharges made to the ground or to containment areas must be monitored and evaluated for compliance with New Mexico State regulations. Additionally, two evaporation lagoons in TA-IV are permitted by the State. All permit and monitoring requirements were met in 2006. In 2006, there were seven reportable surface releases that met State reporting requirements and were reviewed by the Surface Discharge Program.

10.6.7 Savannah River Site Alternative

Notices of violation. No notices of violation were issued for SRS in 2006 under RCRA or the SDWA. No notices of violation were issued under the CAA.

Under the CWA, SRS's NPDES compliance rate was 99.9 percent. DOE reported three exceedances. Corrective actions were taken to address each of these permit noncompliances. Two notices of violation were received under NPDES from SCDHEC.

During 2006, SCDHEC conducted CAA compliance inspections at SRS. As a result of the annual compliance inspections, SRS achieved a compliance rate of 100 percent and received no notice of violation under the CAA (SRS 2006c).

Consent orders. In October 1999, SCDHEC issued a consent order addressing compliance with water quality parameters set forth in the site's NPDES permit at outfall A-01. During 2000, a wetland treatment system was constructed to address these problems. The wetland system was operating and had achieved compliance with permit parameters by the end of 2001.

Price-Anderson Amendments Act. Since 1996, SRS has been the subject of six enforcement actions under the DOE Price-Anderson Enforcement Program. Most recently, in April 2004, DOE issued a preliminary notice of violation describing numerous violations of nuclear safety requirements related to SRS operations at the FB-line, seven of which were classified as Severity Level II violations. These violations included work processes, as low as reasonably achievable (ALARA) practices, quality improvement, and management assessment.

10.6.8 Y-12 Complex

Comprehensive Environmental Response, Compensation and Liability Act. CERCLA, also known as Superfund, was passed in 1980 and was amended in 1986 by SARA. The Oak Ridge Reservation, which Y-12 is a part of, was listed on the NPL as a Superfund site on November 21, 1989. An interagency agreement under Section 120(c) of CERCLA, known as the Oak Ridge Reservation (ORR) Federal Facility Agreement, was effective in 1992 among EPA, the TDEC, and DOE. The agreement establishes the procedural framework and schedule for developing, implementing, and monitoring remedial actions on ORR (and Y-12) in accordance with CERCLA. The agreement lists all of the sites/areas that will be investigated, and possibly undergo remediation, under CERCLA.

The progress toward achieving these goals is described in the *2006 Remediation Effectiveness Report for the U.S. Department of Energy Oak Ridge Reservation, Oak Ridge Tennessee* (DOE 2007a). This report describes the individual remedial actions and provides an overview of some of the monitoring conducted to evaluate the efficacy of those actions.

Resource Conservation and Recovery Act. RCRA provides the framework at the Federal level for regulating the generation, storage, treatment, and management of solid wastes, including wastes designated as hazardous. Subtitle C of RCRA controls all aspects of the management of hazardous waste, from the point of generation to its ultimate disposal. Hazardous waste generators must follow specific requirements for handling these wastes. In addition, owners and operators of hazardous waste treatment, storage, and disposal facilities are required to obtain permits that include a plan for the long-term post-closure care of the facility.

At the end of 2006, Y-12 had 102 generator accumulation areas for hazardous or mixed waste. The Y-12 complex is registered as a large-quantity generator under EPA identification Number TN389090001 and is permitted to perform hazardous waste treatment and storage. During 2006, nine units operated as permitted units. The RCRA treatment units at Y-12 operate under two RDRA permits.

At the Y-12 Complex, 37 RCRA units have been closed since the mid 1980s. TDEC accepted the certification of final closure to the East Chestnut Ridge Waste Pile on January 5, 2006. Located within the boundary of the Y-12 complex are two Class II operating industrial solid waste disposal landfills and one operating Class IV construction demolition landfill. These facilities are permitted by TDEC and accept solid waste from DOE operations on the ORR. A second Class IV construction demolition landfill has been certified closed and the permit terminated on March 15, 2007. In addition, one Class IV is overfilled by 11,700 cubic yards and has been the subject of a CERCLA remedial investigation/feasibility study.

The Y-12 Underground Storage Tank (UST) program includes four active petroleum USTs that meet all current regulatory compliance requirements. All legacy petroleum UST sites at the Y-12 complex have either been granted final closure by TDEC or have been referred to the CERCLA process for further action.

Clean Air Act. Authority for implementation and enforcement of the CAA has been delegated to the State of Tennessee by EPA as described in the State Implementation Plan. Air pollution control rules are developed and administered by the TDEC. The Y-12 complex has two permits issued by the TDEC. One, a Title V Permit, includes 35 air emission sources and more than 100 air emission points. During 2006, a significant permit modification to this Title V Permit was issued to identify new requirements and compliance methodologies for the Y-12 steam plant maintenance project. The new requirements will be effective upon completion of the project and require use of Maximum Achievable Control Technology.

National Emission Standards for Hazardous Air Pollutants, radionuclides. To demonstrate compliance with 40 CFR Part 61, Subpart H (NESHAPs for radiological emissions from DOE facilities), the Y-12 complex is required to monitor certain air release points and evaluate the maximum possible dose to the public. On June 10, 1996, EPA delegated authority for regulation of airborne radionuclide emissions to the TDEC. TDEC adopted the Federal rules. In 2006, the Y-12 complex operated in compliance with the radionuclide NESHAPs dose limits of 10 millirem per year to the most exposed member of the public. Based on modeling of radionuclide emissions from all sources, the effective dose equivalent in 2006 to the most exposed member of the public was 0.8 millirem per year.

Y-12 has numerous buildings and equipment that contain asbestos-containing materials. The regulation of the program to control asbestos during demolition and renovation is regulated by TDEC (the TSCA regulates the management and disposal of this material). No releases of reportable quantities of asbestos were reported at the Y-12 complex in 2006.

Clean Water Act. NPDES under the CWA establishes permit requirements for discharges into waters of the United States. The NPDES program has been delegated, by EPA, to the State of Tennessee. The Y-12 complex operates under Permit TN0002968, issued in 1995, and reissued on May 1, 2006. Presently, about 60 active point-source discharges or instream monitoring locations are monitored for compliance with the permit. In 2006 there was one NPDES noncompliance (chlorine at outfall #201, on February 7, 2006).

CWA includes pretreatment regulations for publicly owned treatment works. Sanitary wastewater from the Y-12 complex is discharged to the City of Oak Ridge treatment works under an industrial and commercial wastewater discharge permit. The permit establishes discharge limits for total suspended solids, biochemical oxygen demand, total nitrogen, and various metals and requires monitoring and reporting of uranium, gross alpha and beta radiation, and several organic compounds.

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Chapter 13
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***above mean sea level (AMSL)*—**The elevation (on the ground) or altitude (in the air) of any object relative to the average sea level datum.

***absorbed dose*—**For ionizing radiation, the energy imparted to matter by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. (See *rad* and *gray*.)

***accident sequence*—**In regard to nuclear facilities, an initiating event followed by system failures or operator errors, which can result in significant core damage, confinement system failure, and/or radionuclide releases.

***actinide*—**Any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium) including uranium and plutonium. All members of this group are radioactive.

***activation products*—**Nuclei, usually radioactive, formed by bombardment and absorption in material with neutrons, protons, or other nuclear particles.

***active fault*—**A fault that is likely to have another earthquake sometime in the future. Faults are commonly considered to be active if they have moved one or more times in the last 10,000 years.

***acute exposure*—**The exposure incurred during and shortly after a radiological release. Generally, the period of acute exposure ends when long-term interdiction is established, as necessary. For convenience, the period of acute exposure is normally assumed to end one week after the inception of a radiological accident.

***administrative control level*—**A dose level that is established well below the regulatory limit to administratively control and help reduce individual and collective radiation doses. Facility management should establish an annual facility administrative control level that should, to the extent feasible, be more restrictive than the more general administrative control level.

***air pollutant*—**Generally, an airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established due to potential harmful effects on human health and welfare.

***air quality control region*—**An interstate or intrastate area designated by the U.S. Environmental Protection Agency for the attainment and maintenance of National Ambient Air Quality Standards (NAAQS).

***air quality standards*—**The level of pollutants in the air prescribed by regulations that may not be exceeded during a specified time in a defined area.

alluvium (alluvial)—Unconsolidated, poorly sorted detrital sediments ranging from clay to gravel sizes deposited by streams.

alpha activity—The emission of alpha particles by radioactive materials.

alpha particle—A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus and has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). (See *alpha radiation*.)

alpha radiation—A strongly ionizing, but weakly penetrating, form of radiation consisting of positively charged alpha particles emitted spontaneously from the nuclei of certain elements during radioactive decay. Alpha radiation is the least penetrating of the three common types of ionizing radiation (alpha, beta, and gamma). Even the most energetic alpha particle generally fails to penetrate the dead layers of cells covering the skin and can be easily stopped by a sheet of paper. Alpha radiation is most hazardous when an alpha-emitting source resides inside an organism. (See *alpha particle*.)

alpha wastes—Wastes containing radioactive isotopes which decay by producing alpha particles.

ambient—Surrounding.

ambient air—The surrounding atmosphere as it exists around people, plants, and structures.

ambient air quality standards—The level of pollutants in the air prescribed by government regulations that may not be exceeded during a specified time in a defined area. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

aquatic—Living or growing in, on, or near water.

aquifer—An underground geologic formation, group of formations, or part of a formation capable of yielding a significant amount of water to wells or springs.

aquitard—A less-permeable geologic unit that inhibits the flow of water.

archeological sites (resources)—Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

argon-41—A radioactive isotope of the noble gas argon with a half-life of 1.83 hours that emits beta particles and gamma radiation. It is formed by the activation, by neutron absorption, of argon-40, a stable argon isotope present in small quantities in air.

artifact—An object produced or shaped by human workmanship of archeological or historical interest.

as low as is reasonably achievable (ALARA)—An approach to radiation protection to manage and control worker and public exposures (both individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit but a process for minimizing doses to as far below limits as is practicable.

atmospheric dispersion**—**The process of air pollutants being dispersed in the atmosphere. This occurs by wind that carries the pollutants away from their source, by turbulent air motion that results from solar heating of the Earth's surface, and by air movement over rough terrain and surfaces.

Atomic Energy Act of 1954**—**This Act was originally enacted in 1946 and amended in 1954. For the purpose of this Programmatic Environmental Impact Statement, "…a program for Government control of the possession, use, and production of atomic energy and special nuclear material whether owned by the Government or others, so directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups of nations for the control of special nuclear materials and atomic weapons…" (Section 3(c)).

Atomic Energy Commission**—**A five-member commission, established by the *Atomic Energy Act* of 1946, to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement. In 1974, the Atomic Energy Commission was abolished, and all functions were transferred to the U.S. Nuclear Regulatory Commission and the Administrator of the Energy Research and Development Administration. The Energy Research and Development Administration was later terminated, and functions vested by law in the Administrator were transferred to the Secretary of Energy.

atomic number**—**The number of positively charged protons in the nucleus of an atom or the number of electrons on an electrically neutral atom.

attainment area**—**An area that the U.S. Environmental Protection Agency has designated as being in compliance with 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. (See *National Ambient Air Quality Standards*, *nonattainment area*, and *particulate matter*.)

attractiveness level**—**A categorization of nuclear material types and compositions that reflects the relative ease of processing and handling required to convert that material to a nuclear explosive device.

background radiation**—**Radiation from: 1) Cosmic sources; 2) Naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); 3) Global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices); 4) Air travel; 5) Consumer and industrial products; and 6) Diagnostic x-rays and nuclear medicine.

badged worker**—**A worker equipped with an individual dosimeter who has the potential to be exposed to radiation.

barrier**—**Any material or structure that prevents or substantially delays movement of radionuclides toward the accessible environment.

basalt**—**The most common volcanic rock, dark gray to black in color, high in iron and magnesium, and low in silica. It is typically found in lava flows.

baseline**—**The existing environmental conditions against which impacts of the proposed action and its alternatives can be compared. For this EIS, the environmental baseline is the site environmental conditions as they exist or are estimated to exist in the absence of the proposed action.

becquerel**—**A unit of radioactivity equal to one disintegration per second. Thirty-seven billion becquerels equal one curie.

BEIR V**—**Biological Effects of Ionizing Radiation; referring to the fifth in a series of committee reports from the National Research Council.

benthic**—**Plants and animals dwelling at the bottom of oceans, lakes, rivers, and other surface waters.

beryllium**—**An extremely lightweight element with the atomic number 4, it is metallic and used in reactors as a neutron reflector.

best available control technology (BACT)**—**A term used in the Federal *Clean Air Act* that means the most stringent level of air pollutant control considering economics for a specific type of source based on demonstrated technology.

beta emitter**—**A radioactive substance that decays by releasing a beta particle.

beta particle**—**A particle emitted in the radioactive decay of many radionuclides. A beta particle is identical to an electron. It has a short range in air and a small ability to penetrate other materials.

beyond-design-basis accident**—**An accident postulated for the purpose of generating large consequences by exceeding the functional and performance requirements for safety structures, systems, and components. (See *design-basis accident*.)

beyond-design-basis events**—**Postulated disturbances in process variables due to external events or multiple component or system failures that can potentially lead to beyond-design-basis accidents. (See *design-basis events*.)

biota (biotic)**—**The plant and animal life of a region (pertaining to biota).

block**—**U.S. Bureau of the Census term describing small areas bounded on all sides by visible features or political boundaries; used in tabulation of census data.

bounded—Producing the greatest consequences of any assessment of impacts associated with normal or abnormal operations.

burial ground—In regard to radioactive waste, a place for burying unwanted radioactive materials in which the Earth acts as a receptacle to prevent the escape of radiation and the dispersion of waste into the environment.

Cambrian—The earliest geologic time period of the Paleozoic era, spanning between about 570 and 505 million years ago.

cancer—The name given to a group of diseases characterized by uncontrolled cellular growth, with cells having invasive characteristics such that the disease can transfer from one organ to another.

canister—A general term for a container, usually cylindrical, used in handling, storage, transportation, or disposal of waste.

canned subassembly—The component of a nuclear weapon which contains the secondary uranium and lithium elements.

capability-based deterrence—Deterrence based on the capability to respond to stockpile reliability and safety problems and to meet new requirements.

capable fault—A fault that has exhibited one or more of the following characteristics: 1) Movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; 2) Macroseismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; 3) A structural relationship to a capable fault according to characteristic 1) or 2) above, such that movement on one could reasonably be expected to be accompanied by movement on the other.

capacity factor—The ratio of the annual average power production of a power plant to its rated capacity.

carbon adsorption—A unit physiochemical process in which organic and certain inorganic compounds in a liquid stream are absorbed on a bed of activated carbon; used in measuring water or waste purification and chemical processing.

carbon dioxide—A colorless, odorless gas that is a normal component of ambient air; it results from fossil fuel combustion and is an expiration product.

carbon monoxide—A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

carcinogen**—**An agent that may cause cancer. Ionizing radiations are physical carcinogens; there are also chemical and biological carcinogens, and biological carcinogens may be external (e.g., viruses) or internal (genetic defects).

carolina bay**—**Ovate, intermittently flooded depression of a type occurring on the Coastal Plain from New Jersey to Florida.

cask**—**A heavily shielded container used to store or ship radioactive materials.

categories of special nuclear material (Categories I, II, III, and IV)**—**A designation, consistent with DOE Manual 470.4–6 Nuclear Material Control and Accountability, determined by the quantity and type of special nuclear material or a designation of a special nuclear material location based on the type and form of the material and the amount of nuclear material present. A designation of the significance of special nuclear material based upon the material type, the form of the material, and the amount of material present in an item, grouping of items, or in a location.

cation**—**A positively charged ion.

cell**—**See *hot cell.*

chain reaction**—**A reaction that initiates its own repetition. In nuclear fission, a chain reaction occurs when a neutron induces a nucleus to fission and the fissioning nucleus releases one or more neutrons, which induce other nuclei to fission.

chemical oxygen demand**—**A measure of the quantity of chemically oxidizable components present in water.

chronic exposure**—**Low-level radiation exposure incurred over a long period of time.

cladding**—**The outer metal jacket of a nuclear fuel element or target. It prevents fuel corrosion and retains fission products during reactor operation and subsequent storage, as well as providing structural support. Zirconium alloys, stainless steel, and aluminum are common cladding materials. In general, a metal coating bonded onto another metal.

Class I areas**—**A specifically designated area where the degradation of air quality is stringently restricted (e.g., many national parks and wilderness areas). (See *prevention of significant deterioration.*)

Class II areas**—**Most of the country not designated as Class I is designated as Class II. Class II areas are generally cleaner than air quality standards require, and moderate increases in new pollution are allowed after a regulatory-mandated impacts review. (*See prevention of significant deterioration.*)

classified information**—**Information that is classified as Restricted Data or Formerly Restricted Data under the *Atomic Energy Act* of 1954, as amended, or information determined to require protection against unauthorized disclosure under Executive Order 12958 or prior Executive Orders, which is identified as National Security Information.

clastic**—**Rock or sediment made up primarily of broken fragments of pre-existing rocks or minerals.

Clean Air Act of 1990**—**This Act mandates and enforces air pollutant emissions standards for stationary sources and motor vehicles.

Clean Water Act 1972, 1987**—**This Act regulates the discharge of pollutants from a point source into navigable waters of the United States in compliance with a National Pollution Discharge Elimination System permit as well as regulates discharges to or dredging of wetlands.

climatology**—**The science that deals with climates and investigates their phenomena and causes.

Code of Federal Regulations**—**The codification of the general and permanent rules published in the *Federal Register* by the executive departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation.

collective dose**—**The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sieverts.

colluvium (colluvial)**—**A loose deposit of rock debris accumulated at the base of a cliff or slope.

combined impact**—**Depending on the scope of the program concerned, a Programmatic Environmental Impact Statement may address more than one "Purpose and Need," each with its own set of alternatives. These several actions, however, may have common environments. The sum of these impacts with respect to the site concerned are combined impacts, as opposed to cumulative impacts, which incorporate the site-specific impacts of activities not otherwise related to the actions and alternatives in question.

committed dose equivalent**—**The dose equivalent to organs or tissues that will be received by an individual during the 50-year period following the intake of radioactive material. It does not include contributions from external radiation sources. Committed dose equivalent is expressed in units of rem or sieverts.

committed effective dose equivalent**—**The dose value obtained by: 1) Multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues; and 2) Summing all the resulting products. Committed effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent* and *weighting factor*.)

community (biotic)**—**All plants and animals occupying a specific area under relatively similar conditions.

community (environmental justice)—A group of people or a site within a spatial scope exposed to risks that potentially threaten health, ecology, or land values or are exposed to industry that stimulates unwanted noise, smells, industrial traffic, particulate matter, or other non-aesthetic impacts.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund)—This Act provides regulatory framework for remediation of past contamination from hazardous waste. If a site meets the Act's requirements for designation, it is ranked along with other "Superfund" sites and is listed on the National Priorities List. This ranking is the Environmental Protection Agency's way of determining which sites have the highest priority for cleanup.

Comprehensive Test Ban Treaty (CTBT)—A proposed treaty prohibiting nuclear tests of all magnitudes.

computational modeling—Use of a computer to develop a mathematical model of a complex system or process and to provide conditions for testing it.

conformity—Conformity is defined in the *Clean Air Act* as the action's compliance with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards, expeditious attainment of such standards, and that such activities will not: 1) Cause or contribute to any new violation of any standard in any area; 2) Increase the frequency or severity of any existing violation of any standard in any area; or 3) Delay timely attainment of any standard, required interim emission reduction, or other milestones in any area.

consumptive water use—The difference in the volume of water withdrawn from a body of water and the amount released back into the body of water.

contact-handled waste—Radioactive waste or waste packages whose external dose rate is low enough to permit contact handling by humans during normal waste management activities (e.g., waste with a surface dose rate not greater than 200 millirem per hour). (See *remote-handled waste*.)

container—In regard to radioactive waste, the metal envelope in the waste package that provides the primary containment function of the waste package, which is designed to meet the containment requirements of 10 CFR Part 60.

contamination—The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or personnel.

conventional weapon—A weapon that is neither nuclear, biological, nor chemical.

cooperating agency—Any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment (40 CFR 1508.5). A State, local, or tribal government also may agree to be a cooperating agency.

credible accident—An accident that has a probability of occurrence greater than or equal to once in a one-million-year timeframe.
Cretaceous—The final geologic time period of the Mesozoic era, spanning between about 144 and 66 million years ago. The end of this period also marks the end of dinosaur life on Earth.

criteria pollutants—Six air pollutants for which the National Ambient Air Quality Standards are established by the U.S. Environmental Protection Agency under Title I of the Federal *Clean Air Act*: sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than or equal to 10 micrometers (0.0004 inch) in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available.

critical assembly—A critical assembly is a system of fissile material (uranium-233, uranium-235, or plutonium-239) with or without a moderator in a specific proportion and shape. The critical assembly can be gradually built up by adding additional fissile material and/or moderator until this system achieves the dimensions necessary for a criticality condition. A continuous neutron source is placed at the center of this assembly to measure the fission rate of the critical assembly as it approaches and reaches criticality.

critical habitat—Defined in the *Endangered Species Act* of 1973 as “specific areas within the geographical area occupied by [an endangered or threatened] species..., essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species...that are essential for the conservation of the species.”

critical mass—The smallest mass of fissionable material that will support a self-sustaining nuclear fission chain reaction.

criticality—The condition in which a system is capable of sustaining a nuclear fission chain reaction.

cultural resources—Archeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

cumulative impacts—The impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

curie—A unit of radioactivity equal to 37 billion disintegrations per second (i.e., 37 billion becquerels); also a quantity of any radionuclide or mixture of radionuclides having one curie of radioactivity.

day-night average sound level**—**The 24-hour, A-weighted equivalent sound level expressed in decibels. A 10-decibel penalty is added to sound levels between 10:00 p.m. and 7:00 a.m. to account for increased annoyance due to noise during night hours.

decay (radioactive)**—**The decrease in the amount of any radioactive material with the passage of time, due to spontaneous nuclear disintegration (i.e., emission from atomic nuclei of charged particles, photons, or both).

decibel (dB)**—**A unit for expressing the relative intensity of sounds on a logarithmic scale where 0 is below human perception and 130 is above the threshold of pain to humans. For traffic and industrial noise measurements, the A-weighted decibel, a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

decibel, A-weighted (dBA)**—**A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the "A" weighting specified by the American National Standards Institution (ANSI S1.4-1983 [R1594]) that accounts for the frequency response of the human ear.

decommissioning**—**Retirement of a facility, including any necessary decontamination and/or dismantlement.

decontamination**—**The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

defense-in-depth**—**The use of multiple, independent protection elements combined in a layered manner so that the system capabilities do not depend on a single component to maintain effective protection against defined threats.

^{o}C (degrees Celsius)**—**A unit for measuring temperature using the centigrade scale in which the freezing point of water is 0 degrees and the boiling point is 100 degrees.

^{o}F (degrees Fahrenheit)**—**A unit for measuring temperature using the Fahrenheit scale in which the freezing point of water is 32 degrees and the boiling point is 212 degrees.

delayed critical devices**—**A critical assembly designed to reach the condition of delayed supercriticality. Delayed criticality is the nuclear physics supercriticality condition, where the neutron multiplication factor of the assembly is between 1 (critical) and 1 plus the delayed neutron fraction. (See *delayed neutrons*.)

delayed neutrons**—**Neutrons emitted from fission products by beta decay following fission by intervals of seconds to minutes. Delayed neutrons account for approximately 0.2 to 0.7 percent of all fission neutrons. For uranium-235, the delayed neutron fraction is about 0.007; for plutonium-239, it is about 0.002.

depleted uranium (DU)—Uranium whose content of the fissile isotope uranium-235 is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium.

deposition—In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles ("dry deposition"), or their removal from the air to the ground by precipitation ("wet deposition" or "rainout").

design basis—For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component, and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be: 1) Restraints derived from generally accepted state-of-the-art practices for achieving functional goals; 2) Requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or 3) Requirements derived from Federal safety objectives, principles, goals, or requirements.

design-basis accident—An accident postulated for the purpose of establishing functional and performance requirements for safety structures, systems, and components.

design-basis events—Postulated disturbances in process variables that can potentially lead to design-basis accidents.

design-basis threat—The elements of a threat postulated for the purpose of establishing requirements for safeguards and security programs, systems, components, equipment, information. (See *threat*.)

deuterium—A nonradioactive isotope of the element hydrogen with one neutron and one proton in the atomic nucleus.

dewatering—The removal of water. Saturated soils are "dewatered" to make construction of building foundations easier.

direct economic effects—The initial increases in output from different sectors of the economy resulting from some new activity within a predefined geographic region.

direct effect multiplier—The total change in regional earnings and employment in all related industries as a result of a one-dollar change in earnings and a one-job change in a given industry.

direct jobs—The number of workers required at a site to implement an alternative.

disposition—The ultimate "fate" or end use of a surplus Department of Energy facility following the transfer of the facility to the Office of the Assistant Secretary for Environmental Waste Management.

diversion—The unauthorized removal of nuclear material from its approved use or authorized location.

dolomite—Calcium magnesium carbonate, a limestone-like mineral.

dolostone—A carbonate rock made up predominately of the mineral dolomite, $CaMg(CO_3)_2$.

dose—A generic term that means absorbed dose, effective dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined elsewhere in this Glossary. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad.

dose equivalent—A measure of radiological dose that correlates with biological effect on a common scale for all types of ionizing radiation. Defined as a quantity equal to the absorbed dose in tissue multiplied by a quality factor (the biological effectiveness of a given type of radiation) and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert.

dose rate—The radiation dose delivered per unit of time (e.g., rem per year).

dosimeter—A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., a film badge or ionization chamber).

drainage basin—An aboveground area that supplies the water to a particular stream.

drawdown—The height difference between the natural water level in a formation and the reduced water level in the formation caused by the withdrawal of groundwater.

drinking water standards—The level of constituents or characteristics in a drinking water supply specified in regulations under the *Safe Drinking Water Act* as the maximum permissible.

ecology—A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

ecosystem—A community of organisms and their physical environment interacting as an ecological unit.

effective dose equivalent—The dose value obtained by multiplying the dose equivalents received by specified tissues or organs of the body by the appropriate weighting factors applicable to the tissues or organs irradiated, and then summing all of the resulting products. It includes the dose from internal and external radiation sources. The effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent* and *committed effective dose equivalent*.)

effluent—A gas or fluid discharged into the environment.

electron—An elementary particle with a mass of 9.107 × 10^{-23} gram (or 1/1,836 of a proton) and a negative charge. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

Emergency Response Planning Guideline (ERPG)-1—The maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor. ***ERPG-2*** is the maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. ***ERPG-3*** is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

emission—A material discharged into the atmosphere from a source operation or activity.

emission standards—Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

endangered species—Defined in the *Endangered Species Act* of 1973 as "any species which is in danger of extinction throughout all or a significant portion of its range."

Endangered Species Act of 1973—This Act requires Federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions will not likely jeopardize the continued existence of any endangered or threatened species or adversely affect the habitat of such species.

engineered safety features—For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment.

enriched uranium (EU)—Uranium whose content of the fissile isotope uranium-235 is greater than the 0.7 percent (by weight) found in natural uranium. (See *uranium*, *depleted uranium*, and *natural uranium*.)

Environment, Safety, and Health Program—In the context of DOE, encompasses those requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with: impacts on the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both the operating personnel and the general public; and protecting property against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facility safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

environmental assessment—A written environmental analysis that is prepared pursuant to the *National Environmental Policy Act* to determine whether a Federal action would significantly affect the environment and thus require the preparation of a more detailed environmental impact statement. If the action would not significantly affect the environment, then a finding of no significant impact is prepared.

***environmental impact statement*—**The detailed written statement required by Section 102(2)(C) of the *National Environmental Policy Act* for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality *National Environmental Policy Act* regulations in 40 CFR Parts 1500–1508 and the DOE *National Environmental Policy Act* regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives; adverse environmental effects that cannot be avoided should the proposal be implemented; the relationship between short-term uses of the human environment and enhancement of long-term productivity; and any irreversible and irretrievable commitments of resources.

***environmental justice*—**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. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, State, local, and tribal programs and policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

***environmental survey*—**A documented, multidisciplined assessment (with sampling and analysis) of a facility to determine environmental conditions and to identify environmental problems requiring corrective action.

***Eocene*—**A geologic epoch early in the Cenozoic era, dating from approximately 54 to 38 million years ago.

***ephemeral stream*—**A stream that flows only after a period of heavy precipitation.

***epicenter*—**The point on the Earth's surface directly above the focus of an earthquake.

***epidemiology*—**Study of the occurrence, causes, and distribution of disease and/or other health-related states and events in human populations, often as related to age, sex, occupation, ethnic, and economic status, to identify and alleviate health problems and promote better health.

exposure limit*—**The level of exposure to a hazardous chemical (set by law or a standard) at which or below which adverse human health effects are not expected to occur. ***Reference dose is the chronic-exposure dose (milligrams or kilograms per day) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur.

Reference concentration is the chronic exposure concentration (milligrams per cubic meter) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur.

fault—A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred. A normal fault occurs when the hanging wall has been depressed in relation to the footwall. A reverse fault occurs when the hanging wall has been raised in relation to the footwall.

Finding of No Significant Impact—A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded, will not have a significant effect on the human environment and will not require an environmental impact statement.

fissile materials—An isotope that readily fissions after absorbing a neutron of any energy. Fissile materials are uranium-233, uranium-235, plutonium-239, and plutonium-241. Uranium-235 is the only naturally occurring fissile isotope.

fission—The splitting of the nucleus of a heavy atom into two lighter nuclei. It is accompanied by the release of neutrons, gamma rays, and kinetic energy of fission products.

fission products—Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

fissure—A long and narrow crack in the earth.

floodplain—The lowlands and relatively flat areas adjoining inland and coastal waters and the flood-prone areas of offshore islands. Floodplains include, at a minimum, that area with at least a 1.0 percent chance of being inundated by a flood in any given year. ***Base floodplain***—The area which has a 1.0 percent or greater chance of being flooded in any given year. Such a flood is known as a 100-year flood**. *Critical action floodplain***—The area which has at least a 0.2 percent chance of being flooded in any given year. Such a flood is known as a 500-year flood. Any activity for which even a slight chance of flooding would be too great (e.g., the storage of highly volatile, toxic, or water-reactive materials) should not occur in the critical action floodplain.

Probable maximum flood—The hypothetical flood considered to be the most severe reasonably possible flood, based on the comprehensive hydrometeorological application of maximum precipitation and other hydrological factors favorable for maximum flood runoff (e.g., sequential storms and snowmelts). It is usually several times larger than the maximum recorded flood.

flux—Rate of flow through a unit area; in reactor operation, the apparent flow of neutrons in a defined energy range. (See *neutron flux*.)

formation—In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

fossil**—**Impression or trace of an animal or plant of past geological ages that has been preserved in the Earth's crust.

fossiliferous**—**Containing a relatively large number of fossils.

fugitive emissions**—**1) Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device; or 2) Any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, piles of stored material (e.g., coal); and road construction areas or other areas where earthwork is occurring.

fusion**—**Nuclear reaction in which light nuclei are fused together to form a heavier nucleus, accompanied by the release of immense amounts of energy and fast neutrons.

gamma radiation**—**High-energy, short wavelength, electromagnetic radiation emitted from the nucleus of an atom during radioactive decay. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to, but are usually more energetic than, x-rays.

Gaussian plume**—**The distribution of material (a plume) in the atmosphere resulting from the release of pollutants from a stack or other source. The distribution of concentrations about the centerline of the plume, which is assumed to decrease as a function of its distance from the source and centerline (Gaussian distribution), depends on the mean wind speed and atmospheric stability.

genetic effects**—**Inheritable changes (chiefly mutations) produced by exposure of the parts of cells that control biological reproduction and inheritance to ionizing radiation or other chemical or physical agents.

GENII**—**A computer code used to predict the radiological impacts on individuals and populations associated with the release of radioactive material into the environment during normal operations and postulated accidents.

geology**—**The science that deals with the Earth: the materials, processes, environments, and history of the planet, including rocks and their formation and structure.

glovebox**—**A large enclosure that separates workers from equipment used to process hazardous material while allowing the workers to be in physical contact with the equipment; normally constructed of stainless steel, with large acrylic/lead glass windows. Workers have access to equipment through the use of heavy-duty, lead-impregnated rubber gloves, the cuffs of which are sealed in portholes in the glovebox windows.

gray**—**The International System of Units (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (1 gray is equal to 100 rad). (The joule is the SI unit of energy.) (See *absorbed dose.*)

***groundwater*—**Water below the ground surface in a zone of saturation.

***habitat*—**The environment occupied by individuals of a particular species, population, or community.

***half-life*—**The time in which one-half of the atoms of a particular radioactive isotope disintegrate to another nuclear form. Half-lives vary from millionths of a second to billions of years.

***Hazard Index*—**A summation of the Hazard Quotients for all chemicals being used at a site and those proposed to be added to yield cumulative levels for a site. A Hazard Index value of 1.0 or less means that no adverse human health effects (noncancer) are expected to occur.

***Hazard Quotient*—**The value used as an assessment of non-cancer-associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is a ratio of the estimated exposure to that exposure at which it would be expected that adverse health effects would begin to be produced. It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens.

***hazardous air pollutants*—**Air pollutants not covered by National Ambient Air Quality Standards but which may present a threat of adverse human health or environmental effects. Those specifically listed in 40 CFR 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants are any of the 188 pollutants to be regulated or renewed under Section 112(b) of the *Clean Air Act*. Very generally, hazardous air pollutants are any air pollutants that may realistically be expected to pose a threat to human health or welfare.

***hazardous chemical*—**Under 29 CFR Part 1910, Subpart Z, hazardous chemicals are defined as "any chemical which is a physical hazard or a health hazard." Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

***hazardous material*—**A material, including a hazardous substance, as defined by 49 CFR 171.8, which poses a risk to health, safety, and property when transported or handled.

***hazardous substance*—**Any substance subject to the reporting and possible response provisions of the *Clean Water Act* and the *Comprehensive Environmental Response, Compensation, and Liability Act.*

***hazardous waste*—**A category of waste regulated under the *Resource Conservation and Recovery Act*. To be considered hazardous, a waste must be a solid waste under the *Resource Conservation and Recovery Act* and must exhibit at least one of four characteristics described in

40 CFR 261.20 through 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31–261.33.

hazards classification**—**The process of identifying the potential threat to human health of a chemical substance.

heavy metals**—**Metallic or semimetallic elements of high molecular weight, such as mercury, chromium, cadmium, lead, and arsenic, that are toxic to plants and animals at known concentrations.

high-efficiency particulate air filter**—**An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inches) in diameter. These filters generally include a pleated fibrous medium, typically fiberglass, capable of capturing very small particles.

high-level radioactive waste**—**The highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.

high-multiplication devices**—**A critical assembly for producing nondestructive superprompt critical nuclear excursions. These types of devices are sometimes called prompt burst devices. (See *prompt critical device* and *nuclear excursion*.)

highly enriched uranium (HEU)**—**Uranium in which the abundance of the isotope uranium-235 is increased well above normal (naturally occurring) levels.

HIGHWAY**—**A computer code used for predicting routes for transporting radioactive material in the United States and calculating route-specific population density statistics.

historic resources**—**Physical remains that postdate the emergence of written records; in the United States, they are architectural structures or districts, archeological objects, and archeological features dating from 1492 and later.

Holocene**—**The current epoch of geologic time, which began approximately 10,000 years ago.

hot cell**—**A shielded facility that requires the use of remote manipulators for handling radioactive materials.

hydrodynamic test**—**High-explosive non-nuclear experiment to investigate hydrodynamic aspects of primary function up to mid to late stages of pit implosion.

hydrodynamics**—**The study of the motion of a fluid and of the interactions of the fluid with its boundaries, especially in the case of an incompressible inviscid fluid.

hydrology—The science dealing with the properties, distribution, and circulation of natural water systems.

impingement—The process by which aquatic organisms too large to pass through the screens of a water intake structure become caught on the screens and are unable to escape.

incident-free risk—The radiological or chemical impacts resulting from emissions during normal operations and packages aboard vehicles in normal transport. This includes the radiation or hazardous chemical exposure of specific population groups such as crew, passengers, and bystanders.

indirect economic effects—Indirect effects result from the need to supply industries experiencing direct economic effects with additional outputs to allow them to increase their production. The additional output from each directly affected industry requires inputs from other industries within a region (i.e., purchases of goods and services). This results in a multiplier effect to show the change in total economic activity resulting from a new activity in a region.

indirect jobs—Within a regional economic area, jobs generated or lost in related industries as a result of a change in direct employment.

induced economic effects—The spending of households resulting from direct and indirect economic effects. Increases in output from a new economic activity lead to an increase in household spending throughout the economy as firms increase their labor inputs.

injection well—A well that takes water from the surface into the ground, either through gravity or by mechanical means.

ion—An atom that has too many or too few electrons, causing it to be electrically charged.

ionizing radiation—Alpha particles, beta particles, gamma rays, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

***irradiated*—**Exposure to ionizing radiation. The condition of reactor fuel elements and other materials in which atoms bombarded with nuclear particles have undergone nuclear changes.

***isotope*—**An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons and different atomic masses.

joint test assembly (JTA)—A nonnuclear test configuration with diagnostic instrumentation of a warhead or bomb.

joule—A metric unit of energy, work, or heat, equivalent to 1 watt-second, 0.737 foot-pounds, or 0.239 calories.

lacustrine wetland—Lakes, ponds, and other enclosed open water at least 8 ha (20 acres) in extent and not dominated by trees, shrubs, and emergent vegetation.

latent cancer fatalities (LTF)—Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

limestone—A sedimentary rock composed mostly of the mineral calcite, $CaCO_3$.

lithic—Pertaining to stone or a stone tool.

loam—A soil composed of a mixture of clay, silt, sand, and organic matter.
long-lived radionuclides—Radioactive isotopes with half-lives greater than 30 years.

low-income population—Low-income populations, defined in terms of U.S. Bureau of the Census annual statistical poverty levels *(Current Population Reports*, Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice* and *minority population*.) From an environmental justice standpoint, low-income populations exist in those census tracts where greater than 50 percent of the population is living below the poverty threshold as defined above.

low-level radioactive waste—Waste that contains radioactivity but is not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined by Section 11e (2) of the *Atomic Energy Act* of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level radioactive waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

magnitude—A number that reflects the relative strength or size of an earthquake. Magnitude is based on the logarithmic measurement of the maximum motion recorded by a seismograph. An increase of one unit of magnitude (for example, from 4.6 to 5.6) represents a 10-fold increase in wave amplitude on a seismograph recording or approximately a 30-fold increase in the energy released. Several scales have been defined, but the most commonly used are: 1) Local magnitude (ML), commonly referred to as "Richter magnitude"; 2) Surface-wave magnitude (Ms); 3) Body-wave magnitude (Mb); and 4) Moment magnitude (Mw). Each is valid for a particular type of seismic signal varying by such factors as frequency and distance. These magnitude scales will yield approximately the same value for any given earthquake within each scale’s respective range of validity.

material access area—A type of security area that is authorized to contain a security Category I quantity of special nuclear material and which has specifically defined physical barriers, is located within a Protected Area, and is subject to specific access controls.

material control and accountability—The part of safeguards that detects or deters theft or diversion of nuclear materials and provides assurance that all nuclear materials are accounted for appropriately.

maximally exposed individual (MEI)—A hypothetical offsite member of the public whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposures (e.g., inhalation, ingestion, or direct exposure).

maximum contaminant level—The designation for U.S. Environmental Protection Agency standards for drinking water quality under the *Safe Drinking Water Act*. The maximum contaminant level for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system. The primary maximum contaminant levels (40 CFR Part 141) are intended to protect public health and are federally enforceable. They are based on health factors, but are also required by law to reflect the technological and economic feasibility of removing the contaminant from the water supply. Secondary maximum contaminant levels (40 CFR Part 143) are set by the U.S. Environmental Protection Agency to protect the public welfare. The secondary drinking water regulations control substances in drinking water that primarily affect aesthetic qualities (such as taste, odor, and color) relating to the public acceptance of water. These regulations are not federally enforceable, but are intended as guidelines for the States.

megajoule—A unit of heat, work, or energy equal to 1 million joules. (See *joule*.)

megawatt—A unit of power equal to one million watts. Megawatt-thermal is commonly used to define heat produced, while megawatt-electric defines electricity produced.

meteorology—The science dealing with the atmosphere and its phenomena, especially as relating to weather.

micron—One-millionth of one meter.

migration—The natural movement of a material through the air, soil, or groundwater; also, seasonal movement of animals from one area to another.

Migratory Bird Treaty Act—This Act states that it is unlawful to pursue, take, attempt to take, capture, possess, or kill any migratory bird, or any part, nest, or egg of any such bird other than permitted activities.

million electron volts (MeV)—A unit used to quantify energy. In this EIS, it describes a particle’s kinetic energy, which is an indicator of particle speed.

millirem—One-thousandth of one rem.

minority population—Minority populations exist where either: 1) The minority population of the affected area exceeds 50 percent; or 2) The minority population percentage of the affected area is meaningfully greater than in the general population or other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). “Minority” refers to individuals who are members of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. “Minority populations” include either a single minority group or the total of all minority persons in the affected area. They may consist of groups of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice* and *low-income population*.)

***Miocene*—**An epoch of the upper Tertiary Period, spanning between approximately 24 and 5 million years ago.

***mitigate*—**Mitigation includes: 1) Avoiding an impact altogether by not taking a certain action or parts of an action; 2) Minimizing impacts by limiting the degree or magnitude of an action and its implementation; 3) Rectifying an impact by repairing, rehabilitating, or restoring the affected environment; 4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or 5) Compensating for an impact by replacing or providing substitute resources or environments.

***mixed waste*—**Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

***Modified Mercalli Intensity*—**A level on the modified Mercalli scale. A measure of the perceived intensity of earthquake ground shaking with 12 divisions, from I (not felt by people) to XII (nearly total damage). It is a unitless expression of observed effects.

***National Ambient Air Quality Standards*—**Air quality standards established by the *Clean Air Act*, as amended. The primary National Ambient Air Quality Standards are intended to protect the public health with an adequate margin of safety, and the secondary National Ambient Air Quality Standards are intended to protect the public welfare from any known or anticipated adverse effect of a pollutant.

***National Emission Standards for Hazardous Air Pollutants*—**Standards set by the U.S. Environmental Protection Agency for air pollutants which are not covered by National Ambient Air Quality Standards and which may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness. These standards are given in 40 CFR Part 61 and 63. National Emission Standards for Hazardous Air Pollutants are given for many specific categories of sources (e.g., equipment leaks, industrial process cooling towers, dry-cleaning facilities, petroleum refineries). (See *hazardous air pollutants*.)

***National Environmental Policy Act of 1969*—**This Act is the basic national charter for the protection of the environment. It requires the preparation of an environmental impact statement for every major Federal action that may significantly affect the quality of the human environment. Its main purpose is to provide environmental information to decision makers and the public so that actions are based on an understanding of the potential environmental consequences of a proposed action and its reasonable alternatives.

National Environmental Research Park—An outdoor laboratory set aside for ecological research to study the environmental impacts of energy developments. National environmental research parks were established by the Department of Energy to provide protected land areas for research and education in the environmental sciences and to demonstrate the environmental compatibility of energy technology development and use.

National Historic Preservation Act of 1966, as amended—This Act provides that property resources with significant national historic value be placed on the National Register of Historic Places. It does not require any permits but, pursuant to Federal code, if a proposed action might impact an historic property resource, it mandates consultation with the proper agencies.

National Pollutant Discharge Elimination System—A provision of the *Clean Water Act* which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the U.S. Environmental Protection Agency, a State, or, where delegated, a tribal government. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places—The official list of the Nation's cultural resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register for their importance in American history, architecture, archeology, culture, or engineering. Properties included on the National Register range from large-scale, monumentally proportioned buildings to smaller-scale, regionally distinctive buildings. The listed properties are not just of nationwide importance; most are significant primarily at the State or local level. Procedures for listing properties on the National Register are found in 36 CFR Part 60.

natural uranium—Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.7-weight percent uranium-235 with the remainder essentially uranium-238). (See *uranium*, *depleted uranium*, and *enriched uranium*.)

neutron—An uncharged elementary particle with a mass slightly greater than that of the proton. Neutrons are found in the nucleus of every atom heavier than hydrogen-1.

neutron flux—The product of neutron number density and velocity (energy), giving an apparent number of neutrons flowing through a unit area per unit time.

nitrogen—A natural element with the atomic number 7. It is diatomic in nature and is a colorless and odorless gas that constitutes about four-fifths of the volume of the atmosphere.

nitrogen oxides—The oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and the formation of atmospheric ozone.

noise—Undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (e.g., hearing, sleep), damage hearing, or diminish the quality of the environment.

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.

nonproliferation—Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

normal operations—All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Notice of Intent—Announces an agency's intent to prepare an EIS and describes the proposed action and possible alternatives and the scoping process. The scoping process includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an EIS should address.

nuclear assembly—Collective term for the primary, secondary, and radiation case.

nuclear component—Part of a nuclear weapon that contains fissionable or fusionable material.

nuclear criticality—See *criticality*.

nuclear excursion—A very short time period (in milliseconds) during which the fission rate of a supercritical system increases, peaks, and then decreases to a low value.

nuclear explosive—Any assembly containing fissionable and/or fusionable materials and maincharge high-explosive parts or propellants capable of producing a nuclear detonation.

nuclear facility—A facility subject to requirements intended to control potential nuclear hazards. Defined in DOE directives as any nuclear reactor or any other facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public.

nuclear grade—Material of a quality adequate for use in a nuclear application.

nuclear material—Composite term applied to: 1) Special nuclear material; 2) Source material such as uranium, thorium, or ores containing uranium or thorium; and 3) Byproduct material, which is any radioactive material that is made radioactive by exposure to the radiation incident or to the process of producing or using special nuclear material.

***Nuclear Nonproliferation Treaty*—**A treaty with the aim of controlling the spread of nuclear weapons technologies, limiting the number of nuclear weapons states and pursuing, in good faith, effective measures relating to the cessation for the nuclear arms race.

***Nuclear Posture Review*—**A report, led by the Department of Defense, which addresses possible changes in U.S. nuclear policy.

***nuclear production*—**Production operations for components of nuclear weapons that are fabricated from nuclear materials, including plutonium and uranium.

***nuclear radiation*—**Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of unstable radioactive atoms as a result of radioactive decay.

***Nuclear Regulatory Commission*—**The Federal agency that regulates the civilian nuclear power industry in the United States.

***nuclear warhead*—**A warhead that contains fissionable and fusionable material, the nuclear assembly, and nonnuclear components packaged as a deliverable weapon.

***nuclear weapon*—**The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

***Nuclear Weapons Complex*—**The sites supporting the research, development, design, manufacture, testing, assessment, certification, and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

***nuclide*—**A species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

***Occupational Safety and Health Administration*—**The U.S. Federal Government agency which oversees and regulates workplace health and safety; created by the *Occupational Safety and Health Act* of 1970.

***offsite*—**Denotes a location, facility, or activity occurring outside of the boundary of a DOE Complex site.

***onsite*—**Denotes a location or activity occurring within the boundary of a DOE Complex site.

***onsite population*—**Department of Energy and contractor employees who are on duty, and badged onsite visitors.

***outfall*—**The discharge point of a drain, sewer, or pipe as it empties into a body of water.

***ozone*—**The tri-atomic form of oxygen; in the stratosphere, ozone protects Earth from the Sun's ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

package—For radioactive materials, the packaging, together with its radioactive contents, as presented for transport (the packaging plus the radioactive contents equals the package).

packaging—The assembly of components necessary to ensure compliance with Federal transportation regulations. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated as part of the packaging.

palentological resources—The physical remains, impressions, or traces of plants or animals from a former geologic age; may be sources of information on ancient environments and the evolutionary development of plants and animals.

Paleozoic—Geologic time dating from 50 million to 245 million years ago when seed-bearing plants, amphibians, and reptiles first appeared.

palustrine wetland—Nontidal wetlands dominated by trees, shrubs, and emergent vegetation.

particulate matter (PM)—Any finely divided solid or liquid material, other than uncombined (i.e., pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, P_{10} includes only those particles equal to or less than 10 micrometers (0.0004 inch) in diameter; $P_{2.5}$ includes only those particles equal to or less than 2.5 micrometers (0.0001 inch) in diameter.

peak ground acceleration—A measure of the maximum horizontal acceleration (as a percentage of the acceleration due to the Earth’s gravity) experienced by a particle on the surface of the Earth during the course of earthquake motion.

Pennsylvanian—A geologic time period of the Paleozoic era, spanning between about 320 and 286 million years ago.

perched aquifer/groundwater—A body of groundwater of small lateral dimensions separated from an underlying body of groundwater by an unsaturated zone.

perchlorate—Perchlorate originates as a contaminant in the environment from the solid salts of ammonium, potassium, or sodium perchlorate. It can persist for many decades under typical groundwater and surface water conditions. Ammonium perchlorate is manufactured for use as the oxidizer component and primary ingredient in solid propellant for rockets, missiles, and fireworks. Other uses of perchlorate salts include their use in nuclear reactors and electronic tubes, as additives in lubricating oils, and in aluminum refining.

perennial stream—A stream that flows throughout the year.

Perimeter Intrusion Detection and Assessment System (PIDAS)—A mutually supporting combination of barriers, clear zones, lighting, and electronic intrusion detection, assessment, and access control systems constituting the perimeter of a Complex protected area and designed to detect, impede, control, or deny access to the protected area.

permeability—In geology, the ability of rock or soil to transmit a fluid.

Permian—The final geologic time period of the Paleozoic Era, spanning between about 286 and 245 million years ago.

person-rem—The unit of collective radiation dose commitment to a given population; the sum of the individual doses received by a population segment.

pit—The central core of a nuclear weapon containing plutonium-239 and/or highly enriched uranium that undergoes fission when compressed by high explosives. The pit and the high explosive are known as the "primary" of a nuclear weapon.

placer—A surficial mineral deposit formed by mechanical concentration of valuable minerals from weathered debris, usually through the action of stream currents or waves.

playa—A dry lake bed in a desert basin or a closed depression that contains water on a seasonal basis.

Pleistocene—The geologic time period of the earliest epoch of the Quaternary period, spanning between about 1.6 million years ago and the beginning of the Holocene epoch at 10,000 years ago. It is characterized by the succession of northern glaciations, also called the "ice age."

plume—The elongated pattern of contaminated air or water originating at a source, such as a smokestack or a hazardous waste disposal site.

plutonium—A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

plutonium-239—An isotope of plutonium with a half-life of 24,110 years which is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles.

population dose—See *collective dose.*

Precambrian—All geologic time before the beginning of the Paleozoic era. This includes about 90 percent of all geologic time and spans the time from the beginning of the Earth, about 4.5 billion years ago, to about 570 million years ago.

prehistoric resources—The physical remains of human activities that predate written records; they generally consist of artifacts that may alone or collectively yield otherwise inaccessible information about the past.

prevention of significant deterioration—Regulations required by the 1977 *Clean Air Act* amendments to limit increases in criteria air pollutant concentrations above baseline in areas that already meet the National Ambient Air Quality Standards. Cumulative increases in pollutant levels after specified baseline dates must not exceed specified maximum allowable amounts.

These allowable increases, also known as increments, are especially stringent in areas designated as Class I areas (e.g., national parks, wilderness areas) where the preservation of clean air is particularly important. All areas not designated as Class I are currently designated as Class II. Maximum increments in pollutant levels are also given in 40 CFR 51.166 for Class III areas, if any such areas should be so designated by the U.S. Environmental Protection Agency. Class III increments are less stringent than those for Class I or Class II areas. (See *National Ambient Air Quality Standards*.)

prime farmland—Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oil seed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, without intolerable soil erosion, as determined by the Secretary of Agriculture (*Farmland Protection Act* of 1981, 7 CFR Part 7, paragraph 658).

probabilistic risk assessment—A comprehensive, logical, and structured methodology that accounts for population dynamics and human activity patterns at various levels of sophistication, considering time-space distributions and sensitive subpopulations. The probabilistic method results in a more complete characterization of the exposure information available, which is defined by probability distribution functions. This approach offers the possibility of an associated quantitative measure of the uncertainty around the value of interest.

probable maximum flood—Flood levels predicted for a scenario having hydrological conditions that maximize the flow of surface waters.

process—Any method or technique designed to change the physical or chemical character of the product.

proliferation—The spread of nuclear weapons and the materials and technologies used to produce them.

prompt critical device—A critical assembly designed to reach the condition of prompt criticality. Prompt criticality is the nuclear physics supercriticality condition, due to neutrons released immediately during the fission process, in which a mass and geometric configuration of fissile material (uranium-233, uranium-235, plutonium-239, or plutonium-241) results in an extremely rapid increase in the number of fissions from one neutron generation to the next. Prompt criticality does not rely on the releases of delayed neutrons, which are not released immediately, but rather over a period of about one minute after fission. Prompt criticality describes the condition in which the nuclear fission reaction is not only self-sustaining, but also increasing at a very rapid rate.

protected area—A type of security area defined by physical barriers (i.e., walls or fences), to which access is controlled, used for protection of security Category II special nuclear materials and classified matter and/or to provide a concentric security zone surrounding a material access area (security Category I nuclear materials) or a vital area. (See *material access area* and *vital area.)*

proton—An elementary nuclear particle with a positive charge equal in magnitude to the negative charge of the electron; it is a constituent of all atomic nuclei, and the atomic number of an element indicates the number of protons in the nucleus of each atom of that element.

pulsed assemblies—A critical assembly designed to produce a brief emission of neutrons and gamma radiation associated with a critical condition which lasts a fraction of a second.

Quaternary—The second geologic time period of the Cenozoic era, dating from about 1.6 million years ago to the present. It contains two epochs: the Pleistocene and the Holocene. It is characterized by the first appearance of human beings on Earth.

rad—The English unit of absorbed dose, a rad is 0.01 joule of energy deposited per kilogram of absorbing material. A joule is a very small amount of energy. For example, a 60-watt light bulb on for about 0.02 seconds would use one joule of energy. It is historically derived from "radiation absorbed dose."

radiation (ionizing)—See *ionizing radiation*.

radioactive waste—In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or byproduct material is subject to regulation as radioactive waste under the *Atomic Energy Act*. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

radioactivity—*Defined as a process:* The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation. *Defined as a property:* The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

radioisotope or radionuclide—An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See *isotope*.)

radon—A radioactive noble gas with the atomic number 86, resulting from the radioactive decay of radium. Radon occurs naturally in the environment and can collect in unventilated enclosed areas, such as basements. Large concentrations of radon can result in the accumulation of radioactive radon progeny which can cause lung cancer in humans.

RADTRAN—A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

Reasonably Available Control Technology (RACT)—The lowest emissions limit that a particular source is capable of meeting by the application of control technology that is reasonably available as well as technologically and economically feasible.

receiving waters**—**Rivers, lakes, oceans, or other bodies of water into which wastewaters are discharged.

recharge**—**Replenishment of water to an aquifer.

Record of Decision (ROD)—A document prepared in accordance with the requirements of 40 CFR 1505.2 and 10 CFR 1021.315 that provides a concise public record of DOE's decision on a proposed action for which an EIS was prepared. A ROD identifies the alternatives considered in reaching the decision; the environmentally preferable alternative; factors balanced by DOE in making the decision, and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reasons they were not.

reference concentration**—**An estimate of a toxic chemical daily inhalation of the human population (including sensitive subgroups) likely to be without an appreciable risk of harmful effects during a lifetime. Those effects are both to the respiratory system (portal-of-entry) and the peripheral to the respiratory system (extra-respiratory effects). It is expressed in units of micrograms per cubic meter.

region of influence**—**A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur and expected to be of consequence for local jurisdictions.

regional economic area**—**A geographic area consisting of an economic node and the surrounding counties that are economically related and include the places of work and residences of the labor force. Each regional economic area is defined by the U.S. Bureau of Economic Analysis.

regulated substance**—**A general term used to refer to materials other than radionuclides that may be regulated by other applicable Federal, State, or local requirements.

reliability**—**The ability of a nuclear weapon, weapon system, or weapon component to perform its required function under stated conditions for a specified period of time. (Essentially equivalent to performance.)

rem**—**The English unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Historically derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as 1 roentgen of x-ray or gamma ray exposure. (See *absorbed dose* and *dose equivalent*.)

remediation**—**The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

remote-handled waste**—**In general, refers to radioactive waste that must be handled at a distance to protect workers from unnecessary exposure (e.g., waste with a dose rate of 200 millirem per hour or more at the surface of the waste package). (See *contact-handled waste.*)

replacement pit fabrication—This function includes the fabrication, surveillance, and storage of the primary high explosive and plutonium core of a nuclear weapon.

Resource Conservation and Recovery Act—This Act gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of nonhazardous wastes.

retrofit—To furnish (e.g., a weapon) with new parts, equipment, or features not available at the time of manufacture.

rhyolite—A fine-grained, silica-rich igneous rock, the extrusive equivalent of granite.

riparian—Of, on, or relating to the banks of a natural course of water.

risk—The probability of a detrimental effect from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (i.e., the product of these two factors).

risk assessment (chemical or radiological)—The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

roentgen—A unit of exposure to ionizing x-ray or gamma radiation equal to or producing one electrostatic unit of charge per cubic centimeter of air. It is approximately equal to 1 rad.

runoff—The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

Safe Drinking Water Act, as amended—This Act protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

safe secure trailer—A specially modified semitrailer, pulled by an armored tractor truck, which DOE uses to transport nuclear weapons, nuclear weapons components, or special nuclear material over public highways.

safeguard—An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized access, possession, use, or sabotage of nuclear materials.

safety analysis report—A report that systematically identifies potential hazards within a nuclear facility, describes and analyzes the adequacy of measures to eliminate or control identified hazards, and analyzes potential accidents and their associated risks. Safety analysis reports are used to ensure that a nuclear facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations. Safety analysis reports are required for DOE nuclear facilities and as a part of applications for U.S. Nuclear

Regulatory Commission licenses. The U.S. Nuclear Regulatory Commission regulations or DOE orders and technical standards that apply to the facility type provide specific requirements for the content of safety analysis reports. (See *nuclear facility*.)

sandstone**—**A sedimentary rock composed mostly of sand-size particles cemented usually by calcite, silica, or iron oxide.

sanitary waste**—**Waste generated by normal housekeeping activities, liquid or solid (includes sludge), which is not hazardous or radioactive.

sanitization**—**An irreversible modification or destruction of a component or part of a component to the extent required to prevent revealing classified or otherwise controlled information.

scope**—**In a document prepared pursuant to the *National Environmental Policy Act* of 1969, the range of actions, alternatives, and impacts to be considered.

scoping**—**An early and open process for determining the scope of issues to be addressed in an EIS and for identifying the significant issues related to a Proposed Action. The scoping period begins after publication in the *Federal Register* of a Notice of Intent to prepare an EIS. The public scoping process is that portion of the process where the public is invited to participate. DOE also conducts an early internal scoping process for environmental assessments or EISs. For EISs, this internal scoping process precedes the public scooping process. DOE's scoping procedures are found in 10 CFR 1021.311.

scrubber**—**An air pollution control device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

sealed pit**—**A nuclear weapon pit that is hermetically closed to protect nuclear material from the environment.

secondary**—**See *weapon secondary*.

security**—**An integrated system of activities, systems, programs, facilities, and policies for the protection of restricted data and other classified information or matter, nuclear materials, nuclear weapons and nuclear weapons components, and/or DOE contractor facilities, property, and equipment.

sedimentation**—**The settling out of soil and mineral solids from suspension in water.

seismic**—**Earth vibration caused by an earthquake or an explosion.

seismicity**—**The relative frequency and distribution of earthquakes.

severe accident**—**An accident with a frequency of less than 10^{-6} per year that would have more severe consequences than a design-basis accident in terms of damage to the facility, offsite consequences, or both.

sewage—The total organic waste and wastewater generated by an industrial establishment or a community.

shielding—In regard to radiation, any material of obstruction (e.g., bulkheads, walls, or other construction) that absorbs radiation to protect personnel or equipment.

short-lived activation product—An element formed from neutron interaction that has a relatively short half-life that is not produced from the fission reaction (e.g., a cobalt isotope formed from impurities in the metal of the reactor piping).

short-lived nuclides—Radioactive isotopes with half-lives no greater than about 30 years.

shrink-well potential—The potential for soils to contract while drying and expand after wetting.

sievert—The International System of Units (SI) unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality factor (1 sievert is equal to 100 rem). (See *gray*.)

silica gel—An amorphous, highly adsorbent form of silicon dioxide.

silt—A sedimentary material consisting of fine mineral particles intermediate in size between sand and clay.

siltstone—A sedimentary rock composed of fine textured materials.

soils—All unconsolidated materials above bedrock. Natural earthy materials on the Earth's surface, in places modified or even made by human activity, containing living matter, and supporting or capable of supporting plants out of doors.

somatic effect—Any effect that may manifest in the body of the exposed individual over his or her lifetime.

source material—Depleted uranium, normal uranium, thorium, or any other nuclear material determined, pursuant to Section 61 of the *Atomic Energy Act* of 1954, as amended, to be source material, or ores containing one or more of the foregoing materials in such concentration as may be determined by regulation.

source term—The amount of a specific pollutant (e.g., chemical, radionuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

special nuclear materials—As defined in Section 11 of the *Atomic Energy Act* of 1954, special nuclear material means: 1) Plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the U.S. Nuclear Regulatory Commission determines to be special nuclear material; or 2) Any material artificially enriched by any of the above.

spectral (response) acceleration**—**An approximate measure of the acceleration (as a percentage of the acceleration due to Earth's gravity) experienced by a building, as modeled by a particle on a massless vertical rod having the same natural period of vibration as the building.

spectral characteristics**—**The natural property of a structure as it relates to the multidimensional temporal accelerations.

staging**—**The process of using two layers to achieve a combined effect greater than that of one layer.

START I and II**—**Terms which refer to negotiations between the United States and Russia (formerly the Soviet Union) during *Strategic Arms Reduction Treaty* (START) I negotiations aimed at limiting and reducing nuclear arms. START I discussions began in 1982 and eventually led to a ratified treaty in 1988. START II protocol, which has not been fully ratified, will attempt to further reduce the acceptable levels of nuclear weapons ratified in START I.
steppe**—**A semi-arid, grass-covered, and generally treeless plain.

stockpile**—**The inventory of active nuclear weapons for strategic defense of the United States.

stockpile stewardship program**—**A program that ensures the operational readiness (i.e., safety and reliability) of the U.S. nuclear weapons stockpile by the appropriate balance of surveillance, experiments, and simulations.

Stockpile surveillance**—**Routine and periodic examination, evaluation, and testing of stockpile weapons and weapon components to ensure that they conform to performance specifications and to identify and evaluate the effect of unexpected or age-related requirements.

strategic reserve**—**That quantity of plutonium and highly enriched uranium reserved for future weapons use. For the purposes of this SPEIS, strategic reserves of plutonium will be in the form of pits, and strategic reserves of highly enriched uranium will be in the form of canned secondary assemblies. Strategic reserves also include limited quantities of plutonium and highly enriched uranium metal maintained as working inventory at DOE laboratories.

stratigraphy**—**Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

sulfur oxides**—**Common air pollutants, primarily sulfur dioxide, a heavy, pungent, colorless gas (formed in the combustion of fossil fuels, considered a major air pollutant), and sulfur trioxide. Sulfur dioxide is involved in the formation of acid rain. It can also irritate the upper respiratory tract and cause lung damage.

Superfund Amendments and Reauthorization Act (SARA) of 1986**—**Public Law 99-499 which amends the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) of 1980. SARA more stringently defines hazardous waste cleanup standards and emphasizes remedies that permanently and significantly reduce the mobility, toxicity, or volume of wastes. Title III of SARA, the *Emergency Planning and Community Right-to-Know Act*, mandates establishment of community emergency planning programs, emergency notification, reporting of chemicals, and emission inventories.

surface water—All bodies of water on the surface of the earth and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

Tertiary—The first geologic time period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning between about 66 and 1.6 million years ago. During this period, mammals became the dominant life form on Earth.

thermonuclear—The process by which very high temperatures are used to bring about the fusion of light nuclei, such as deuterium and tritium, with the accompanying release of energy.

Third Third wastes—The Environmental Protection Agency proposed the Third Thirds Rule, as required by the Hazardous and Solid Waste Amendments of 1984, to establish treatment standards and effective dates for all wastes (including characteristic wastes) for which treatment standards had not yet been promulgated (40 CFR 268.12), including derived-from wastes (i.e., multi-storage leachage), and for mixed radioactive/hazardous wastes.

threat—1) A person, group, or movement with intentions to use extant or attainable capabilities to undertake malevolent actions against DOE interests; 2) The capability of an adversary coupled with his intentions to undertake any actions detrimental to the success of DOE program activities or operation.

threatened species—Any plants or animals 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 in the *Endangered Species Act* and its implementing regulations (50 CFR Part 424). (See *endangered species*.)

threshold limit values—The recommended highest concentrations of contaminants to which workers may be exposed according to the American Conference of Governmental Industrial Hygienists.

total effective dose equivalent—The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

Toxic Substances Control Act of 1976—This Act authorizes the Environmental Protection Agency to secure information on all new existing chemical substances and to control any of these substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the Environmental Protection Agency before they are manufactured for commercial purposes.

Transuranic (TRU)—Any element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

Transuranic Package Transporter Model 2 (TRUPACT 2)—A version of Type B transportation container (see *Type B packaging*) used for transporting transuranic waste. It is made of stainless steel, approximately 8 feet in diameter, 10 feet high, and constructed with leak-tight inner and outer containment vessels. TRUPACT 2 can hold up to 14 55-gallon waste drums, 2 standard waste boxes, or 1 10-drum over-pack (a container designed to provide additional protection for older, deteriorating drums).

transuranic waste—Radioactive waste not classified as high-level radioactive waste and that contains more than 100 nanocuries (3,700 becquerels) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

tritium—A radioactive isotope of the element hydrogen with two neutrons and one proton. Common symbols for the isotope are H-3 and T.

tuff—A fine-grained rock composed of ash or other material formed by volcanic explosion or aerial expulsion from a volcanic vent.

Type B packaging—A regulatory category of packaging for transportation of radioactive material. The U.S. Department of Transportation and U.S. Nuclear Regulatory Commission require Type B packaging for shipping highly radioactive material. Type B packages must be designed and demonstrated to retain their containment and shielding integrity under severe accident conditions, as well as under the normal conditions of transport. The current U.S. Nuclear Regulatory Commission testing criteria for Type B package designs (10 CFR Part 71) are intended to simulate severe accident conditions, including impact, puncture, fire, and immersion in water. The most widely recognized Type B packages are the massive casks used for transporting spent nuclear fuel. Large-capacity cranes and mechanical lifting equipment are usually needed to handle Type B packages.

Type B shipping cask—A U.S. Nuclear Regulatory Commission-certified cask with a protective covering that contains and shields radioactive materials, dissipates heat, prevents damage to the contents, and prevents criticality during normal shipment and accident conditions. It is used for transport of highly radioactive materials and is tested under severe, hypothetical accident conditions that demonstrate resistance to impact, puncture, fire, and submersion in water.

unconfined aquifer—A permeable geological unit having the following properties: a water-filled pore space (saturated), the capability to transmit significant quantities of water under ordinary differences in pressure, and an upper water boundary that is at atmospheric pressure.

unsaturated zone (vadose)—A region in a porous medium in which the pore space is not filled with water.

uranium—A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14 known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (See *natural uranium, enriched uranium,* and *depleted uranium*.)

vault (special nuclear material [SNM])—A penetration-resistant, windowless enclosure having an intrusion alarm system activated by opening the door and which also has: 1) Walls, floor, and ceiling substantially constructed of materials which afford forced-penetration resistance at least equivalent to that of 20.32-centimeter (8-inch) thick reinforced concrete; and 2) A builtin combination-locked steel door which, for existing structures, is at least 2.54-centimeter (1-inch) thick exclusive of bolt work and locking devices and which, for new structures, meets standards set forth in Federal specifications and standards.

viewshed—The extent of an area that may be viewed from a particular location. Viewsheds are generally bounded by topographic features such as hills or mountains.

vital area—A type of DOE security area that is located within the Protected Area and that has a separate perimeter and access controls to afford layered protection, including intrusion detection, for vital equipment.

Visual Resource Management Class—Any of the classifications of visual resources established through application of the Visual Resources Management process of the Bureau of Land Management. Four classifications are employed to describe different degrees of modification to landscape elements: ***Class I***—areas where the natural landscape is preserved, including national wilderness areas and the wild sections of national wild and scenic rivers; ***Class II***—areas with very limited land development activity, resulting in visual contrasts that are seen but do not attract attention; ***Class III***—areas in which development may attract attention, but the natural landscape still dominates; and ***Class IV***—areas in which development activities may dominate the view and may be the major focus in the landscape.

vitrification—A waste treatment process that uses glass (e.g., borosilicate glass) to encapsulate or immobilize radioactive wastes to prevent them from reacting with the surroundings in disposal sites.

volatile organic compounds (VOC)—A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol. In regard to air pollution, any organic compound that participates in atmospheric photochemical reaction, except for those designated by the U.S. Environmental Protection Agency Administrator as having negligible photochemical reactivity.

warhead—Collective term for the package of nuclear assembly and non-nuclear components that can be mated with a delivery vehicle or carrier to produce a deliverable nuclear weapon.

waste classification—Waste classified according to DOE Order 435.1, Radioactive Waste Management, including high-level radioactive, transuranic, and low-level radioactive waste.

Waste Isolation Pilot Plant—A facility in southeastern New Mexico developed as the disposal site for transuranic waste (not in operation prior to publication).

waste management—The planning, coordination, and direction of those functions related to the generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

waste minimization and pollution prevention—An action that economically avoids or reduces the generation of waste and pollution by source reduction, reducing the toxicity of hazardous waste and pollution, improving energy use, or recycling. These actions will be consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

water table—Water under the surface of the ground occurs in two zones: an upper unsaturated zone and the deeper saturated zone. The boundary between the two zones is the water table.

watt —A unit of power equal to 1 joule per second. (See *joule*.)

weapon primary—The crucial subsystem for weapon reliability and safety; the primary contains the main high explosive and the plutonium that comprise the principal safety concerns. Without proper primary-stage function, the secondary will not work.

weapon secondary—Provides additional explosive energy release; composed of lithium deuterium, and other materials. As the secondary implodes, the lithium in the isotopy forms lithium-6, is converted to tritium by neutron interactions, and the tritium product in turn undergoes fusion with the deuterium to create the thermonuclear explosion.

weapons-grade—Fissionable material in which the abundance of fissionable isotopes is high enough that the material is suitable for use in thermonuclear weapons.

weapons assembly/disassembly (A/D)—Assembly operations assembles piece parts into subassemblies using joining techniques such as welding, adhesive bonding, and mechanical joining. Disassembly takes retired weapons apart and recycles all materials of value.

weighting factor—Generally, a method of attaching different importance values to different items or characteristics. In the context of radiation protection, the proportion of the risk of effects resulting from irradiation of a particular organ or tissue to the total risk of effects when the whole body is irradiated uniformly (e.g., the organ dose weighting factor for the lung is 0.12, compared to 1.0 for the whole body). Weighting factors are used for calculating the effective dose equivalent.

wetland—"[T]hose areas that are inundated or saturated by surface or groundwater 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. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3).

whole-body dose—In regard to radiation, dose resulting from the uniform exposure of all organs and tissues in a human body. (See *effective dose equivalent*.)

wind rose—A circular diagram showing, for a specific location, the percentage of the time the wind is from each compass direction. A wind rose for use in assessing consequences of airborne releases also shows the frequency of different wind speeds for each compass direction.

worker year—Measurement of labor requirement equal to one full-time worker employed for one year.

X/Q (Chi/Q)—The relative calculated air concentration due to a specific air release; units are seconds per cubic meter (sec/m^3).

yield—The force in tons of TNT of a nuclear or thermonuclear explosion.

zero-based stockpile—A nuclear weapons stockpile with zero nuclear weapons and therefore requiring no stockpile management effort.

Chapter 14
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B.S., Mechanical Engineering, Tennessee Technological University, 1988
Years of Experience: 17

Whiteman, Albert, E., Tetra Tech, Inc.
MBA, Oklahoma State University, 1972
M.S., Physics, Oklahoma State University, 1970
B.A., Physics and Mathematics, Friends University, 1968
Years of Experience: 35

Wyka, Theodore, U.S. DOE/NNSA
MSE, Environmental Engineering, Virginia Polytechnic Institute, 1995
B.S., Mechanical Engineering, University of Notre Dame, 1982
Years of Experience: 25

Young, Phil, Accident Analysis, Tetra Tech, Inc.
M.S., Health Physics, Georgia Institute of Technology, 1989
B.S., Radiation Health (Health Physics), Oregon State University, 1988
Years of Experience: 17

Chapter 15
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DISTRIBUTION LIST

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Federal Agencies

U.S. Army - White Sands Missile Range
Advisory Council on Historic Preservation
Defense Nuclear Facilities Safety Board
Office of Federal Agency Programs
Office of Nuclear Reactor Regulation
U.S. Department of the Air Force
U.S. Department of Commerce
U.S. Department of Homeland Security
U.S. Department of the Interior
U.S. Department of the Interior, National Park Service, Bandelier National Monument; Great Smoky Mountains National Park
U.S. Environmental Protection Agency
U.S. Nuclear Regulatory Commission

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Nevada Test Site Programmatic Site-Specific Advisory Board
Northern New Mexico Citizens Advisory Board
Oak Ridge Site Specific Advisory Board
Savannah River Site Citizens Advisory Board

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Tennessee Department of Labor and Workforce Development
Susan Cowden

Tennessee Department of Economic and Community Development
Gary Human

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Marj Leider
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Georgia

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Columbia County Board of Commissioners, Ron C. Cross, Chairman

Missouri

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Melba Curls
Terry Riley
Cathy Jolly
Russ Johnson
Jan Marcason
Ed Ford
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Bill Skaggs
Sharon Sanders Brooks
John A. Sharp

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Ron Williams

Nye County Board of Commissioners

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Joni Eastley
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Nye County

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Darrell Lacy, NWRPO

Town of Tonopah

James T. Eason
Al O'Donnell, Chamber of Commerce

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David Coss, Santa Fe
Richard Lucero, Española

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Max Baker, Los Alamos County Administrator
Anthony Mortillaro, Los Alamos County, Assistant Administrator
Rick Bohn, Los Alamos County, Director, Community Development
Lorenzo Valdez, Rio Arriba County Manager

South Carolina

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Vernon Dunbar, City of New Ellenton
W. Ken Durham, Town of Edgefield
Lark W. Jones, North Augusta
Thomas Rivers, Town of Williston

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J. W. Wall, Council of Allendale
Richard Huggins, Barnwell County Council
Monroe Kneece, Edgefield County Council
James M. Adams, North Augusta City Council
Carolyn C. Baggott, North Augusta City Council
Pat C. Carpenter, North Augusta City Council
Kenneth J. McDowell, North Augusta City Council
Arthur Shealy, North Augusta City Council
Jason Whinghter, North Augusta City Council

City and County Officials

J. Clay Killian, Aiken County Government
Timothy Simmons, Aiken County Commission for Higher Education
Robert Thomas, Allendale County Development Board
Isaiah Odom, Bamberg County
Marshall Martin, Barnwell County Economic Commission
F. Wayne Rogers, Lower Savannah Council of Governments

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J. David Jameson, President, Aiken Chamber
Van Smith, Aiken Downtown Development Association

Tennessee

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Local Oversight Committee Oak Ridge

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Environmental Quality Advisory Board
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Hayes Ledford, Chattanooga Area Chamber
Clyde Craven, Oak Ridge Chamber
Parker Hardy, Oak Ridge Chamber
Tatia M. Harris, Knoxville Area Chamber Partnership
Greta Ownby, Oak Ridge Chamber
Terry Payne, Roane County Chamber
Oak Ridge Economic Partnership

Texas

Mayors
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Amarillo Commissioners
Ronald Boyd
Madison Scott
Brian J. Eades
Jim Simms

Amarillo Economic Development Corporation, Buzz David

Chambers of Commerce
Gary Molberg, Amarillo Chamber
John Teague, Amarillo Chamber

Native American Tribes and Organization

All Indian Pueblo Council
Five Sandoval Indian Pueblos
Eight Northern Indian Pueblos Council
Jicarilla Apache Nation
Mescalero Apache Tribe
National Congress of American Indians
National Environmental Coalition of Native Americans
National Tribal Environmental Council
Navajo Nation
Navajo Nation Council
Pueblo of Acoma
Pueblo of Cohiti
Pueblo of Isleta
Pueblo of Jemez
Pueblo of Laguna
Pueblo of Nambe
Pueblo of Picuris
Pueblo of Pojoaque
Pueblo of Sandia
Pueblo of San Ildefonso
Pueblo of San Felipe
Pueblo of Santa Ana
Pueblo of Santa Clara
Pueblo of Santo Domingo
Pueblo of Taos
Pueblo of Tesuque
Pueblo of Zia
Pueblo of Zuni

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Richard Spees, Akerman Senterfitt
John Arnold, Albuquerque Journal
Donna Detweiler, Albuquerque Mennonite Church
Dennis Reisenweaver, Alion Science & Technology
Susan Gordon, Alliance for Nuclear Accountability
Alfred Meyer, Alliance for Nuclear Accountability
Michael Schumacher, Amarillo Globe-News
Stephen McNeil, American Friends Service Committee
Amsa Virji, American Friends Service Committee
Dirk Stephans, ARES Corporation
Matthew Cardinale, Atlanta Progressive News
Krista Brewer, Atlanta WAND
Barbara Joye, Atlanta WAND
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Paul Williams, Atomic Heritage Foundation
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Steve Jones, Atomic Trades and Labor Council
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John Howanitz, B&W Y-12 Community Relations Council
Robert Johnson, B&W Y-12 Community Relations Council
Richard Pack, B&W Y-12 Community Relations Council
William Thornton III, B&W Y-12 Community Relations Council
Paul Vanatta, B&W Y-12 Community Relations Council
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Kevin Kamps, Beyond Nuclear
George Jobson, BGI
Charles Utley, Blue Ridge Environmental Defense League
Cassandra Baker, BSRI
Eddie Cook, BWXT Pantex
Mike Law, BWXT Pantex
Jeff Flowers, BWXT Pantex LLC
Owen Stevens, BWXT Y-12
Greg Barber, C. Martin Co.
Matthew Kirkland, C. Martin Co.

Martin Fleck, Campaign for a Nuclear Weapons Free World
Jodi Breisler, Capitol News Connection
Taijiro Kimura, Carnegie Endowment
Elliott Becker, Center for Defense Information
Lydell Lauro, CFS Development
Cathy Hickey, CH2M HILL
Sherree Shaw, CH2M HILL
John Lackey, Church of the Savior
Peggy Johnson, Citizen Alert
Shrayas Jatkar, Citizens for Alternatives to Radioactive Dumping
Alien Liddel, Citizens for Alternatives to Radioactive Dumping
Jeanne Pahls, Citizens for Alternatives to Radioactive Dumping
Ranowul Jzar, Citizens for Environmental Justice
Susan Wood and J.M. McKibben, Citizens for Nuclear Technology Awareness
Ron Davis, Citizens for Police Review
Charlie Kuykendall, Coalition of Oak Ridge Retired Employees
Marilyn Hoff, Code Pink
Candace Ross, Code Pink
A Smith, COMFAM
Eric Martinez, Community Service Organization del Norte
Donna Carey, Concerned Citizens of Llano de San Juan, New Mexico
Joni Arends, Concerned Citizens for Nuclear Safety
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Linda Wiener, Concerned Citizens for Nuclear Safety
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Tito Madrid, Congresswoman Heather Wilson
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M. H. Churney, CSNC
Donald Clark, Cumberland Countians for Peace and Justice
Karen Kostoff, Democracy for America
Stuart Riley, Democracy for New Mexico
David Shafer, Desert Research Institute
Yusif Barakat, Detroit Area Peace for Justice Network
Andrew Thibadeau, Division of Information Technology and Security
Fred Humes, Economic Development Partnership
Steve Priest, Energy Solutions
Barbara Nwecomb, EPC
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Tara Morrow, Faithful Security
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Daphne Young, KDWN Radio
Edward Lawrence, KLAS-TV
Chris Olsen, KVII-TV
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Leonard Stark, Oak Ridge Environmental Peace Alliance
Shelley Wascom, Oak Ridge Environmental Peace Alliance
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C.E. Williams, Panhandle GCD
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Jedidiyah DeVries, Tri-Valley CAREs
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Danny Otteson, Washington Group
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Jennie Stoltenberg, Washington Group
Leroy Wells, Washington Group
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Clair Blackburn, Westinghouse
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Steven Books, Wisconsin's Citizens Response
Joseph Elder, Wisconsin's Citizens Response
Kaj Foget, Wisconsin's Citizens Response
David Knuti, Wisconsin's Citizens Response
Barbara Smith, Wisconsin's Citizens Response
Stephanie Heiler, Women for a Better World
Katya Miller, Women in Black
Wende Ballew, Women's Action for New Directions
Christine Cernansky, Women's Action for New Directions
Terence Dicks, Women's Action for New Directions
Amanda Hill, Women's Action for New Directions
Anne Hughes, Women's Action for New Directions
Berta Laney, Women's Action for New Directions
Judith Lomas, Women's Action for New Directions
Bobbie Paul, Women's Action for New Directions
Kris Phelps, Women's Action for New Directions
Gloria Tatum, Women's Action for New Directions
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Laura Santina, Women's International League for Peace and Freedom
Paul Borchardt, Wonderland Amusemant Park
Susan Cowden, Workforce Development Division
Todd Fine, World Security Institute
Jeff Jay, WSRC
Barry Shedrow, WSRC
Sham Shete, WSRC
Srini Venkatesh, WSRC
Alex Hunt, WTAMU
Josh Howard, Y12 Chronic Beryllium Support Group

Public Reading Rooms

California

Lawrence Livermore National Laboratory
Public Reading Room
Discovery Center; Building 6525
Livermore, CA 94550
Phone: (925) 422-3272

Livermore Public Library
1188 South Livermore Ave
Livermore, CA 94550-9315
Phone: (925) 937-5500

Tracy Public Library
20 East Eaton Avenue
Tracy, CA 95376
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Georgia

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East-Central Georgia
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902 Greene Street
Augusta, GA 30901
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Missouri

Central Library
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Kansas City, MO 64105
Phone: (816) 701-3400

North-East Branch
6000 Wilson Road
Kansas City, MO 64123
Phone: (816) 701-3485

Ms. Geraldine Haile
Kansas City Site Office
Mid- Continent Public Library
Blue Ridge Branch
9253 Blue Ridge Boulevard
Kansas City, MO 64138
Phone: (816) 761-3382

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NNSA Nevada Site Office
U.S. Department of Energy
Public Reading Room

755 East Flamingo Road; Room 103
Las Vegas, NV 89119
Phone: (702) 784-5121
Fax: (702) 794-5198
Email:cic@nv.doe.gov

Shipping Address:
PO Box 98521, Mail Stop 400
Las Vegas, NV 89193-8521

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Bechtel SAIC Company LLC
Reading Room
Science Center
4101 B Meadows Lane
Las Vegas, NV 89107
Phone: (702) 295-1312

Las Vegas Library
833 Las Vegas Boulevard North
Las Vegas, NV 89101
Phone: (702) 507-3500

Indian Springs Library
715 Gretta Lane
Indian Springs, NV 89018
Phone: (702) 879-3845

Beatty Community Library
400 North 4th Street
Beatty, NV 89003
Phone: (775) 553-2257

New Mexico

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LANL Public Reading Room
PO Box 1663, Mail Stop M9991
Los Alamos, NM 87545
Phone: (505) 667-0216

Mr. Dan Barkley
National Nuclear Security Administration Service Center
DOE Reading Room
Government Information Department

Zimmerman Library
University of New Mexico
Albuquerque, NM 87131-1466
Phone: (505) 277-7180

Mesa Public Library
2300 Central Avenue
Los Alamos, NM 87544
Phone: (505) 662-8250

Santa Fe Main Library
145 Washington Avenue
Santa Fe, NM 87501
Phone: (505) 955-6780

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Mr. Paul H. Lewis
Savannah River Operations Office
Gregg-Graniteville Library
University of South Carolina-Aiken
171 University Parkway
Aiken, SC 29801
Phone: (803) 641-3320
Email: paull@usca.edu

Aiken County Public Library
314 Chesterfield St. S
Aiken, SC 29801
Phone: (803) 642-2020

Barnwell County Public Library
617 Hagood Ave
Barnwell, SC 29812
Phone: (803) 259-3612

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Oak Ridge Public Library
Civic Center
1401 Oak Ridge Turnpike
Oak Ridge, TN 37830
Phone: (865) 425-3455

Kingston Public Library
1004 Bradford Way
Kingston, TN 37763
Phone: (865) 376-9905

Texas

Central Library
413 E 4th Ave
Amarillo, TX 79101
Phone: (806) 378-3054

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1500 NE 24th Ave
Amarillo, TX 79107
Phone: (806) 381-7931

U.S. Department of Energy Reading Room
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Amarillo College
Washington Street Campus
2201 S. Washington St.
Amarillo, Texas
Phone: (806) 371-5400

Carson County Library
401 Main Street
Panhandle, Texas 79068
Phone: (806) 537-3742

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James Williams
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Richard Williams
Jon Williams
Mariah Williams
Majorie Williams
Dean Williamson
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Appendix A
ALTERNATIVES

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A.1 CONSOLIDATED PLUTONIUM CENTER (CPC)

CPC Requirements

- A CPC would consolidate all Category I/II security and hazard class defense programs mission activities requiring the use and handling of plutonium material. It would provide the facilities and equipment to perform pit manufacturing, pit surveillance, plutonium research and development, manufacturing process development, manufacture of parts for pit certification testing, and training of manufacturing and research and development personnel. A CPC would also consolidate and store all plutonium metal and other materials and parts required in support of these activities, and have supporting analytical chemistry and metallurgical capability.
- Stockpile requirements are based on national security requirements directed by the President based upon strategy and agreements between the Department of Energy (DOE) DOE and Department of Defense (DoD). CPC capacity and production output would be designed to meet the Reliable Replacement Warhead (RRW) requirements. Legacy pits would be supported as required through the use of contingency floor space, additions of required specific pit equipment, and development of specific procedures in handling required material. The facility would not be designed specifically to support all legacy pit types, but would accommodate any requirement for legacy pits as an adjustment to the equipment and facility capability designed for RRW pits with the use of contingency floor space and module flexibility.
- A CPC would provide the facilities and equipment to perform pit manufacturing, pit surveillance, and plutonium research and development.
- Stockpile requirements are based on national security requirements directed by the President and the Congress based on joint recommendations from DOE and DoD. CPC capacity and production output would be designed to meet national security requirements, which could include production of new pits for maintenance of the legacy stockpile or replacement weapons (e.g., RRWs).
- As described in Chapter 2, this SPEIS assumes that a CPC would provide a manufacturing capacity of 125 pits per year (ppy) using a single shift, with a contingency of 200 pits through multiple shifts. A CPC would be capable of supporting the surveillance program at a rate of one pit being destructively evaluated per pit type in the stockpile per year. For Los Alamos, this SPEIS also assesses an alternative that would result in a smaller pit production capacity (80 ppy), based on the use of the existing and planned infrastructure at that site.
- A newly constructed CPC would be constructed and started up over a six year period, and would be fully operational by approximately 2022. A CPC would be designed for a service life of at least 50 years.
- The sites being considered as potential locations for a CPC and consolidation of Category

I/II quantities of special nuclear material (SNM) include: Los Alamos, NTS, Pantex, SRS, and Y–12.

- A newly constructed CPC would consist of a central core area surrounded by a Perimeter Intrusion Detection and Assessment System (PIDAS), which would enclose all operations involving Category I/II quantities of SNM. The enclosed area would be approximately 40 acres. A buffer area would provide unobstructed view of the area surrounding the PIDAS. All administrative and non-SNM support buildings would be located outside the edge of the buffer area. Once operational, approximately 110 acres would be required for a new CPC (Table A.1-1). As shown in Table A.1-1, two CPC alternatives at Los Alamos (Upgrade Alternative and 50/80 Alternative) could reduce land area requirements by the use of existing and planned facilities and infrastructure.

Table A.1-1—Land Requirements for CPC Alternatives

	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110*	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	

* Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

- It is assumed that CPC facilities would be constructed above ground. During design activities, studies would be performed on worker safety, security enhancements, and costs. Examining whether the site of the CPC facilities above or below ground is an example of such a study. All five sites are assumed to be able to support a buried or partially buried/bermed facility. This SPEIS includes a discussion of the potential differences among the sites in supporting a buried or bermed facility (see Section A.1.5).
- If Los Alamos is not selected for the CPC mission, it is assumed that plutonium facilities at that site would be reduced to Category III or IV nuclear facilities for R&D purposes, or closure, after the CPC begins operations. Any residual non-Defense Program (DP) missions (i.e. Pu-238) would be responsible for funding to meet safety/security requirements. However, as explained in Section 3.4.1.6, facilities at Los Alamos are also being considered for upgrade to meet CPC requirements.
- SNM storage at the CPC would be based on the need to support a 3 month production period. Approximately 3 metric tons of storage is anticipated.
- Any transuranic (TRU) waste from a CPC is assumed to be disposed of at the Waste Isolation Pilot Plant (WIPP) (see Section 10.5.5).

A.1.1 CPC Operations

The following section discusses the operations for the CPC. The section begins with a summary of the pit production process that would occur in a CPC. The overall process would involve three main areas: 1) Material Receipt, Unpacking, and Storage; 2) Feed Preparation; and 3) Manufacturing.

A.1.1.1 *Material Receipt, Unpacking, and Storage*

Plutonium feedstock material would be delivered from offsite sources in DOE/Department of Transportation (DOT) approved shipping containers. The shipping containers would be held in Cargo Restraint Transporters (CRT) and hauled by Safeguards Transporters (SGTs). The bulk of the feedstock material would come from Pantex, in the form of pits from retired weapons. Additionally, small amounts of plutonium metal from LANL and SRS could be used. The CRTs would be unloaded from the truck and the shipping packages unpacked from the CRT. Each shipment would be measured to confirm the plutonium content, entered into the facility's Material Control & Accountability (MC&A) database, and placed into temporary storage. The shipping packages would later be removed from storage and opened to remove the inner containment vessel. Containment vessels with the feedstock material would then be measured for purposes of and transferred to the Receipt Storage Vault pending transfer to the Feed Preparation Area.

A.1.1.2 *Feed Preparation*

The containers would then be transferred through a secure transfer corridor to an adjacent Feed Preparation Area where plutonium metal is prepared for manufacturing. For pits to be recycled, the pit is first cut in half and all nonplutonium components are removed. Notable among these non-plutonium components is enriched uranium (EU), which would be decontaminated and then shipped to Y-12 for recycling. All of the other disassembled components would be decontaminated, to the maximum extent possible, and then disposed of as either low-level waste (LLW) or TRU waste, as appropriate.

There are two baseline processes currently being evaluated for the purification of the plutonium metal. One process relies more heavily on aqueous chemistry (aqueous process) and the other on pyrochemical reactions (pyrochemical process). The primary difference between the two processes is that the aqueous process does not employ chloride containing aqueous solutions, which means conventional stainless steels can readily be used to contain all of its processes. On the other hand, the pyrochemical process requires specialized materials to contain the corrosive chloride bearing solutions that it employs.

The primary process evaluated in this SPEIS is the aqueous process. This is a well known process, which has been successfully used at DOE sites for many years. It is comparatively simple and experiences few, but well controlled corrosion problems. This process requires more space than the pyrochemical process and does not produce as pure a product metal as the pyrochemical process. This lower purity requires additional processing runs and therefore produces significantly more waste than the pyrochemical process. The aqueous process provides a bounding analysis of the waste impacts from a CPC.

The pyrochemical process is more complex than the aqueous process, employing seven versus four major processing steps. However, this can be done in less space with more processing flexibility. It also produces very pure metal and a lower volume of waste. The purity of metal allows the pyrochemical process to have the option of only partially processing metallic plutonium to obtain adequate production purity. The pyrochemical process, however, requires special materials to contain the corrosive chloride solutions. Based on results from ongoing technology development, the pyrochemical process appears to have the greatest potential for improvements in efficiencies and in waste stream reductions. The pyrochemical process has been successfully used for many years at LANL.

The pyrochemical process has the potential to be environmentally more benign, thus having less environmental impact than the aqueous process. As the design of a CPC develops and a final purification process is selected, the site-specific, tiered EIS would evaluate in more detail the impact of the actual process to be used. Additionally, for a CPC that might be constructed at SRS, this SPEIS includes consideration of using facilities and infrastructure that are being constructed in support of the Materials Disposition Program. One particular facility, the Pit Disassembly and Conversion Facility (PDCF), could provide the capability to disassemble pits and convert the plutonium to a form suitable for producing new pits. The PDCF would include a hardened plutonium processing building, conventional buildings and structures housing support personnel, systems, and equipment (see Section 3.4.1.2).

A.1.1.3 *Manufacturing*

The pit manufacturing work includes the fabrication of the plutonium components for pits and the assembly of pits. A pit in this context is the assembly of all components into the full pit that is shipped to Pantex. Typically, non-plutonium parts would be government-furnished equipment and fabricated elsewhere. Non-plutonium components would be shipped to the CPC to be assembled along with the plutonium components into pits. A quality assurance acceptance program would be required to receive and accept non-plutonium parts. In addition, a bonded stores capability must be provided for interim storage of government-furnished equipment and other parts/materials for war reserve (WR) production. The CPC would require the capability to perform SNM shipping, receiving, and storage; pit disassembly and feedstock sampling; metal preparation, recovery, and refining; product forming, machining, welding, cleaning, and assembly; and product inspection (including radiography), process qualification, production surveillance, and analytical chemistry support. Supporting and ancillary functions (waste handling, security operations, training, maintenance, administration, process development, and testing) required to perform pit manufacturing are also included in the CPC. These capabilities would be applied to both WR production and production of parts/samples in support of certification and new production surveillance activities.

The CPC would deploy manufacturing processes that would enable the production of RRW pits as components for replacement of warheads in the enduring stockpile. The facility would be designed based on an agile facility concept, whereby processes could be changed out as new technologies are developed and limited additional capacity created as contingency for unforeseen requirements. Feedstock for the fabrication of the plutonium components would consist primarily of site-return pits requiring disassembly and reprocessing, but would also include purified metal from the CPC processing line. The capability to manufacture legacy pits would be retained through the agility and flexibility aspects of design with the manufacturing modules and floor space within the facility.

New pits would be inspected and prepared for storage and eventual shipment to Pantex. The majority of the waste from this process would be plutonium shavings that would be recycled within a CPC.

A.1.1.3.1 Manufacturing Process Development

During the projected lifetime of the facility, there would be changes in technology and changes in design of warheads where new processes and equipment would need to be developed and tested before they enter the production line. Process development requires both cold and hot space. Examples currently underway are foundry development where a new casting process is being developed to increase capacity and efficiency; metal purification where a new piece of equipment would accelerate activities, reduce radiation exposure, and reduce waste; machining where multi-functional equipment can replace the need for 3 or 4 separate pieces of equipment; new dimensional analysis to reduce time and improve accuracy of measurement; and module development to locate multiple pieces of equipment in a manner that increases efficiency within a set of operations. This area also provides capability for training new personnel, developing processes, and evaluating new equipment without unnecessary exposure to radiation.

A.1.1.3.2 Manufacture of Certification Parts

Besides the manufacture of pits for the stockpile, the manufacture of pits or parts of pits would be required for support of physics and engineering certification testing. In most instances, such pits or parts may be manufactured on the production line. Their production, however, must be considered in design of the floor space and equipment to ensure the production line is not interrupted in achieving its required capacity and output.

A.1.1.4 *Plutonium Research and Development*

The CPC would also conduct plutonium research and development. Plutonium research and development seeks to understand the properties and performance characteristics of plutonium, including fundamental thermodynamic, shock-induced deformation, intermediate strain-rate elastic-plastic behavior, spall, and surface ejecta. Understanding of the properties and performance characteristics supports modeling of weapon performance and provides assurance of stockpile reliability. Samples are prepared to support tests, such as those using the JASPER gas-gun facility at NTS. Parts are manufactured to support subcritical experiments to study specific fundamental plutonium properties. R&D also supports studies on plutonium aging to measure and understand weapon characteristics as the material ages. Sample fabrication requires the use of lathes, drill presses, tomography, metallographic equipment, polishing, precision machining and inspection, and rolling mill equipment. This research and development resource would also constantly assess the activities required for pit processing and work to develop new more efficient and environmentally preferred methods.

A.1.1.5 *Plutonium Pit Surveillance*

Pit surveillance is the periodic disassembly and inspection of pits removed from the active stockpile to help identify any defects or degradation and assure that nuclear weapons in the enduring stockpile are safe and reliable. Evaluations include leak testing, weighing, dimensional inspection, dye penetration inspection, ultrasonic inspection, radiographic inspection, metallographic analysis, chemical analysis, pressure tests, and mechanical properties testing.

A.1.2 CPC Facility Requirements

In order to allow for the pit production process, as described above, the CPC would require the design of facilities to allow for its operation. Although the overall specific requirements are still in the design stage, the general needs are clearly known and are as follows:

Security. The majority of CPC would be located within a PIDAS. The PIDAS would be a multiple-sensor system within a 30-foot wide zone enclosed by two fences that surround the entire Security Protection Area. There would be an Entry Control Facility (ECF) at the entrance to the Security Protection Area.

Process and R&D buildings. A proposed concept being evaluated for a CPC divides the major plant components into four separate buildings identified as Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D to perform the functions described in Section 3.1.1. The process buildings would be two-story reinforced concrete structures located aboveground at grade. The exterior walls and roofs would be designed to resist all credible man-made and natural phenomena hazards and comply with all NNSA security requirements.

The first story of each building would include plutonium processing areas, manufacturing support areas, waste handling, control rooms, and support facilities for operations personnel. The second story of each of the three process buildings would include the heating, ventilating, and air conditioning (HVAC) supply fans, exhaust fans and high-efficiency particulate air (HEPA) filters, breathing/plant/instrument air compressor rooms, electrical rooms, process support equipment rooms, and miscellaneous support space. Interior walls are typically reinforced concrete to provide personnel shielding and durability for the 50-year facility design life. Each of these processing buildings would have its own ECF, truck loading docks, operations support facility, and safe havens designed in accordance with applicable safety and security requirements. The three processing buildings would be connected by secure transfer corridors.

Support Buildings within the PIDAS. The major support structures located within the PIDAS would include an Analytical Support Building and a Production Support Building. The Analytical Support Building would contain the laboratory equipment and instrumentation required to provide analytical chemistry and metallurgical support for the CPC processes, including radiological analyses. The Production Support Building would provide the capability for performing nonradiological classified work related to the development, testing, staging and trouble-shooting of CPC processes and equipment. A number of other smaller structures also supporting a CPC would include standby generator buildings, fuel and liquid gas storage tanks, an HVAC chiller building, cooling towers, and an HVAC exhaust stack.

Support buildings outside the PIDAS. The major structures located outside the PIDAS would include an Engineering Support Building, a Commodities Warehouse, and a Waste Staging/TRU Packaging Building. This Waste Staging/TRU Packaging Building would be used for characterizing and certifying the TRU waste prior to packaging and short-term lag storage prior to ship-ment to the TRU waste disposal site. Parking areas and storm water detention basins would also be located outside the PIDAS. In addition, a temporary concrete batch plant and construction laydown area would be required during construction. A generic layout showing the major buildings and their relationship to each other is shown in Figure A.1.2-1. Table A.1.2-1 shows the dimension estimates. The overall plant layout in this generic representation is a greenfield campus type layout, and would be adapted to each site, as necessary. The actual footprint of all of the buildings, as shown in the table, is considerably less than the “developed” area from the generic layout. Thus, the actual developed site layout could be much less than that shown in Table A.1.2-2, and could fit any site with enough space for buildings footprint and adequate security standoff distances.

Table A.1.2-1—Dimensions for the CPC

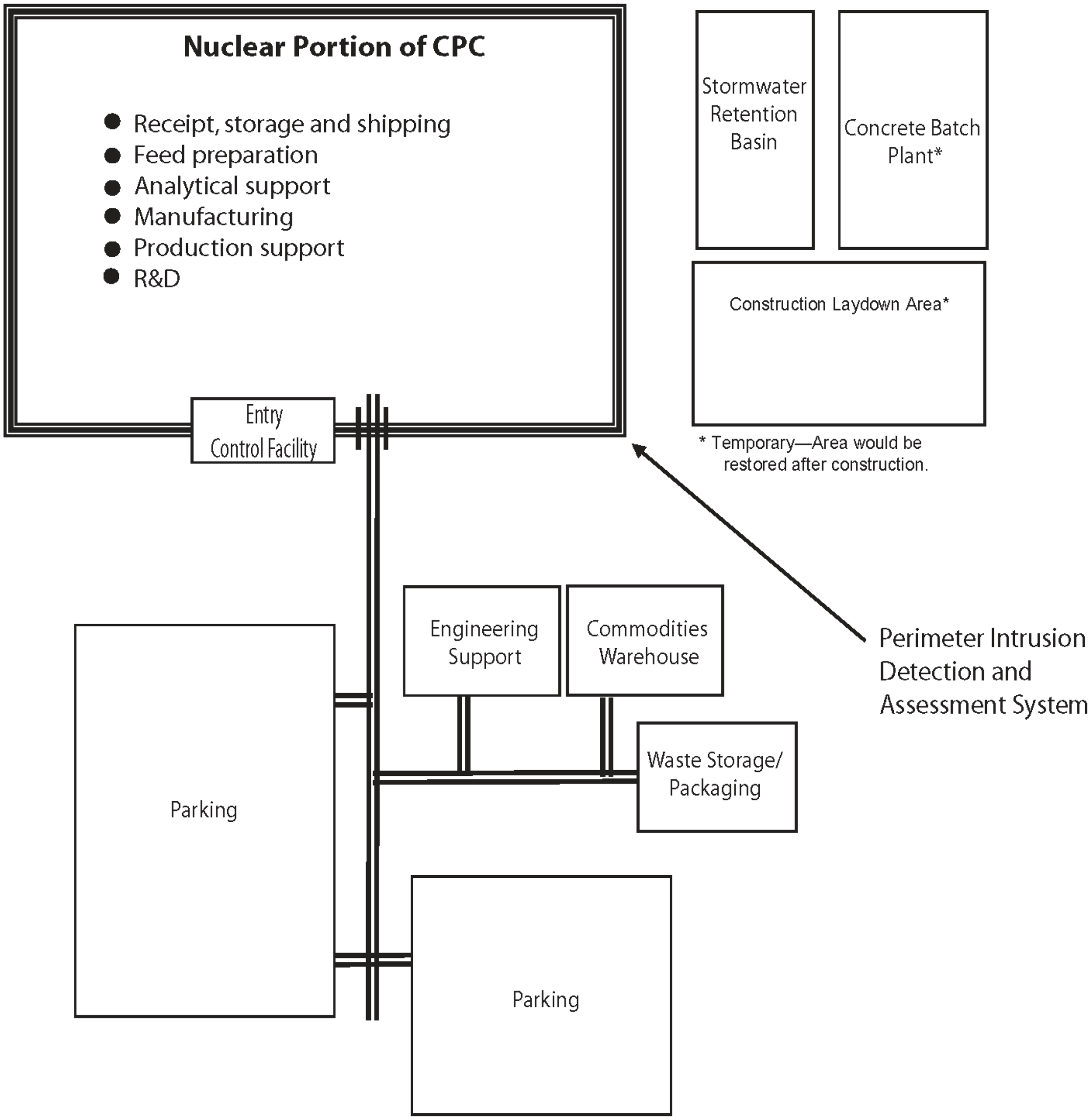
	Dimension
Processing Facilities Footprint (ft^2)	308,000
Support Facilities Footprint (ft^2)	280,000
Research and Development (ft^2)	57,000
Total Facilities Footprint (ft^2)	645,000
Area Developed During Construction (acres)	140
Post Construction Developed Area (acres)	110

Source: NNSA 2007.

A.1.3 CPC Transportation Requirements

The CPC would require transportation activities as described in this section. Plutonium pit assemblies would be shipped from Pantex to the CPC site. During startup, and potentially at other infrequent times, additional plutonium metal could be required. This additional plutonium could be shipped to the CPC from SRS. Additionally, as discussed in Section 3.4.1.4, once the CPC becomes operational, LANL would transfer its Category I/II plutonium to the CPC if LANL is not selected as the CPC site.

Both TRU waste and LLW would be generated at the CPC site. DOE’s WIPP near Carlsbad, New Mexico, or a WIPP-like facility would be the destination for TRU waste from all CPC alternative sites. Three CPC site alternatives (LANL, NTS, and SRS) have low level waste (LLW) disposal facilities and would dispose of LLW onsite. Although Y-12 has some LLW disposal capability, it currently ships its LLW to NTS for disposal. Pantex does not have any LLW disposal capacity and would have to ship LLW to the NTS, if Pantex is selected as the CPC site. A matrix depicting the origins, destinations, and materials shipped is provided in Table A.1.3-1. The matrix also includes shipments under the No Action Alternative and LANL Upgrade Alternative (see Section 3.4.1.2). The number of shipments per year is presented in Table A.1.3-2.



Source: NNSA 2007.

Figure A.1.2-1—Generic Layout of a CPC

Table A.1.3-1—Origins, Destinations, and Material Shipped to Support the CPC

Shipment Type	CPC at SRS	CPC at Pantex	CPC at LANL	CPC at NTS	CPC at Y-12
LANL Plutonium in	LANL ⇒ SRS	LANL ⇒ Pantex	None	LANL ⇒ NTS	LANL ⇒ Y-12
Pits in	Pantex ⇒ SRS	None	Pantex ⇒ LANL	Pantex ⇒ NTS	Pantex ⇒ Y-12
EU in	Y-12 ⇒ SRS	Y-12 ⇒ Pantex	Y-12 ⇒ LANL	Y-12 ⇒ NTS	None
EU out	SRS ⇒ Y-12	Pantex ⇒ Y-12	LANL ⇒ Y-12	NTS ⇒ Y-12	None
Pits out	SRS ⇒ Pantex	None	LANL ⇒ Pantex	NTS ⇒ Pantex	Y-12 ⇒ Pantex
TRU waste out	SRS ⇒ WIPP	Pantex ⇒ WIPP	LANL ⇒ WIPP	NTS ⇒ WIPP	Y-12 ⇒ WIPP
LLW out	Onsite Disposal	Pantex ⇒ NTS	Onsite Disposal	Onsite Disposal	Y-12 ⇒ NTS

Materials Shipped. The materials which would require shipping are described as follows:

- ***SRS plutonium/LANL plutonium.*** This material is plutonium metal that is primarily plutonium-239, but contains other plutonium isotopes in small amounts. It would be used for start-up testing and once the CPC becomes operational could be infrequently shipped. Additionally, once the CPC becomes operational, LANL would transfer its Category I/II plutonium to the CPC if LANL is not selected as the CPC site (see Section 3.4.1.4).
- ***Pits.*** Pits would be the feed and product stream for the CPC. A pit is actually an assembly of plutonium metal. The plutonium is primarily plutonium-239, and the uranium is primarily uranium-235. A single shipment of pits would contain several hundred pounds of plutonium and uranium. In order to produce 125 ppy it is estimated that 7 annual round trips (or 14 total) would be required.
- ***EU.*** The EU parts from disassembled pits would be shipped to Y-12 for processing and returned to the CPC. A single shipment of EU contains more than a thousand pounds of uranium.
- ***TRU waste.*** Processing of plutonium pits would produce contact-handled TRU waste, primarily americium-241. It is estimated that this would require about 74 shipments per year to the WIPP in New Mexico or a WIPP-like facility
- ***LLW.*** This waste would consist of job control waste and decontamination wastes. The radioisotopes would primarily be TRUs, but their concentrations would be sufficiently low to classify the waste as LLW. Approximately 0.1 percent of the volume analyzed for shipping LLW would be mixed (MLLW). Waste generation is expected to sufficiently low to allow for disposal onsite for all candidate sites, except for Y-12 and Pantex, which would ship its LLW either to NTS or a commercial LLW disposal facility. It is estimated that this would require up to 10 shipments per year.

Table A.1.3-2—Numbers of Shipments per Year for the CPC

Transported Materials	200 ppy
Pits	22
TRU waste	118
Total	**156**

Source: NNSA 2007.

A.1.4 Differences Between a CPC and the Rocky Flats Plant

A CPC would be designed and operated to minimize risk to both workers and the general public during normal operations and in the event of an accident. Benefiting from decades of experience, a CPC would employ modern processes and manufacturing technologies and would utilize an oversight structure for safety, environmental protection, and management oversight that has been established since the closure of the Rocky Flats Plant.

A.1.4.1 *Building Design*

Modern safety and security design standards of today require substantially different structures from the earlier pit manufacturing facilities at the Rocky Flats Plant, near Golden, Colorado. The buildings at the Rocky Flats Plant were constructed in the 1950s with metal roof sheeting covered by a builtup weather seal. In contrast, the exterior walls and roof of PF-4 (the current interim production plutonium machining facility at LANL) are constructed of reinforced concrete greater than a foot thick. Internal walls at PF-4 provide multiple-hour fire barriers between wings. A CPC would be designed with similar improvements.

A.1.4.2 *Fire Control*

Although DOE experienced accidents associated with the manufacture of plutonium pits, most of these accidents occurred in a relatively short time period (from 1966 to 1969) at the Rocky Flats Plant. The majority of these accidents involved plutonium metal and chips undergoing spontaneous ignition. Such events can occur when the environment they are in allows for the rapid oxidation of plutonium, often in association with a moist air environment. Efforts at Rocky Flats concentrated on the elimination of such fires. It is now recognized that potential for fire initiation cannot be totally eliminated. Although the frequency and severity of fires can be reduced through the management of combustible materials and facility design, such events are now anticipated and planned for in the structural and process design and operational procedures. Engineering monitoring systems would be activated if a fire were to occur. These systems would activate controls and procedures to control, quickly suppress, and contain fires within the specific originating glovebox, minimizing the risk to workers and the general public.

Today, plutonium machining activities are conducted in gloveboxes supplied with an inert gas. Furthermore, gloveboxes are now equipped with exhaust filter systems. All working areas are separately vented with systems containing HEPA filters. These HEPA filters are fabricated of special nonflammable bonded material. Filter plenums are equipped with an automatic cooling system to reduce the temperature of the air reaching the final stages of HEPA filters. Unlike Rocky Flats, a CPC would have an automatic fire detection and suppression system designed to meet the latest National Fire Protection Association life safety codes and standards for manufacturing facilities. The design features would include multiple zones for both fire detection and suppression to assure that any fire which may occur would be isolated in small, separated areas of the facility and thereby preclude the spread of fire to other separated areas or the entire building.

A.1.4.3 *Waste Management and Material Control*

A CPC would have a dedicated waste handling area capable of preparing waste for transport in accordance with established procedures and waste acceptance requirements. In addition, all waste streams to be generated by the CPC would have an established disposition path for each alternative being considered. Since the CPC SEIS analyzes operations over a 50-year period, it is reasonable to expect that some disposition paths may change. A CPC would utilize a stringent MC&A system to accurately account for all SNM.

A.1.5 Above Ground Versus Below-Grade or Bermed CPC

An above ground facility is the basic preconceptual design configuration for a CPC. During conceptual design, a below grade facility configuration would be considered during the conduct of alternative studies. Although an above-grade facility can be designed to meet required security from the present design basis threat, a below-grade facility provides for a more passive security design with less reliance on active security systems and can provide additional physical security protection. However, a below grade facility poses additional life-safety considerations to protect personnel in an emergency and for them to be able to egress the facility in a timely manner. These issues together with physical security would be explored during a conceptual design period.

With regard to environmental considerations, a preconceptual design representation of a below grade production building, bermed with a concrete overcap, would require 25–50 percent more acreage than an above grade facility due to the extension of the berm to the physical structure. This soil overburden has the potential to reduce challenges to the building confinement system from events such as external fires and tornados. As much as 100 percent more concrete in volume is estimated to be necessary for support structures and an overcap, together with a 100–200 percent increase in the volume of material excavated, backfilled, and compacted. A 25 percent increase in asphalt paving is also estimated to take place.

There are additional costs and schedule increases estimated for a below-grade facility. Additional project costs are estimated to be between $100 million to $500 million depending upon both the design and the soil characterization. For example, a below-grade facility with soft soil and some involvement of groundwater might only add as little as two to three months to the project schedule. However, a 100 percent solid bedrock earthwork could take an additional two-and-a-half to three years for excavation. Both examples provide bounding estimates with no site expected to be 100 percent solid bedrock.

As part of a preliminary business case analysis for this SPEIS, NNSA has evaluated the issues, challenges, advantages and disadvantages of underground facilities. The information in this section is summarized from that report.[1] For each of the five sites considered in this SPEIS (Los Alamos, NTS, Pantex, SRS, and Y-12), two “cut-and-fill” options were assessed: 1) A buried facility with about 5 feet of soil cover; and 2) A facility buried at 20 feet below grade (i.e., 20 feet of soil cover). With any cut-and-fill option, a relatively shallow depression is excavated in the earth, the facility is built, followed by back-filling to bury the structure. The 5-feet

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[1] Independent Business Case Analysis of Consolidated Options for the Defense Programs SNM and Weapons Production Mission, September 2007, Preliminary Draft, Prepared.

underground option was evaluated because this depth provides the equivalent overpressure protection as hardening gives an above-ground building. The 20-feet underground option was evaluated because a concrete breaker slab over this earth cover would protect the facility from the impact of a fully loaded airliner. Modeling of the effects of the impact of an aircraft show that, for the worst case, nine feet of earth cover will prevent penetration of aircraft parts, and a design for a 50 psi overpressure will protect from the blast from the detonation of the aircraft fuel. The building designed for the 35 psi overpressure buried 20 feet deep is capable of withstanding the 50 psi surface blast.

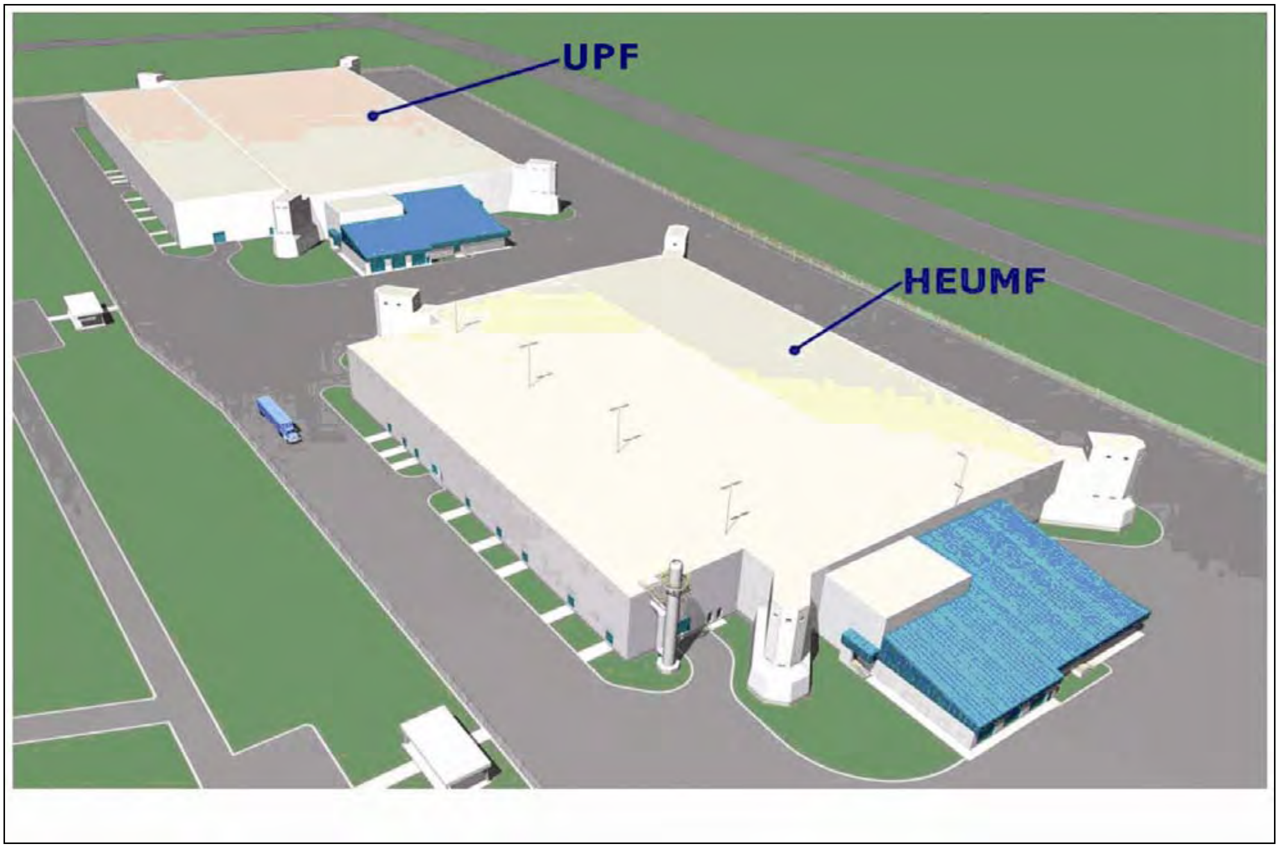
Building underground would require increased excavation and the need to construct the roof slab and roof slab support system to support the pressure from the earth cover. Conversely, the walls underground do not need to be as robust as the equivalent above ground structure. Underground buildings could use earth to shield between structures and to contain migration of materials in an accident. Underground facilities could be constructed in stages or modules connected to one another via underground passages after the construction is completed. This would allow facility expansion in stages and consolidation of activities at a single site.

The results from this feasibility study show putting nuclear facilities underground is not a significant discriminator among the proposed five sites as all five sites can employ underground construction. All of the proposed sites for the CPC/Consolidated Nuclear Center (CNC)/Consolidated Nuclear Production Center (CNPC) were assessed to be capable of using underground construction. For sites where the water table is high or the earth is less amenable to excavation, most of the cover for the building can be bermed by bringing in fill material. In addition, the underground options are more robust in meeting the DBT and will likely be capable of adapting to changes in the DBT in the future. Proper planning of the underground facilities can allow expansion without a significant change in the PIDAS or the protective force. This could lead to a consolidation strategy which could occur in stages over a number of years.

Modeling showed that the underground facility (5 or 20, no difference) could be protected with 85 less security guards than the same structure above ground. In addition, this modeling showed that the reduced guard force required two hardened fighting positions versus the five hardened fighting positions required for the above ground construction. Seismic resistance is improved slightly for both the structure and sensitive equipment underground. However, worker safety and construction would be much more complex for the underground option.

A.2 URANIUM PROCESSING FACILITY (UPF) AT Y-12

The UPF would replace multiple existing enriched uranium (EU) and other processing facilities. The current operating and support areas occupy approximately 633,000 square feet in multiple buildings, while the consolidated UPF would result in approximately a 33 percent reduction, to approximately 400,000 square feet in one building. Once the UPF becomes operational, some of those existing facilities would be available for decontamination and decommissioning (D&D), while other facilities could be used for non-EU processes. Figure A.2-1 shows an artist’s rendering of the proposed UPF. Figure A.2-2 shows the location of the UPF relative to other buildings at Y-12.



Source: NNSA 2005c.

Figure A.2-1—Artist's Rendering of the UPF Adjacent to the HEUMF

A.2.1 UPF Construction

The new structures and support facilities that would comprise the UPF complex include the following:

- UPF building;
- UPF electrical switching center;
- Chiller building and chiller building switch center; cooling tower;
- Aboveground water tank for a seismic-qualified firewater system with a firewater pumping facility;
- Electrical generators; and
- Modified PIDAS to encompass the UPF complex.

The design service life of the UPF would be 50 years. The UPF would be equipped with safety support systems to protect workers, the public, and the environment. The UPF would be housed in a multistory, reinforced concrete building designed and built for security. The main building would be a reinforced concrete structure with reinforced concrete exterior walls, floor slabs, and roof. The roof and exterior walls would be sized to protect the interior from tornado- and wind-borne missiles and blast effects.

Conventional construction techniques would be used to build the UPF. The preliminary schedule for the project indicates that site preparation would begin in approximately 2011, with completion by approximately 2016, and operations beginning by approximately 2018. Construction activities would be performed in a manner that assures protection of the environment during the construction phase. Disposal of construction debris would be made in accordance with waste management requirements in properly permitted disposal facilities. Throughout the construction process, storm water management techniques, such as silt fences and runoff diversion ditches, would be used to prevent erosion and potential water pollutants from being washed from the construction site during rainfall events.

As shown on Figure A.2-2, construction of the UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. Once constructed, the UPF facilities would take up approximately eight acres. The construction laydown area for the UPF would be developed on the west side of the proposed UPF site. This area would be finished with an eight-inch thick compacted, stabilized base for the construction phase. Interim employee parking lots would be developed west of the proposed construction laydown area. The site would be sufficiently graded and developed to accommodate a number of temporary construction trailers, storage buildings, and materials storage yards. After construction of the UPF is complete, it may be feasible to rework the laydown area to provide for additional parking.

A.2.2 Traffic Planning and Parking

The entrance road to the existing Polaris parking lot would be relocated to facilitate site work. Up to 1,200 car spaces may be built to replace the parking spaces lost when the proposed UPF is constructed. Further PIDAS modifications would be constructed to encompass the Highly Enriched Uranium Maerials Facility (HEUMF) (under construction) and the proposed UPF.

A.2.3 Site Preparation and Facility Construction

Site preparation would include any excavation, filling, and grading needed to meet design requirements for an on-grade, reinforced concrete structure. Detailed testing would be conducted to fully characterize site geology, hydrology, and soil compaction, as well as to sample for radioactive contamination, mercury, and other materials of concern before construction.

The structure's foundation would be concrete piers that are drilled down into the bedrock of the site, or a thick concrete slab. To reduce the overall footprint of the structure, a precast-concrete crib retaining wall would be constructed on the north and west sides of the UPF would be constructed with the same rigorous natural phenomena (NP) resistance design as the HEUMF, which is defined as Performance Category[2] (PC) 3.

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[2] Performance Categories classify the performance goals of a facility in terms of facility's structural ability to withstand natural phenomena hazards (i.e., earthquakes, winds, and floods). In general, facilities that are classified as: PC 0 do not consider safety, mission, or cost considerations; PC 1 must maintain occupant safety; PC 2 must maintain occupant safety and continued operations with minimum interruption; PC 3 must maintain occupant safety, continued operations, and hazard materials confinement; and PC 4 must meet occupant safety, continued operations, and confidence of hazard confinement**.**

A.2.4 Security Considerations

Upon completion of construction, both the UPF and the HEUMF (which is already under construction and will have its full PIDAS in place) would be surrounded by a PIDAS security barrier. The PIDAS would be a multiple-sensor system within a 30-foot wide zone enclosed by two fences that surround the entire Security Protection Area.

A.2.5 UPF Operations

The core operations of the new consolidated UPF would be assembly, disassembly, Quality Evaluation, specialized chemical and metallurgical operations of EU processing, and product certification/inspection. The full range of operations would include:

- Assembly of subassemblies from refurbished and new components;
- Disassembly or dismantlement of returned weapons subassemblies resulting in recycle;
- Refurbishment, surplus generation, and disposal of components;
- Product certification through dimensional inspection, physical testing, and radiography;
- Quality evaluation (specially designed tests and inspections to collect data and determine the condition of units and components to assess the future reliability of the weapons systems in the stockpile);
- Metallurgical operations, including EU metal casting, rolling, forming, and machining;
- Analytical services for uranium; and
- Chemical processing, including conversion to uranium compounds and metal from salvage scrap and oxides. Chemical processing streams would be provided to process high enrichment, mixed enrichment, and special EU materials.

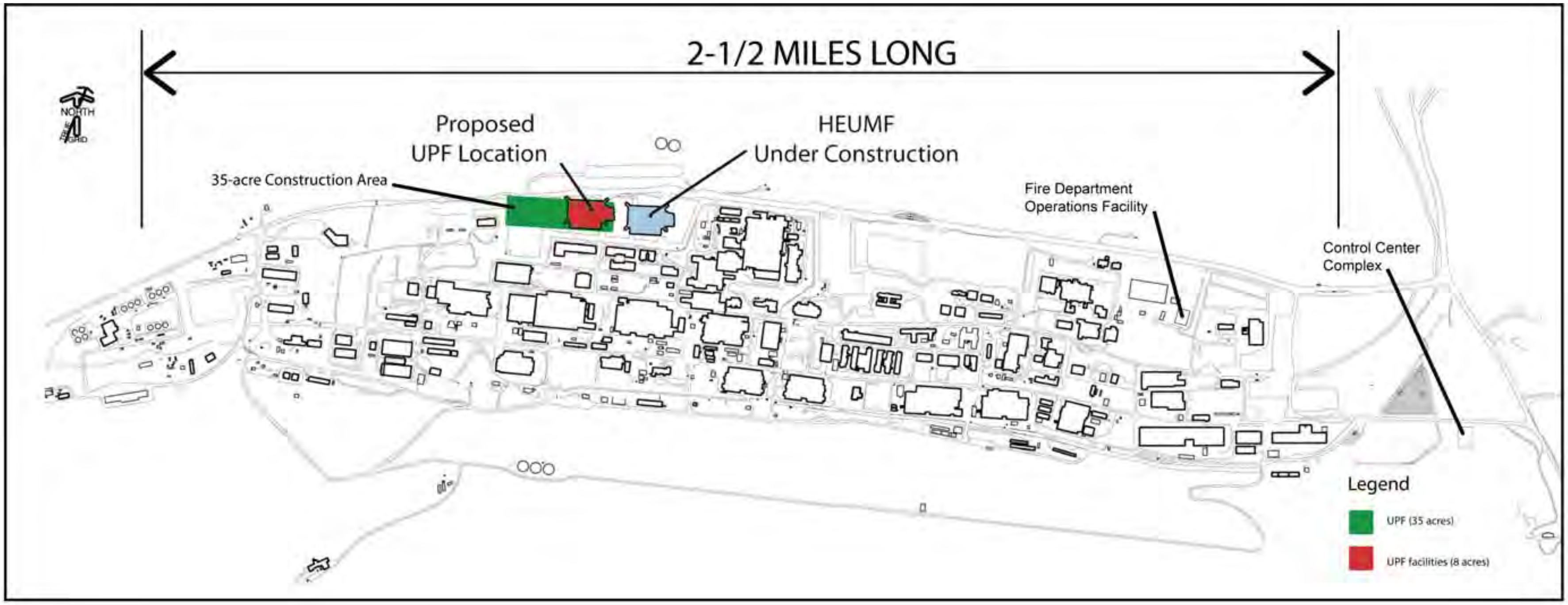

Figure A.2-2—Location of the UPF Relative to Other Buildings at Y-12

A.2.6 Utility and Safety Support Systems

The material processing areas within the UPF would incorporate the appropriate use of gloveboxes, inert atmosphere, negative air pressure, and other engineered controls, supported by administrative controls, to protect workers and the public from exposure to radiological and hazardous materials. Exhaust emissions for the facility would comply with the applicable Federal and State requirements. In conjunction with other engineered containment measures, the ventilation system barriers would provide a layered system of protection.

Other systems that would be included in the new UPF for facility operation and ES&H protection include:

- Criticality accident alarm system;
- Emergency notification system;
- Alarm system;
- Fire suppression alarm systems;
- Telephone and public address system;
- Classified and unclassified computer network;
- Personnel monitoring system;
- Security-related sensors; and
- Automated inventory system with continuous real-time monitoring.

The UPF would use a three-level negative air pressure approach to maintaining containment of particulate- and vapor-contaminated air, with the area having the lowest air pressure (i.e., highest negative air pressure) being primary containment. Secondary containment would be maintained at a lesser negative pressure, while the office and administrative areas would be maintained at a positive pressure with respect to the secondary containment areas. The primary containment ventilation system would consist of fans and collection ducts, scrubbers, mist eliminators, instrumentation, and HEPA filter banks. A secondary containment ventilation system would provide containment, negative pressure confinement, monitoring, and treatment for exhaust air from secondary containment areas frequented or occupied by operating personnel as well as other areas subject to contamination.

HEPA filters would be used in all process exhaust air streams to limit releases of EU. HEPA filters installed for this purpose would be performance qualified to limit offsite exposures to the public and releases to the environment. Current plans have a single exhaust stack being used as a central air emission point from the facility. All UPF process and exhaust air streams would be discharged from this stack, which would be located and designed to optimize the effects of plume dilution from the prevailing winds as well as to minimize the possibility of cross-contamination through the UPF and other Y-12 facility ventilation air intakes. The UPF discharge stack would be equipped with continuous emissions monitors for radiological emissions to meet Y-12 requirements to comply with environmental laws and reporting required data to the State of Tennessee as evidence of meeting those requirements.

Potable water, process water, and safety shower water would be supplied through the utility access corridors. The potable water would be used for sanitary purposes. Process water would be provided by a dedicated system. Safety shower water also would be provided by a dedicated system.

A dedicated breathing air system would be installed within the UPF and would consist of dedicated compressors, receivers, filters, dryers, monitoring instrumentation and alarms, distribution piping, and breathing air stations at multiple points of use throughout the facility.

Liquid effluent monitors would be installed in all discharge lines from processes handling uranium metal or uranium compounds. Systems would be designed to detect and record concentrations in parts per million of uranium in solution. Discharge streams exceeding established limits for concentrations of uranium would be automatically diverted to geometrically safe holdup tanks.

A defense-in-depth approach would be used in the UPF to prevent the occurrence of a fire and ensure that sufficient means are provided to detect and suppress fires. The facility would be fully sprinklered (except for X-ray vaults), which would enable the performance of process operations except where the presence of water is a criticality safety concern. All systems, equipment, and processes would be designed in accordance with appropriate fire protection codes, building codes, and other available safety documentation. In addition to the water suppression capabilities, fire extinguishers would be installed throughout the facility.

The UPF would be built of noncombustible materials so that the building structure would not contribute to the fire loading. The process building would be separated from all other significant facilities. Roadways serving the UPF would provide access, from either direction, to any point on the exterior of the building and would be configured to allow emergency vehicles to maintain a standoff distance of 50 feet. Fire hydrants would be located 50 feet from the building with the pumper connection pointing to an accessible paved area.

Extension of the current fire alarm system would support UPF fire alarm needs. All water flow, smoke, and heat detection would be alarmed. Fire hazards and potential losses inside the UPF would be controlled. Storage for combustibles would be minimized in processing areas and would be properly stored in areas established for such materials. Use of flammable liquids and gases would be minimized to the extent practical. Bulk storage of flammable gases would be located outside the building, and appropriate excess flow valves would be installed in gas supply systems to stop flow in the event of a line break.

Two new 161- 13.8- kilovolt substations north of the UPF would provide electrical power to the UPF. For the purposes of this SPEIS, underground electric utility construction would be utilized. Auxiliary electrical power would be provided for safety and operational support utilizing hydrocarbon burning engine/generator sets.

A.2.7 Upgrades to Existing Enriched Uranium Facilities at Y-12

The upgrade projects proposed would be internal modifications to the existing facilities and would improve worker health and safety, enable the conversion of legacy SNM to long-term storage forms, and extend the life of existing facilities. For continued operations in the existing facilities, major investments will be required for roof replacements; structural upgrades; HVAC replacements; and fire protection system replacement/upgrades. The projects would improve airflow controls between clean, buffer, and contamination zones; upgrade internal electrical distribution systems; and upgrade a number of building structures to comply with current NP criteria (BWXT 2004a).

For the purpose of this analysis, it is assumed that the upgrades would be performed over a 10-year construction period, following issuance of this SPEIS Record of Decision (ROD). This would enable the National Nuclear Security Administration (NNSA) to spread out the capital costs associated with the upgrades, and minimize disruption of operations.

Conventional construction techniques would be used for upgrade projects. Under this alternative, a preliminary schedule for the project indicates that site preparation would begin in 2008, with upgrades complete in approximately 2018. Upgrade activities would be performed in a manner that assures protection of the environment during the construction phase. Techniques would be used to minimize the generation of debris that would require disposal. Disposal of debris would be made in accordance with waste management requirements in properly permitted disposal facilities. Throughout the upgrade construction process storm water management techniques, such as silt fences and runoff diversion ditches, would be used to prevent erosion and potential water pollutants from being washed from the construction site during rainfall events.

NP: structural. The current authorization basis for many of the EU buildings has been designated as PC 2, which means these buildings must maintain occupant safety and continued operations with minimum interruption. An assessment of the structural adequacy of the buildings indicates they do not meet current codes and standards related to NP events (e.g., tornados and earthquakes) required for a PC 2 designation. If the buildings are intended to operate an additional 50 years, they would require structural upgrades to bring the buildings into compliance (BWXT 2004a).

Fire protection. The existing fire protection systems for many of the EU buildings are primarily piping systems operating under the Code of Record in effect at the time of installation. These codes have changed significantly over the years, and if the life of facility is intended to be extended any significant length of time, the systems may need to be upgraded to meet current codes and standards if exemptions for continued operations are denied. Upgrades would likely require total replacement of the current systems. Replacements would be required for sprinkler systems, riser replacements, and underground supply line upgrades (BWXT 2004a).

Utilities replacement/upgrades: mechanical systems. HVAC systems have an expected life in the range of 25–30 years. Many of the systems serving the EU building are beyond or are approaching the end of their useful life and are in need of replacement. The majority of the HEPA filters are located in antiquated systems. These systems also do not include test sections that allow the systems to be tested without removal of the prefilters. This arrangement subjects the filter change crews to added exposures compared to currently available filters with test sections. The continued long-term operations of existing facilities would require these filter systems to be replaced (BWXT 2004a).

Roofing. Most existing roofs for the EU buildings would need replacing (BWXT 2004a).

A.3 CONSOLIDATED NUCLEAR PRODUCTION CENTER

Program Requirements

- The CNPC would be sized and configured to support the U.S. nuclear weapons stockpile projected to exist after full implementation of the *Moscow Treaty*. The CNPC capacity would be sized to support delivery of 125 weapon assemblies per year in five-day, single shift operations. Multiple shift operation would yield up to 200 weapon assemblies per year.
- Sufficient capacity would be provided at the CNPC to support 75 weapon surveillance units per year. A capacity to perform up to 15 destructive nuclear component surveillances per year would be constructed.
- Weapon dismantlement sufficient to achieve the *Moscow Treaty*-accountable stockpile level of 1,700–2,200 operationally deployed strategic nuclear weapons is assumed to occur at Pantex in existing facilities. Because it is likely that further stockpile reductions and associated weapon dismantlements would occur during the operating life of the CNPC, a baseline dismantlement capacity of 400 units per year in five-day, single shift operations is assumed.
- The future U.S. nuclear weapons stockpile is assumed to consist of the same number of weapon types as exist today. The U.S. national security and political leadership are currently considering the authorization of a new weapon type, the RRW, to replace over the next several decades the weapon types in the existing nuclear weapons stockpile. Because a multi-decade series of decisions can not be forecast with confidence at this time, the CNPC would be equipped to allow the future production of both legacy type replacement weapons and the new RRW weapons.
- Plutonium and HEU (together referred to as SNM) would be stored at the CNPC to support future NNSA needs.

Required CNPC Capabilities

- The CNPC would include capabilities for HEU processing and weapon component production as currently performed at Y-12, and plutonium processing and weapon component production as currently performed on a limited capacity basis at LANL. In addition, R&D in support of LANL and LLNL programs requiring the use of Category I or II quantities of SNM would be performed at the CNPC.
- In addition, the CNPC would include facilities for the assembly/disassembly (A/D) mission currently performed at the Pantex Plant. In all cases, the HE processing and fabrication mission is assumed to be an integral part of the weapons A/D mission. As explained in Section 3.5.2, there is an option to separate the weapon A/D mission to allow decision-makers to consider an alternative that locates the nuclear production facilities portion of the CNPC at a different site than the weapons A/D mission.
- Fabrication, inspection, and assembly equipment at the CNPC must support the fabrication of new RRW weapons or replacement legacy weapons. In general, the ability

to produce legacy weapons would also provide RRW production capability. RRW concepts use fewer hazardous materials (than found in most legacy weapons) and require production tolerances within the range of those required for legacy weapons production.

- The assembly of plutonium and HEU nuclear weapons components also requires the production of several unique nonnuclear components. For plutonium components, it is assumed that the stainless steel and other unique metallic parts would be fabricated at or procured by Kansas City Plant (KCP). Legacy weapon plutonium components also require the production of beryllium components. It is assumed that the limited beryllium component production capability at LANL would be sufficient to support any required legacy plutonium component production.
- For HEU secondaries, it is assumed that non-nuclear components currently produced at Y-12 would be produced at the CNPC.
- The CNPC would be designed to provide best reasonably achievable levels of security to protect SNM and complete nuclear weapons. Current classified 2005 Design Basis Threat requirements from NNSA are to be used for the CNPC design. Trade studies would be performed to seek to balance worker safety, security enhancements, and costs for the CNPC. The siting of the CNPC facilities above or below ground is a major example of such a trade study. For initial planning purposes, it is assumed that CNPC facilities would be constructed above ground.
- The CNPC would be designed to have a useful operating life of at least 50 years without major facility renovation beyond normal preventive and corrective maintenance.
- The CNPC would be designed and operated to meet all existing applicable federal, state, and local laws and regulations.

CNPC Facility and Siting Requirements

- The CNPC would be considered for location at one of the following NNSA sites: Los Alamos, Pantex, Nevada Text Site (NTS), Savannah River Site (SRS), and Y-12. Should a site not have adequate space for the full CNPC mission, an option that locates only the plutonium and HEU missions at the site would be evaluated, with the weapons A/D mission remaining at Pantex or relocated to the NTS.
- Beneficial use would be sought from existing and planned assets and capabilities at each site that are expected to have a reasonable remaining useful life at the time of CNPC occupancy. For example, the new HEUMF being constructed at Y-12 is assumed to provide storage for planned inventories of DOE and NNSA highly enriched uranium (HEU) at least until the CNPC is operational. Should the CNPC be constructed at Y-12, the HEUMF would continue to support DOE and NNSA needs, and the Y-12-specific CNPC design would not require new HEU storage facilities.
- A modular arrangement of facilities (campus) is assumed for the CCE options rather than separate operational wings of a single large facility under one roof. The facilities making up the CCE campus would be configured so that they can be constructed sequentially. A single building to house the CCE functions was not considered to be reasonable due to

the need to bring facilities online in sequence and the fundamental differences in uranium, plutonium, and A/D operations.[3] The assumed schedule for the CCE facilities is:

Facility	Start Detailed Facility Design	Begin Operations
CUC	2009	2018
CPC	2012	2022
A/D/HE Center	2015	2025

- It is assumed that facilities at Y-12 and Pantex, whose missions would be included in the CCE alternative, would be brought to a safe shutdown condition as soon as possible if these sites were not selected for a CCE.
- A CNPC or CNC would consist of a central area that includes all operations involving Category I/II quantities of SNM that would be surrounded by a PIDAS. A buffer area would provide unobstructed view of the area surrounding the PIDAS. Support facilities requiring lower levels of security protection would be outside the PIDAS. The land requirements for operation of a CNPC and CNC are shown in Tables A.3-1 and A.3-2 respectively.

Table A.3-1—Land Requirements to Operate a CNPC*

Operation (acres)	Total Area: 445 Acres**	
	PIDAS	Non-PIDAS
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 210** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120

*Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
****** Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

Table A.3-2—Land Requirements to Operate a CNC*

Operation (acres)	Total Area: 145**	
	PIDAS	Non-PIDAS
	Total: 55 • CPC: 40 • CUC: 15	**Total: 90** • Non-SNM component production: 20 • Administrative Support: 70

*Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
****** Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.

A generic layout of the CNPC is shown in Figure A.3-1.

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[3] The facilities that would constitute a CCE would be separate buildings in a campus because they have different safety and operational requirements, and it would not be technically feasible to put them in a single large facility without having separate systems for the operation of the three facilities and other physical features (blast wall separation, etc.) to keep them separate. They would be built in sequence because they are very complex facilities and the realities of construction logistics, cash flow, and start-up management would not support a single facility. Building them in sequence reduces the construction management risk and allows lessons learned from one to benefit the others. The CUC would be first because the existing uranium facilities at Y-12 are very old. The CPC would be built second because the LANL facilities can handle the immediate need for pits. The weapons A/D/HE facilities would be last because there is the least programmatic urgency for them.

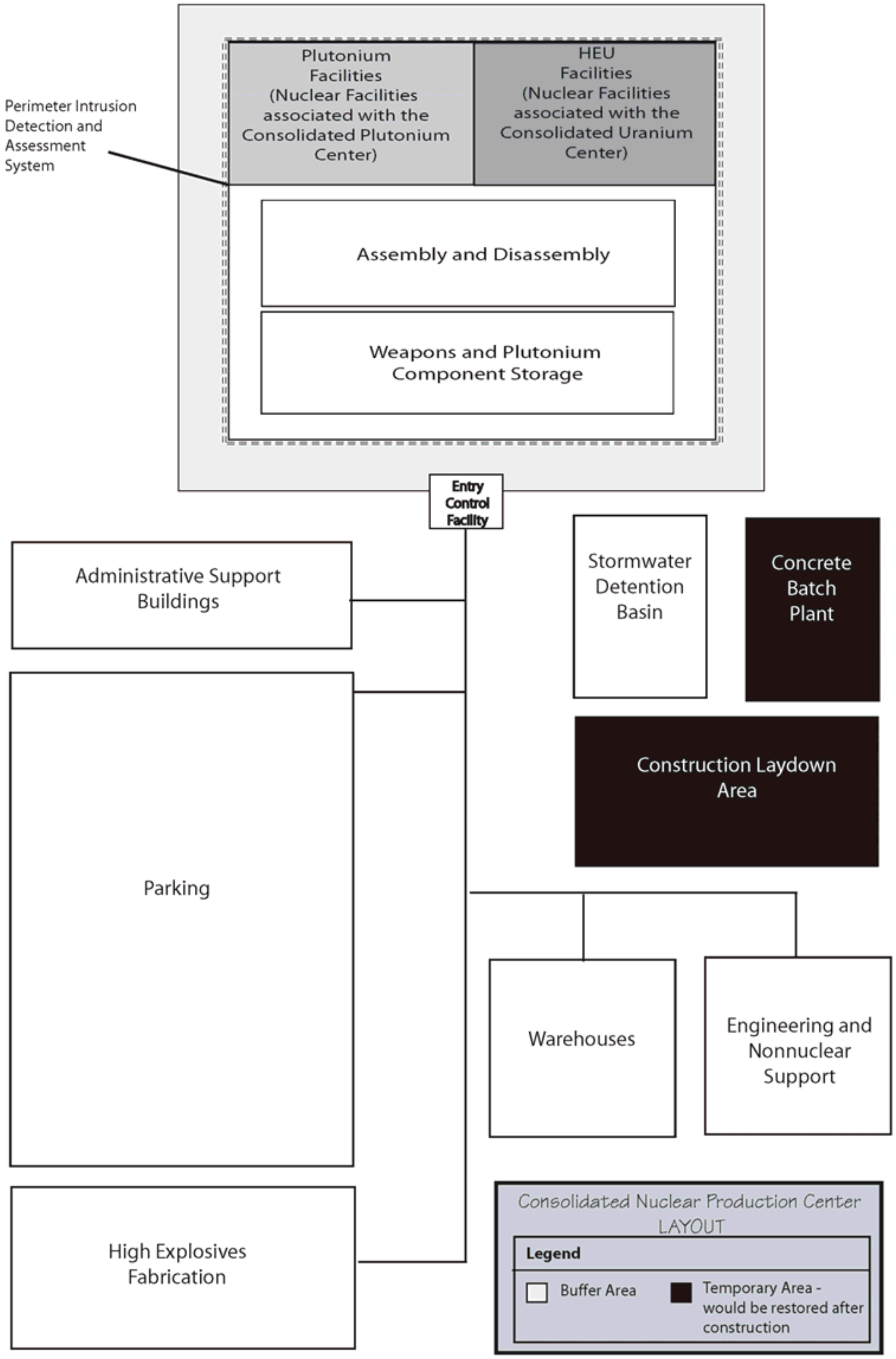

Figure A.3-1—Generic Layout of the CNPC

A.3.1 Consolidated Uranium Center (CUC)

The CUC would primarily be made up of a nuclear facility[4] located within the PIDAS, and non-nuclear support facilities outside the PIDAS. The nuclear facility would process HEU, produce nuclear weapon secondary components, and provide the capability to perform HEU R&D in support of Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL). The nuclear facility would also store HEU. The non-nuclear facilities would contain the necessary and support operations associated with additional weapon materials, such as depleted uranium (DU) alloys; lithium hydride and lithium deuteride; stainless steel, and other general manufacturing materials.

The CUC would be constructed over a six-year period, beginning in approximately 2011, with completion by approximately 2016, and operations beginning by approximately 2018. The design service life of the CUC would be 50 years.

This section presents major differences between the UPF described in Section 3.4.2 and the CUC that could be built at sites other than Y-12. The major difference involves the addition of HEU storage and the non-nuclear support facilities outside the PIDAS. Construction of the CUC at sites other than Y-12 would require approximately 50 acres of land.

The nuclear portion of the CUC would contain approximately 500,000 square feet in one building. Of this, storage would account for approximately 100,000 square feet, and would be used for long-term storage of Categories I/II HEU. A capacity to store approximately 10,500 cans and 10,500 drums (55-gallon equivalents) of HEU, a surge capacity area for an additional 3,000 drums, and a storage area for material currently under international safeguards would be provided. The non-nuclear support facilities outside the PIDAS would contain approximately 150,000 square feet.

The CUC would provide secure docking for safeguard transports (SGTs) to ensure the secure, safe transfer of secondaries and other materials containing HEU. The shipping and receiving docks at the CUC would accommodate the simultaneous loading and unloading of three Safeguards Transporters (SGTs) or Safe Secure Trailers (SSTs). The main operational steps that would be involved in handling containers with HEU materials are presented below:

- SGT arrives at the loading dock.
- Shipping containers are offloaded and moved to the nondestructive assay (NDA) and recontainerization area.
- A transfer check is performed.
- Containers undergo NDA.
- HEU materials are placed in new containers if required.
- Each container entered into the computerized tracking system and is assigned a rack location.

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[4] For purposes of this SPEIS, this nuclear facility will be referred to as the Uranium Processing Facility (UPF), as generally described in Section 3.4.2. However, the UPF at Y-12 would not require HEU storage within the UPF, as an existing HEU Materials Facility (HEUMF) exists at that site. The UPF for all other site alternatives would include HEU storage integral to the UPF. The UPF described in this section includes such integral HEU storage.

- Each container is moved by forklift to its assigned location in the storage area.
- Each container is connected to the automated inventory system

A.3.2 Assembly/Disassembly/High Explosives Center (A/D/HE Center)

The A/D/HE Center would carry out the following major missions:

- Assemble warheads;
- Dismantle weapons that are surplus to the strategic stockpile and sanitize or dispose of components from dismantled weapons;
- Develop and fabricate explosive components; and
- Conduct surveillance related to certifying weapon safety and reliability.

The A/D/HE Center would be made up nuclear facilities located within the PIDAS and non-nuclear facilities outside the PIDAS. In support of this mission, approximately 300 acres would be required for the A/D/HE Center. The nuclear facilities would contain the cells and bays in which maintenance, modification, and A/D operations are conducted. The facilities would be designed to mitigate the effects of the unlikely accidental detonation of the weapon's explosive components. Bays differ from cells in that bays are designed to vent an explosion to the atmosphere while protecting adjacent facilities from the blast, while cells are designed to filter the explosion products while also protecting the adjacent facilities from the blast.

An area of 180 acres would be provided in the PIDAS for the weapons A/D facilities and the associated weapons and plutonium component storage. Located outside the PIDAS area would be a buffer zone and non-nuclear facilities for HE fabrication, administrative support, and disposal of explosive materials. This area would be approximately 120 acres. The A/D/HE Center would be constructed over a six-year period, beginning in approximately 2021, with completion by approximately 2026, and operations beginning by approximately 2027. The design service life of the A/D/HE Center would be 50 years.

A.3.2.1 *Operations Conducted at the A/D/HE Center*

Assembly. Weapons assembly requires written, prescribed steps to combine separate parts to form a new weapon. Complete weapons assembly would be accomplished in the following stages:

- Physics package assembly;
- Mechanical and electronic components assembly; and
- Final package or ultimate user package assembly.

The physics package is a subassembly combining HE components (to be produced at the A/D/HE Center) and nuclear components (to be manufactured at the CPC and Consolidated Uranium Center [CUC]) within a protective shell. Physics package assembly entails bonding or mating the main charge subassemblies to a nuclear pit and then inserting this subassembly into a case along with other components. Mechanical and electronic components assembly entails placing the physics package in a warhead case and then installing the components for the arming, fusing, and firing systems; the neutron generator; and the gas transfer system. The final package assembly involves installing additional components and packaging the weapon for shipment.

Dismantlement. Dismantlement consists of disassembly and disposal or sanitization of weapon components. The dismantlement process begins with the arrival of the weapon at the A/D/HE Center. Disassembly would include the following:

- Weapons staging, which includes inspection and verification after receipt from DoD;
- A variety of specialty operations (e.g., X-ray examinations, leak testing, coding, packaging, painting, verification, etc.) in special purpose bays;
- Mechanical disassembly operations in bays;
- Nuclear disassembly operations in cells;
- Demilitarization and sanitization of weapon components, which includes grinding, crushing, and open-air burning;
- Packaging and shipping HEU to the CUC and tritium components to the SRS;
- Packaging and shipping pits to the CPC; and
- Segregation of waste products into nonhazardous, hazardous, low-level radioactive, and low-level mixed waste categories.

High explosives fabrication. The A/D/HE Center would manufacture the main charge HE and other small explosive components. The fabrication process for explosives involves synthesizing energetic materials (explosives) and then formulating the energetic materials with other materials as appropriate. Some of the energetic materials are manufactured at the plant, while others are procured commercially. The explosive powder is then pressed into the configurations needed and machined for use in nuclear weapons. The products of manufacturing operations are explosive main charges, small explosive components, and other highly specialized explosive materials. Main charge subassemblies are emplaced in the physics package of a nuclear explosive during the weapon assembly process. Various small explosive subassemblies and pellets are produced from explosives, metal or plastic components, electrical components, hardware, assembly materials, and small explosive components that are manufactured offsite.

Surveillance. To maintain the reliability of the Nation’s nuclear weapons, a certain number of randomly selected weapons from all active systems would be annually removed from the stockpile and returned to the A/D/HE Center. The weapons are disassembled, tested, and evaluated to ensure the operability of the weapons components. Most testing is done onsite, but tests associated with component aging are performed at other laboratories and production agencies. Some weapons are configured as Joint Test Assemblies (JTAs) and provided to the military for flight testing. Main charge explosive components and SNM are removed from weapons before this testing. Certain components are physically removed from the weapon, assembled into test con-figurations, and subjected to electrical and/or explosives testing. Components not destroyed during the testing process can be recycled and made available for use in other weapon system assemblies.

Security at the A/D/HE Center. Security at the A/D/HE Center would be charged with protecting plant personnel, facilities, materials, and information from intrusion. Protective forces guard against any events that may cause adverse impacts on national security, the environment or the health and safety of the public or employees. Special response security team members prepare for any situation that may arise. Specially equipped and trained, these individuals face a range of events that may develop as a result of the constantly changing world situation or local events. State-of-the-art technologies would augment security forces to provide early detection, warning and deterrence.

A.4 A/D/HE CENTER AT NTS

At NTS, the A/D/HE Center would make use of the existing capabilities at NTS such that construction requirements would be reduced compared to the generic A/D/HE Center described above. The A/D/HE Center at NTS would maximize use of existing facilities at the Device Assembly Facility (DAF), the underground complex of tunnels at U1a, the Big Explosive Experiment Facility (BEEF), the Explosives Ordnance Disposal Unit (EODU), existing NTS site infra-structure, and the support areas of Mercury, the Control Point, and Area 6 construction (Figure A.4-1). By utilizing each of these unique existing assets, the need for additional construction is minimized and the existing benefits of each site are maximized.

The existing DAF would form the cornerstone of the A/D/HE Center at NTS. The NTS alternative would utilize the DAF for disassembly operations. DAF can fully support disassembly operations and continue to support the existing criticality experiment missions that were recently added to the DAF. Disassembly operations in the DAF would not require additional construction within the PIDAS or additions to the existing PIDAS. In the non-PIDAS area of the DAF and outside the buffer zones, an administrative facility and parking area would be constructed to support the increased personnel processing requirement for disassembly. The available space in DAF consists of the following:

- 3 Assembly cells (8,510 square feet);
- 2 Radiography bays (6,351 square feet);
- 1 Downdraft table bay (1,681 square feet);
- 1 Assembly bay (1,681 square feet);
- 2 Bunkers (1,872 square feet);
- 2 limited use vaults (180 square feet);
- 1 High bay (1,790 square feet);
- 1 Bunker (936 square feet);
- 1 MC&A measurement building (2,142 square feet);
- 1 shipping/receive bay (2,012 square feet);
- Administrative space (3,700 square feet);
- 1 Glovebox bay (1,681 square feet); and
- Corridors (20,000 square feet).

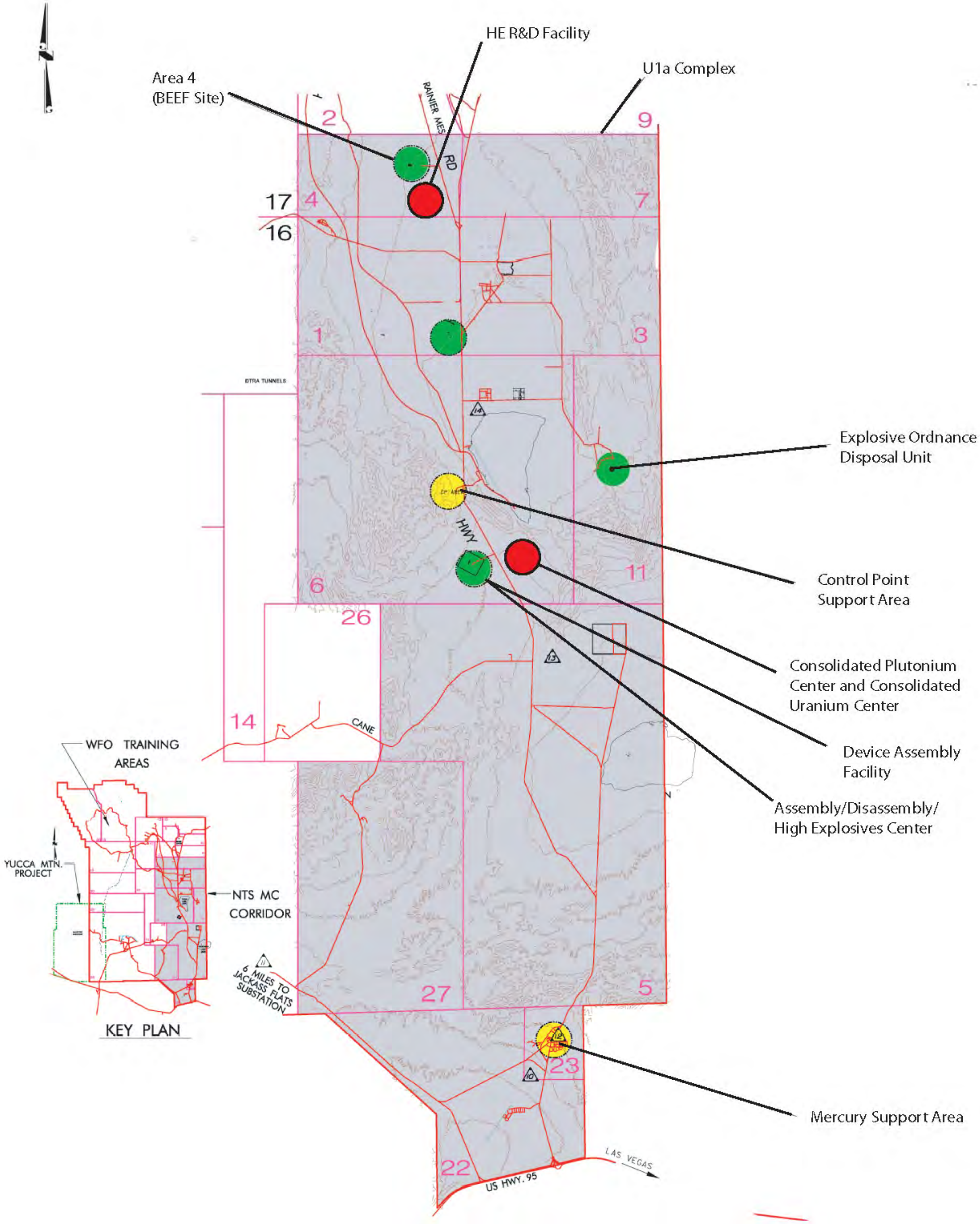


Figure A.4-1—NTS CNPC Reference Location

The remaining operations of assembly, longer-term storage for nuclear and non-nuclear components that are generated by DAF disassembly activities, weapon surveillance, and strategic reserve storage of plutonium would be located 900 feet underground in the tunnel complex at U1a. This alternative would include construction of new tunnels and alcoves in accordance with nuclear explosive requirements for assembly and storage operations. At the U1a Complex, access to the tunnel network is limited to two vertical access/egress shafts that would require construction of a small PIDAS around the surface footprint of each shaft.

A.5 CONSOLIDATION OF CATEGORY I/II SNM

A.5.1 No Action Alternative

A.5.1.1 *Lawrence Livermore National Laboratory*

LLNL uses radioactive materials in a wide variety of operations including scientific and weapons R&D, diagnostic research, research on the properties of materials, and isotope separation. Based on facility design and operation, LLNL establishes administrative limits for fissile, special use, radioactive, and sealed materials. An administrative limit is the total amount of certain materials allowed in a specific building at LLNL. These limits are used in determining potential risks associated with accidents. Actual inventories may be classified. Nonwaste management facilities at LLNL authorized to have Category I/II SNM quantities are Building 332, Building 334, and Building 239. However, only Building 332 stores such material, and both Building 334 and Building 239 have no materials stored in them. As such, only Building 332 is germane to the discussion below. With respect to waste management facilities with Category I/II SNM, the Decontamination and Waste Treatment Facility (DWTF) (Figure A.5.1-1) manages TRU waste that would be shipped to WIPP.

The Building 332 Plutonium Facility is part of the Superblock, a protected area located in the southwest quadrant of the Livermore Site (see Figure A.5.1-2). This building has a total area of 104,687 gross square feet, including radioactive materials laboratories, mechanical shops, change rooms, storage vaults, a fan loft, basement, equipment rooms, and offices. There are currently 24 laboratories in which radioactive materials can be handled within the radioactive material areas (RMAs) of the facility (LLNL 2005).

The mission of Building 332 includes R&D in the physical, chemical, and metallurgical properties of plutonium and uranium isotopes, compounds and alloys, and certain actinide elements. Operations within Building 332 include melting, casting, welding, and machining; developing alloys and heat treating; testing torsion, tensile, and compression; measuring density and heat capacity; machining, inspecting, and testing components; using chemical processes to purify, separate, or convert actinide materials; pressure testing and gas filling operations; and assembling components. Chemical analyses can also be conducted on gram-sized samples in support of these activities.

The Materials Management Division is responsible for all shipments of radioactive and other controlled materials to and from Building 332, as well as movement within the building. This division also controls storage of these materials in the building vaults. The vaults are equipped to safely store fissile, radioactive, and certain other SNM required for programmatic operations. Criticality safety controls for the vaults include specially designed storage racks and containers to control the spacing of stored fissile materials and mass limits for each storage location or rack cell within a storage vault. LLNL criticality safety controls also specify mass limits for each workstation (LLNL 2005). Legacy and new TRU waste is temporarily stored in the basement, and the individual waste drums are scanned by a segmented gamma scanner to verify radionuclide and curie content. Although actual quantities of Category I/II SNM in Building 332 are classified, the administrative limits are as follows:

Plutonium	1,400 kg
Enriched uranium	500 kg

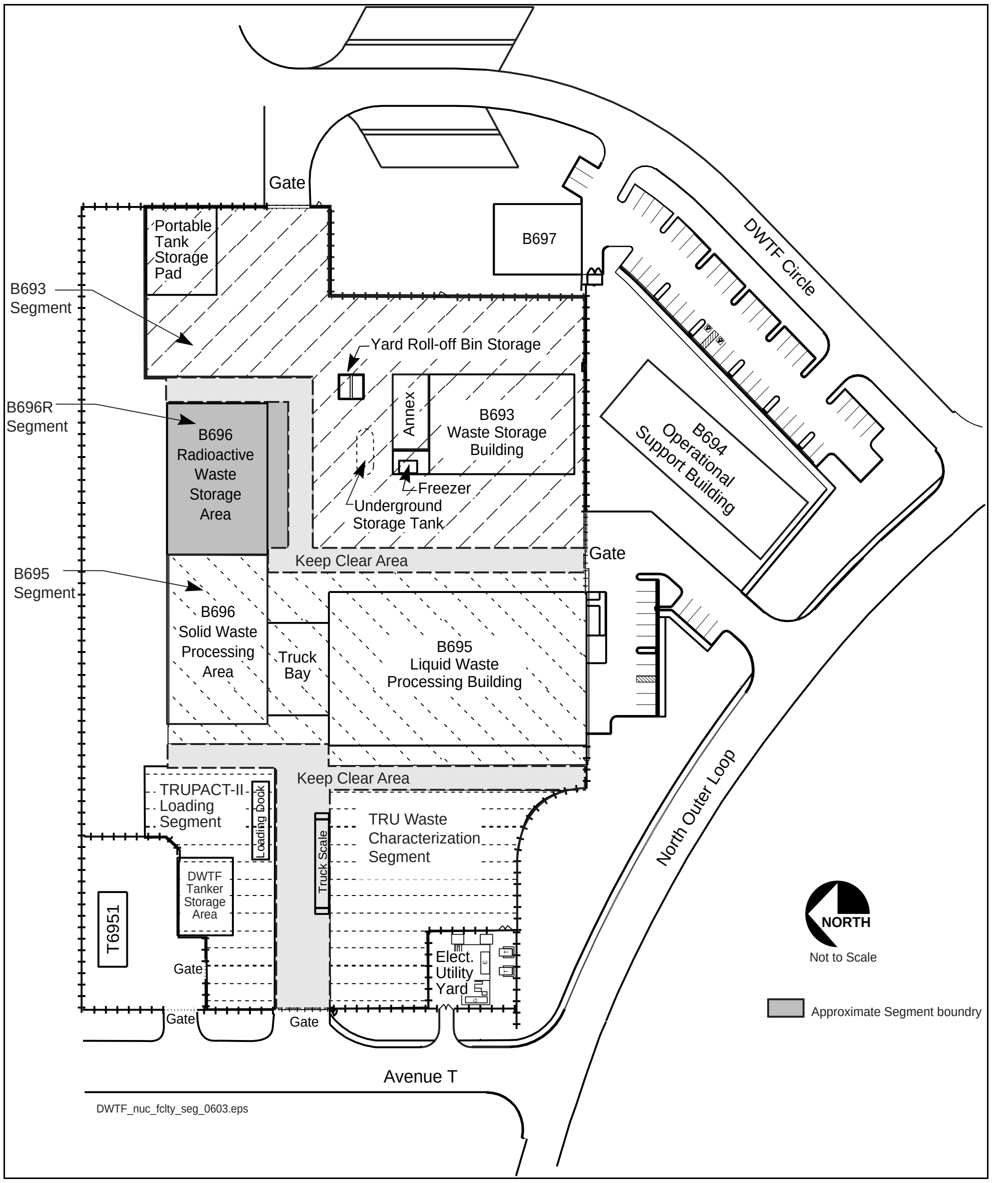


Figure A.5.1-1—Decontamination and Waste Treatment Facility at LLNL

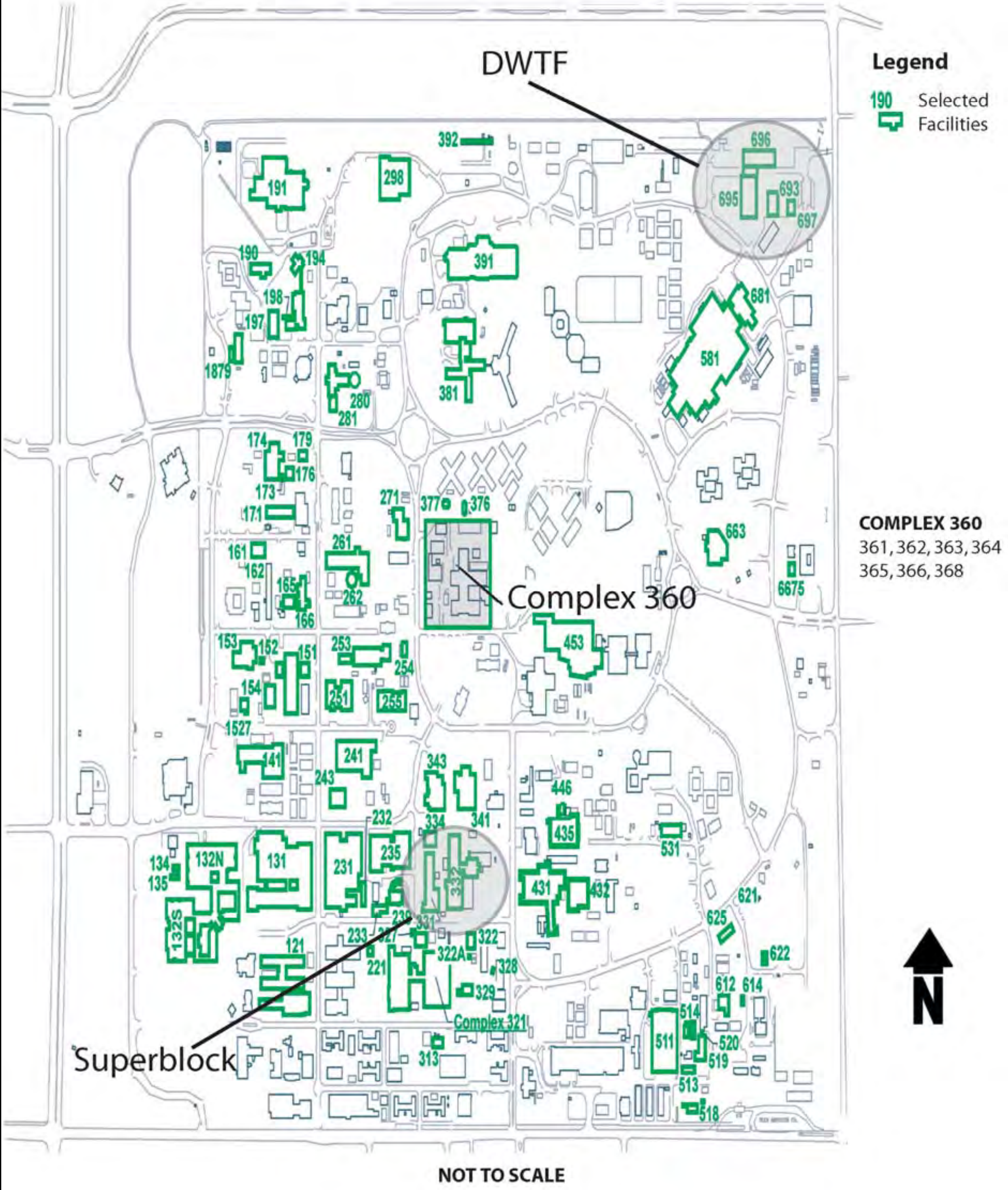


Figure A.5.1-2—Location of Building 332 and the DWTF at LLNL

In 1996, construction of a new consolidated waste treatment facility, the DWTF, began in the northwest corner of the Livermore Site (see Figure A.5.1-1). The DWTF construction has been completed and currently consists of Buildings 6951, 693, 694, 695, 696, and 697 and associated yard areas. The DWTF replaces waste management operations in Area 514 and Building 233 and consolidates other waste management activities into one facility (Figure A.5.1-3).

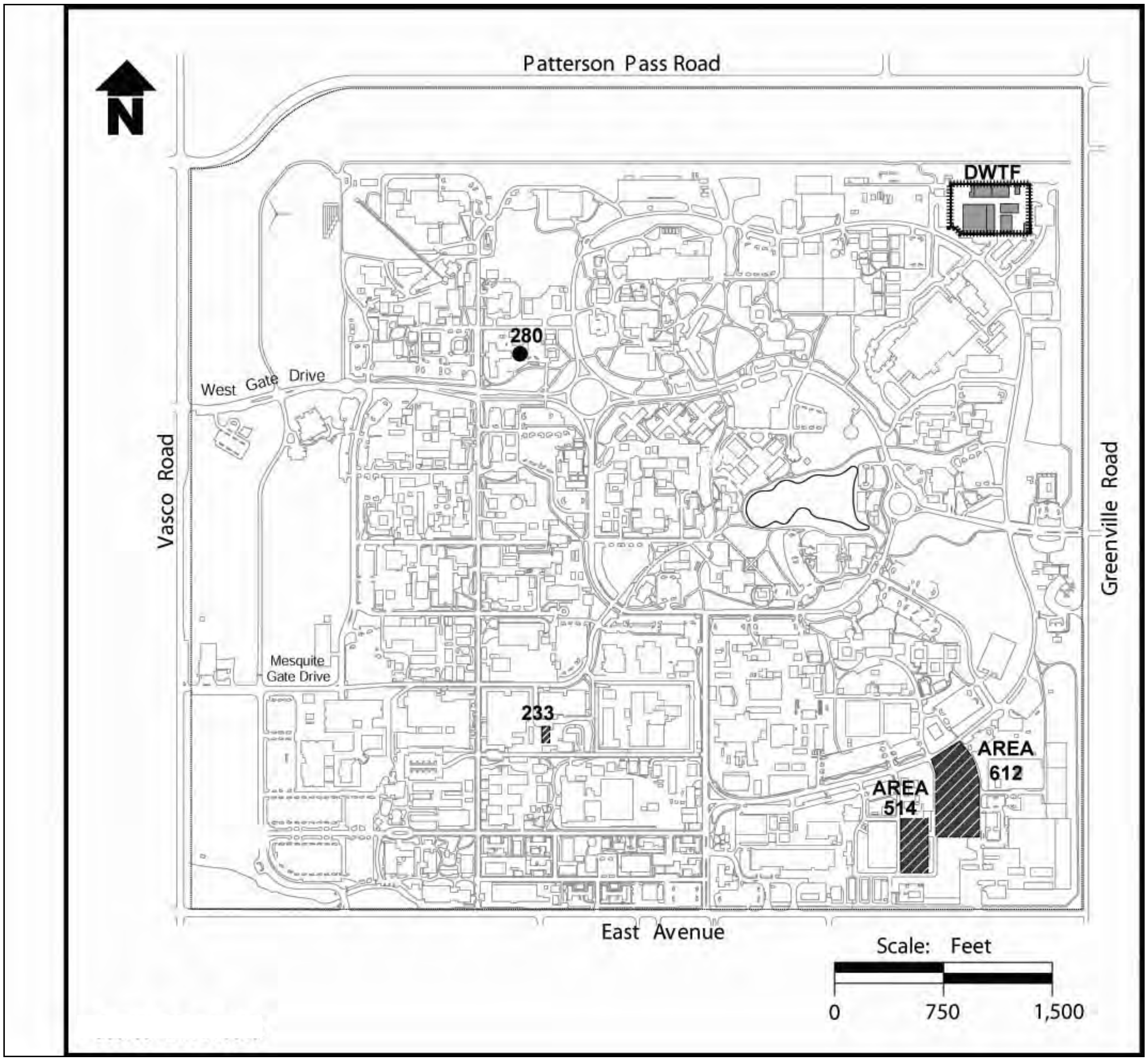


Figure A.5.1-3—Location of Waste Management Areas at LLNL

The DWTF is a hazardous, radioactive, and mixed waste treatment and storage facility located in the northeast corner of the Livermore Site. Hazardous and mixed waste management activities involve five individual facilities: Buildings 693, 694, 695, 696, and 697, and associated yard areas (see Figure A.5.1-3). Building 693 is a container storage unit and activities include waste packaging and storage. Building 695 provides storage and waste treatment capabilities including bulking and blending of wastes into treatment tanks; treating liquid and solid hazardous, mixed, and low-level radioactive wastes; storing; container rinsing; and waste transfer. Building 694 is the operational support facility and Building 697 is a Chemical Exchange Warehouse used for chemical exchange operations. Building 696 provides radioactive waste storage and solid waste receiving and processing capabilities. Building 695 includes a maintenance shop. Areas within the DWTF yard include a rainwater management area, a tanker storage area, a covered truck bay, and truck scales. Yard areas are used by mobile vendors to certify TRU waste and load it for shipment to WIPP.

Building 696R is designed for the storage of solid TRU waste, solid and liquid LLW, and combined waste (i.e., radioactive and California-regulated hazardous waste). Operations in the Building 696R segment include loading, unloading, staging, storage, over packing, LLW sampling, and periodic visual inspections of waste containers. Building 635 also stores TRU waste.

The mission performed in the TRU waste segments is to characterize LLNL TRU waste, repackage it as necessary, and load the waste drums into Transuranic Package Transporter–II (TRUPAC-II) casks for offsite shipment. The waste needs to meet both the DOT shipping requirements and the waste acceptance criteria for the receiving facility, which will be the WIPP. The amount of TRU managed at DWTF is approximately 110 cubic meters per year (LLNL 2005).

A.5.1.2 *Los Alamos National Laboratory*

LANL uses radioactive materials in a wide variety of operations including scientific and weapons R&D, diagnostic research, research on the properties of materials, and plutonium pit production. The technical area (TA)-55 Plutonium Facility Complex (TA-55 Complex) encompasses about 40 acres and is located about one mile southeast of TA-3 (Figure A.5.1-4). The Plutonium Facility Complex has the capability to process and perform research on actinide materials, although plutonium is the principal actinide used in the facility. Most of TA-55 is situated inside a restricted area surrounded by a double security fence. The main complex has five connected buildings: the Administration Building, Support Office Building, Support Building, Plutonium Facility, and Warehouse.

The Plutonium Facility, a two-story laboratory of approximately 151,000 square feet, is the major R&D facility in the complex (Figure A.5.1-5). The Plutonium Facility provides storage, shipping, and receiving activities for the majority of the LANL SNM inventory, mainly plutonium. This includes temporary storage of Security Category I/II materials removed from TA-18 in support of TA-18 closure until these materials are shipped to NTS and other DOE sites. All materials from TA-18 are scheduled to be moved to final disposition locations by March 2008. In addition, sealed sources collected under DOE’s Off-Site Source Recovery Project are stored at TA-55 or sent to other LANL locations for storage pending final disposition. When appropriate, mixed-oxide fuel materials stored at TA-55 would be transported to other DOE sites. TA-55 provides interim storage of up to 7.3 tons of the LANL SNM inventory, mainly plutonium.

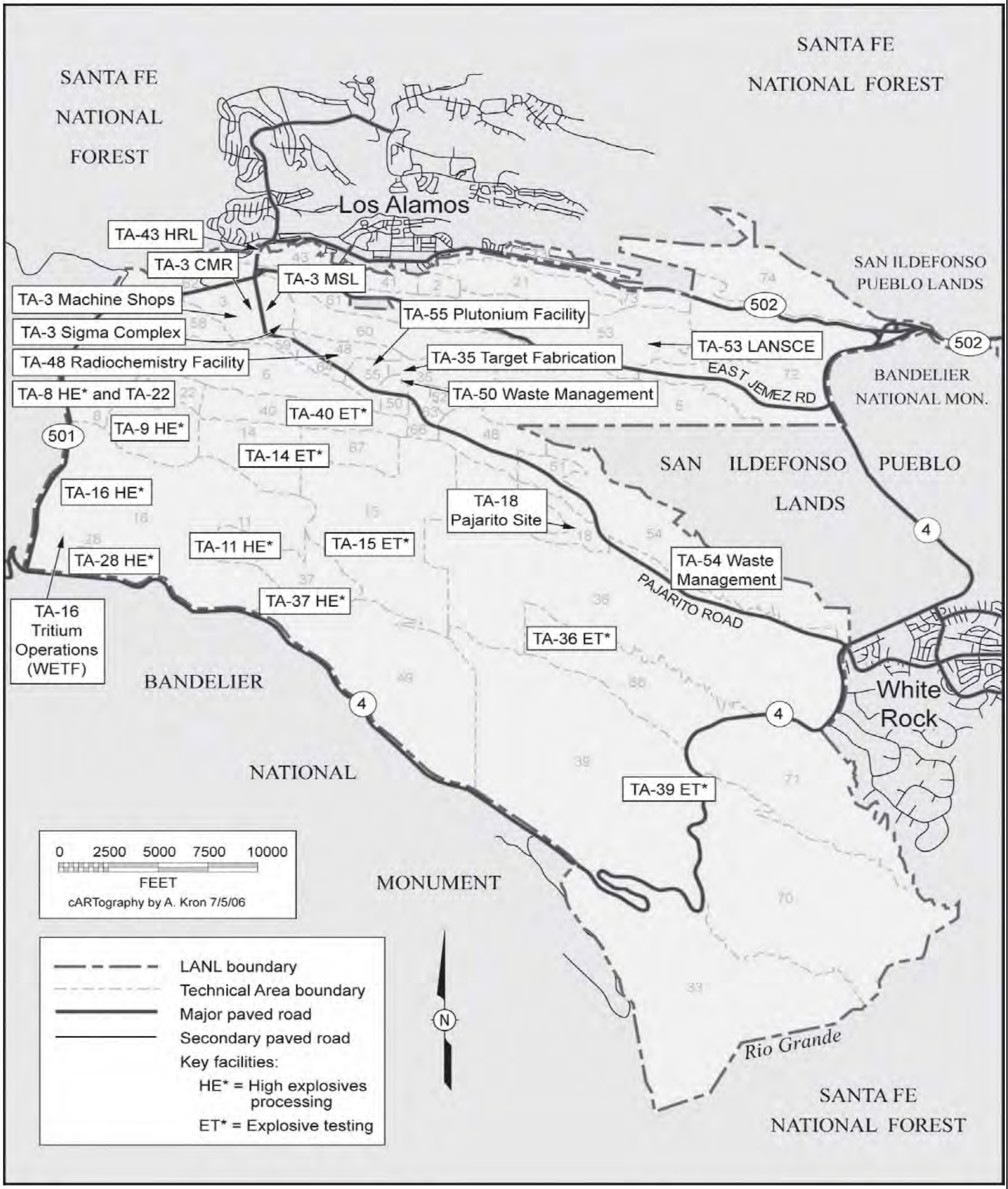


Figure A.5.1-4—Major Technical Areas at LANL, including TA-55 Plutonium Facility Complex

Figure A.5.1-5—Plutonium Facility at TA-55

PROJECT-SPECIFIC ALTERNATIVES

A.6 HIGH EXPLOSIVES R&D

A.6.1 No Action Alternative

This section describes the HE R&D facilities and missions currently conducted at weapons complex sites.

A.6.1.1 *Lawrence Livermore National Laboratory*

HE R&D at LLNL is carried out primarily in two facilities—the HEAF at the main Livermore site, and the Chemistry, Materials and Life Sciences Facility at Site 300. A basic description of each of these facilities is given below.

The High Explosives Application Facility (HEAF) is a full-spectrum R&D facility which performs the following missions:

- Explosive characterization and lab-scale development;
- Performance and safety testing; and
- Modeling and simulation of explosive properties and reactions.

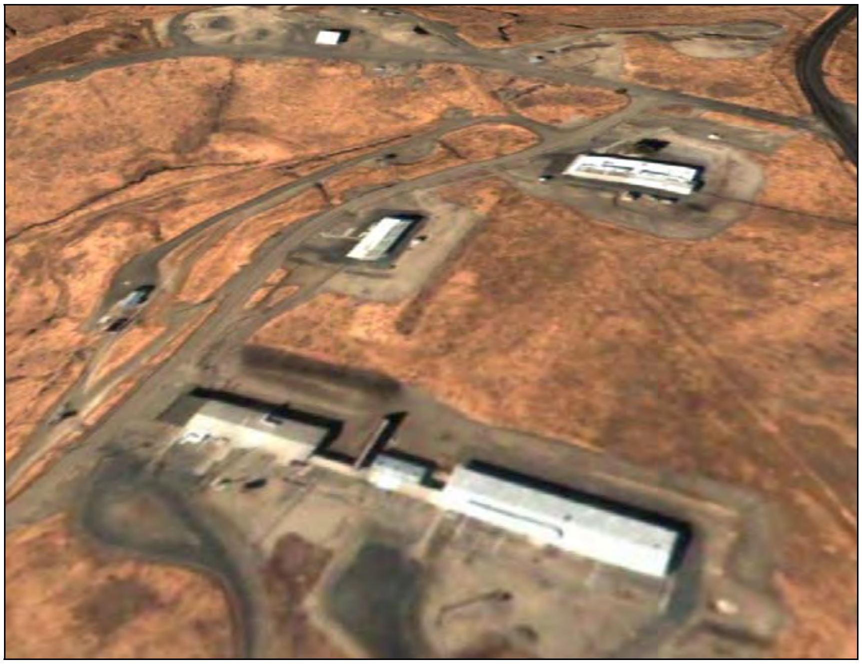
The HEAF includes laboratory areas approved for handling explosives in quantities up to 10 kilograms, and office space for the research and support staff. The net usable area of the facility is approximately 65,000 square feet. An aerial view of the HEAF is shown in Figure A.6.1-1.

Note: The facility section at the bottom of the image is the office area; the area behind that houses the laboratory areas including firing tanks

Figure A.6.1-1—The LLNL HEAF

The Chemistry, Materials and Life Sciences Facility at Site 300 provides the capability for larger scale synthesis and formulation, HE R&D part fabrication (e.g. pressing radiography, machining and assembly), and explosives waste packaging, storage and treatment. These capabilities are provided by the Chemistry Area, the Process Area, the Explosive Waste Storage Facility, and the Explosive Waste Treatment Facility. The net usable space is approximately 35,000 square feet. Figures A.6.1-2 and A.6.1-3 show the Chemistry, Materials and Life Sciences Facility at Site 300.

Figure A.6.1-2—Chemistry Area at Site 300, providing scale up of formulation and synthesis of HE



Note: Shown are B.806 (foreground), B807 directly behind B806 to the left, B805 behind B806 to the right, and the EWSF at the top of the photo

Figure A.6.1-3—A portion of the Process Area at Site 300

There are approximately 175 scientists, engineers, and technicians associated with the HE R&D mission at LLNL.

A.6.1.2 *Los Alamos National Laboratory*

LANL conducts HE R&D activities in nine technical areas, as discussed below. While the LANL HE R&D facilities share some common spaces with the hydrodynamic program, for purposes of this SPEIS, the current HE R&D activities at LANL are considered to be housed in approximately 250,000 square feet, managed as three facilities (HE Science, HE Fabrication, and HE Firing Sites) in 31 buildings (>1000 square feet), which includes magazines and firing points. Major TAs with HE R&D facilities are discussed below and shown on Figure A.6.1-4.

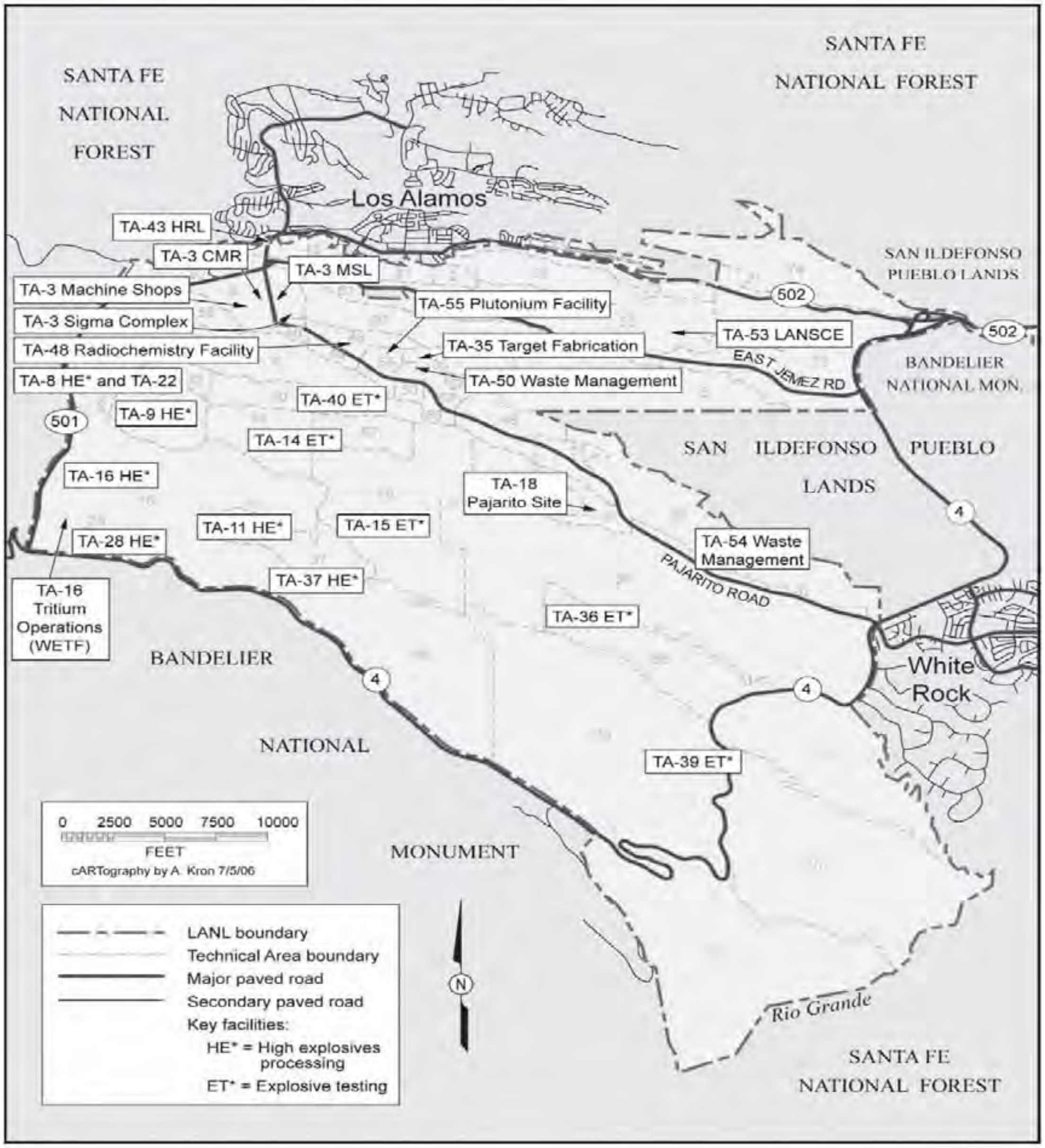


Figure A.6.1-4—LANL Technical Areas

TA-9	This TA is located on the western edge of LANL. Fabrication feasibility and the physical properties of explosives are explored at this site, and new organic compounds are investigated for possible use as explosives. Storage and stability problems are also studied.
TA-14	Located in the northwestern part of LANL, this TA is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning. Tests are conducted on explosives charges to investigate fragmentation impact, explosives sensitivity, and thermal responses of new high explosives. This site is currently permitted to treat waste through open detonation or open burning under the *RCRA*.
TA-16	Fabrication of precision explosive assemblies, from powder pressing to machining and inspection, occurs at TA-16 to support HE R&D experimentation. LANL owns and maintains the only capability for fabrication of plane wave lenses used throughout the nation, at this facility.
TA-22	This TA, located in the northwestern portion of LANL, houses the Los Alamos Detonator Facility. Construction of a new Detonator Production Facility began in 2003. R&D and fabrication of high-energy detonators and related devices are conducted at this facility.
TA-36	TA-36 is in a remotely located area in the eastern portion of LANL that is fenced and patrolled. It has two active firing sites that support the HE R&D mission (it has two other firing sites that support the hydrotesting mission). The sites are used for a wide variety of nonnuclear ordnance tests pertaining to warhead designs, armor and armor-defeating mechanisms, explosive vulnerability to projectile and shaped-charge attack, warhead lethality, and determining the effects of shock waves on explosives and propellants. Diagnostics include optical photography, multiple beam laser velocimetry, high speed electrical signal recording, and pulsed X-ray techniques.
TA-39	TA-39 is located at the bottom of Ancho Canyon. The behavior of nonnuclear weapons is studied here, primarily by photographic techniques. Also studied are the various phenomenological aspects of explosives, interactions of explosives, explosions involving other materials, shock wave physics, equation-of-state measurements, and pulsed-power systems design and experimentation.
TA-40	TA-40, centrally located within LANL, is used for studies of explosive initiation, detonation, and shock wave response of other materials related to weapon systems. Both fundamental and applied research investigating phenomena associated with the physics of high explosives and shock-induced chemical reactions are conducted. In addition, surveillance and qualification studies of War Reserve (WR) detonators are conducted.

TA-46 TA-46, located between Pajarito Road and the San Ildefonso Pueblo, is one of LANL's basic research sites. Activities have focused on applied photochemistry operations and have included development of technologies for laser isotope separation and laser enhancement of chemical processes. Current operations include studies of the response of small quantities of explosives to thermal and mechanical stimuli, with the experiments housed in boomboxes.

TA 53 At Area C of LANSCE, located at TA-53, LANL has developed Proton Radiography, a unique national resource. Proton radiography (800 megaelectron volts [MeV]) has the ability to capture a sequence of images, creating a movie of an explosive event (up to 33 frames, currently). Protons have approximately 100 micrometers spatial resolution for HE systems, with high contrast over a wide range of areal densities. Protons are different from X-rays in that there is no background or detector scatter, so quantitative density measurements are possible. Proton radiography shots are currently limited to 10 pounds Trinitrotoluene (TNT) equivalent in a containment vessel.

The general HE R&D activities at LANL can be broken down into the following missions:

- HE synthesis and formulation R&D;
- Physics and engineering performance, and safety models;
- Thermal response of HE;
- HE characterization;
- Characterization of HE-driven materials;
- Detonator technology R&D;
- HE test fire capabilities; and
- Military and commercial applications of HE.

A.6.1.3 *Pantex Plant*

The Pantex Plant researches the physical and chemical characteristics of the parts used in nuclear weapons. Highly specialized explosive main charges and initiation systems are required for a weapon to produce a nuclear explosion. Research at Pantex includes the use of insensitive HE for increased safety as well as refinement of HE manufacturing methods and safety procedures. Pantex performs HE synthesis, formulation, machining, extrusion, testing, process development, and analytical operations in performing its HE research and development and production missions. These operations are performed in Zone 11 or Zone 12 using HE materials stored in Zone 4 East remote firing sites (see Figure A.6.1-5). HE R&D activities and HE production mission work at Pantex occur in common facilities and work areas. As a result, R&D and production missions are not segregated in terms of facilities, infrastructure or work force. In general, less than 10 percent of the annual HE-related budget at Pantex is associated with HE R&D activities.

R&D activities at Pantex, not related specifically to production process improvement, primarily involve stockpile-related surveillance and periodic reimbursable work typically with technical direction from the national laboratories. This work is traditionally concentrated within the testing mission categories. There are currently no Pantex facilities dedicated entirely to HE R&D work. By conducting HE R&D efforts in the production facilities, NNSA is able to leverage the infrastructure investment to accomplish both objectives.

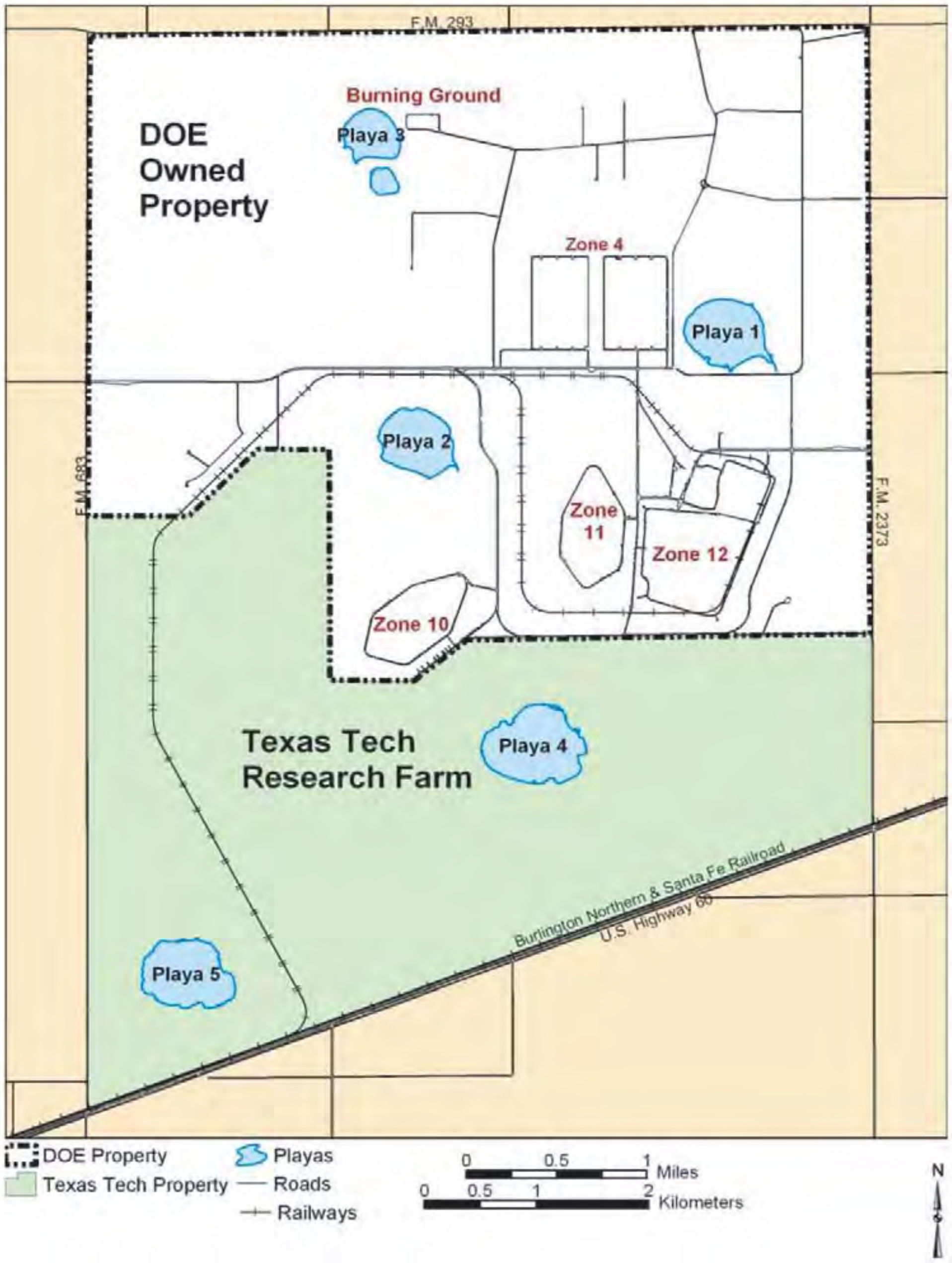


Figure A.6.1-5—Relevant Zones at Pantex for HE R&D

A.6.1.4 *Sandia National Laboratories/New Mexico (SNL/NM)*

SNL/NM has mission responsibility for the nonnuclear components, which comprise approximately 95 percent of the components in a weapons system, and for assuring the safety and reliability of the complete, integrated nuclear weapon system. The major SNL/NM facilities and labs that conduct HE R&D are described below.

The Explosive Component Facility (ECF), shown in Figure A.6.1-6, was built specifically to conduct the SNL/NM work on explosive components. The ECF includes over 100,000 square feet of laboratories, diagnostic centers and performance facilities for the research and development of advanced explosive technology and sits on 22 acres on Tech Area II (see Figure A.6.1-7). Unique facility features include explosives labs qualified for all types of explosives, HE chambers and firing pads, explosive component disassembly area, explosives receiving area, and explosives storage. The ECF includes the ability to handle, store, test and model all types of explosive materials, conduct performance testing and material compatibility studies, and surety assessments related to safety and reliability. Approximately 80 people work at the ECF.

Figure A.6.1-6—Explosives Component Facility (ECF); SNL/NM Bldg 905

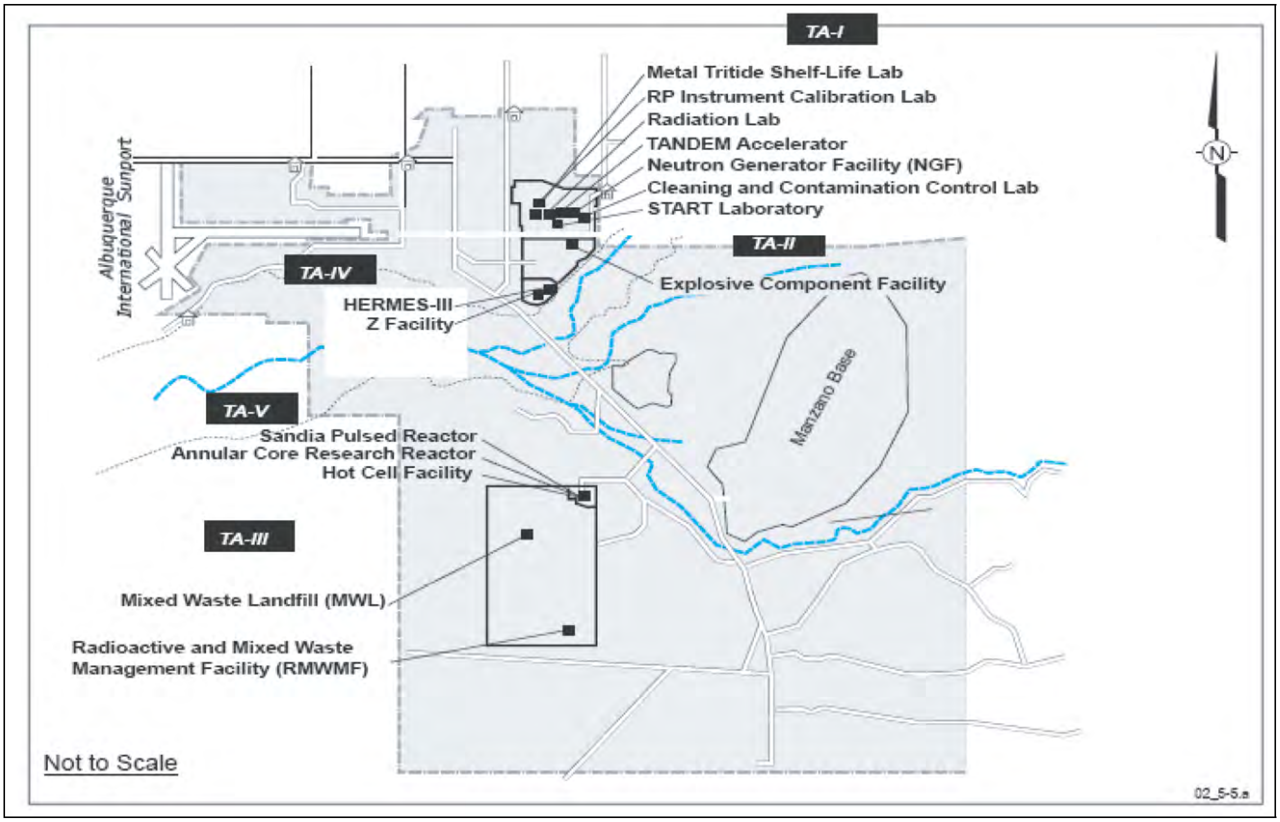


Figure A.6.1-7—SNL/NM Technical Areas

The Terminal Ballistics Facility (TBF) includes a 1,000 square-foot indoor and a 100-acre outdoor firing range that accommodate live testing and firing of guns ranging in size from 0.17 caliber to 8-inch. The facility retains the world's fastest launch capability for masses of 300–2000 grams. The site also conducts static firings of solid fuel rocket motors of up to 100,000 pounds thrust. The firing site can accommodate explosive detonation tests up to 50-pound TNT equivalent. Up to 12 people work at the TBF depending upon the test being supported. These staff are part of the approximately 80 people who work at the ECF.

Currently, there are two facility infrastructures used for explosive storage: the “6000 Igloos” and Manzano. Both storage infrastructures and the facilities are owned by Kirtland AFB. The 6000 Igloo storage area has a total of 21,000 square feet and includes 21 facilities (10 of 21 are for classified storage). The Manzano storage area includes 43 facilities, of which 13 are used for explosive storage. Approximately 18 people maintain the storage facilities.

Sandia utilizes facilities in 9930, 9939, 9920 to conduct research, design, development, manufacture and testing of explosive components, explosive systems, and arming and firing system hardware. The department also operates laboratories in Tech Area IV and the Explosives Applications Laboratory (Site 9930) in Coyote Canyon. Approximately 36 people support this mission.

The DETS Complex utilizes facility 9940 and is located on the Coyote Test Field. Current work at the facility involves arming and firing of explosives and the testing of explosive systems components in both terrestrial and aquatic settings. The site can fire up to 50 pounds TNT equivalent. These facilities are used to serve the needs of the Joint Tactical Operations Teams (JTOT) nuclear emergency response program and to meet the energetics technology needs of the DoDSpecial Forces and the Intelligence Community. There are three lines of business: energetics research, emergency response training, and threat assessments. This now includes a firing site on Thunder Range, which is 523 acres and can fire up to 500 pounds TNT equivalent. Staffing at these two sites is approximately 30–60 people.

A.7 TRITIUM R&D

A.7.1 Tritium R&D No Action Alternative

Under the No Action Alternative, NNSA would continue the ongoing tritium mission at current sites. This would entail the following tritium operations at the sites described below.

A.7.1.1 *Lawrence Livermore National Laboratory*

The LLNL Tritium Facility is a Hazard Category 3 (HC-3) nuclear facility supporting a variety of NNSA, DoD, Department of Homeland Security, and work-for-others programs using tritium, plutonium, uranium, and other radionuclides. It is located within the Superblock limited security area (see Figure A.7.1-1) at LLNL's main Livermore site. The primary tritium mission of the LLNL Tritium Facility is NIF target R&D with NIF production target filling to be added in support of the NIF Ignition Campaign beginning in 2009. As a result, per the LLNL SWEIS ROD, LLNL has received NNSA approval to increase its tritium inventory to 35 grams. The facility also hosts Gas Transfer System Research and Development experiments conducted by Sandia National Laboratory/California (SNL/CA) researchers, which is engaged in neutron generator development and provides maintenance and recertification services for the UC-609 Type B tritium shipping package.

Figure A.7.1-1—LLNL Tritium Facility within Superblock

A.7.1.2 *Los Alamos National Laboratory*

The LANL WETF is a Hazard Category 2 nuclear facility located at TA-16, which also is referred to as S-Site. TA-16 is in a remote area with controlled access (that is, a limited security area) (Figure A.7.1-2). The Weapons Engineering Tritium Facility (WETF) is in the early stages of its anticipated operational life of 30–40 years. The WETF mission is to perform tritium R&D in support of LANL's stockpile stewardship mission, primarily the gas transfer system (GTS) design agency (DA) mission. Support of the GTS DA mission requires the flexibility to quickly react to any issue that is discovered in the stockpile. The primary use of tritium in the stockpile is in GTS, which requires that large quantities of tritium be processed and handled. Typical WETF tritium processing activities include: 1) Loading and unloading; 2) Removing tritium decay products and other impurities from gaseous tritium; 3) Mixing tritium with other gases; 4) Analyzing tritium as mixtures; 5) Loading tritium onto various metals and metal alloys; 6) Repackaging tritium and other gases to user specifications; 7) Environmental storage and conditioning of GTS components; 8) Performing various user-defined experiments with tritium; 9) Unloading (depressurizing) containers of tritium; and 10) Functionally testing R&D GTS.

A number of WETF systems support tritium processing, experiments, containment, confinement, gaseous tritium cleanup, analysis, and tritium monitoring. WETF's inventory is limited to a total of 1000 grams of tritium. With some physical modifications to the facility, the current Documented Safety Analysis (DSA) would support a tritium inventory as high as 2,000 grams. A portion of the WETF is dedicated to shipping and receiving tritium, which is usually received from SRS in PV-18 primary containers inside UC-609 DOT Type B containers.

Figure A.7.1-2—Aerial Photo of the WETF

All tritium R&D at LANL is performed by approximately 25 people. The number of programmatic R&D researchers is approximately 10 full-time employee (FTEs), with portions of R&D support people making up the remaining 15 FTEs (performing gas analysis, gas mixing, R&D material preparation, R&D apparatus construction/maintenance, etc.).

A.7.1.3 *Savannah River Site*

The SRS Tritium Facilities consist of six HC-2 facilities and two HC-3 facilities which support the NNSA Stockpile Stewardship missions for tritium target extraction; tritium unloading, purification and enrichment; tritium and nontritium reservoir loading; reservoir reclamation; and GTS surveillance. These are collectively referred to as the "tritium production" missions, although the actual production of new tritium is carried out in a Tennessee Valley Authority reactor, with extraction taking place at SRS in the Tritium Extraction Facility (TEF). The TEF includes two of the HC-2 facilities and became operational in late 2006. This facility was designed for a 40-year service life. Final processing of new tritium gas from TEF, as well as all other tritium gas processing, is carried out in the H-Area New Manufacturing Facility (HANMF). This facility became operational in 1994 and was also designed for a 40 year service life. The Tritium Facility Modernization & Consolidation Project, completed in 2004, significantly expanded the tritium gas processing capabilities in the HANMF and added surveillance capabilities in a new 234-7H facility.

The SRS Tritium Facilities, shown in Figure A.7.1-3, are located adjacent to H-Area near the center of the site and about seven miles from the nearest site boundary. The bounding safety basis tritium inventory for the SRS Tritium Facilities is 75,520 grams. All tritium gas processing is done within secondary containment gloveboxes or modules which have either nitrogen or argon atmospheres. The glovebox and module atmospheres are continuously recirculated through stripper systems to recover any tritium which may leak out of piping or components. All gas streams released to the environment are processed through a recovery system to reduce tritium levels to as low as reasonable achievable.

Figure A.7.1-3—Aerial Photo of SRS Tritium Facilities

A.7.1.4 *Sandia National Laboratories/New Mexico (SNL/NM)*

Tritium Operations at SNL/NM are primarily associated with the Neutron Generator Production Facility (NGPF) (Figure A.7.1-4). The primary responsibility of the NGPF is to produce and manufacture neutron generators, which fuse deuterium and tritium to produce neutrons used to initiate the fission reaction in nuclear weapons. The neutron generator is a “limited-life” component of a nuclear weapon that uses tritium and must be replaced periodically due to the relatively short half-life of tritium. Neutron generators were produced at the Pinellas Peninsula Plant in Florida starting in the late 1950s. In 1993, as part of the Non-nuclear Reconfiguration Program, Sandia was given the mission assignment for production of various nuclear weapons components, including neutron generators.

SNL/NM also performs weapons research qualification and testing on neutron tube and generator materials, process and lot samples, subcomponents, and post-mortem examinations on final product. The department also performs technical studies that characterize processes and products in collaboration with production and development and design organizations. The site-wide reporting issue for tritium at SNL/NM is about 65,000 curies. The NGPF has a maximum inventory level of 12,000 curies and has the ability to increase to 15,999 curies if required. Presently, the inventory on site at the NGPF is about 3,500 curies.

Figure A.7.1-4—Neutron Generator Production Facility at SNL/NM

A.8 NNSA FLIGHT TEST OPERATIONS

Introduction. NNSA flight test operations is an SNL-managed program to assure compatibility of the hardware necessary to interface between the NNSA weapons and the DoD delivery systems and to assess weapon system functions in realistic delivery conditions. The actual flight tests are conducted with both the B83 and B61 weapons, which are pulled from the stockpile and are converted into JTA units. In addition, development tests of gravity bomb and short-range systems are conducted at Tonopah Test Range (TTR). These flight tests are presently conducted at the TTR, a a 280 square-mile site, located about 140 air-miles northwest of Las Vegas, Nevada. TTR activities include: stockpile reliability testing; structural development R&D; arming, fuzing, and firing testing; testing delivery systems; and environmental restoration. NNSA operates this facility under the terms of a land use agreement with the United States Air Force (USAF) entitled "Department of the Air Force Permit to the NNSA To Use Property Located On The Nevada Test and Training Range, Nevada.". Figure A.8-1 shows the location of TTR and its proximity to NTS.

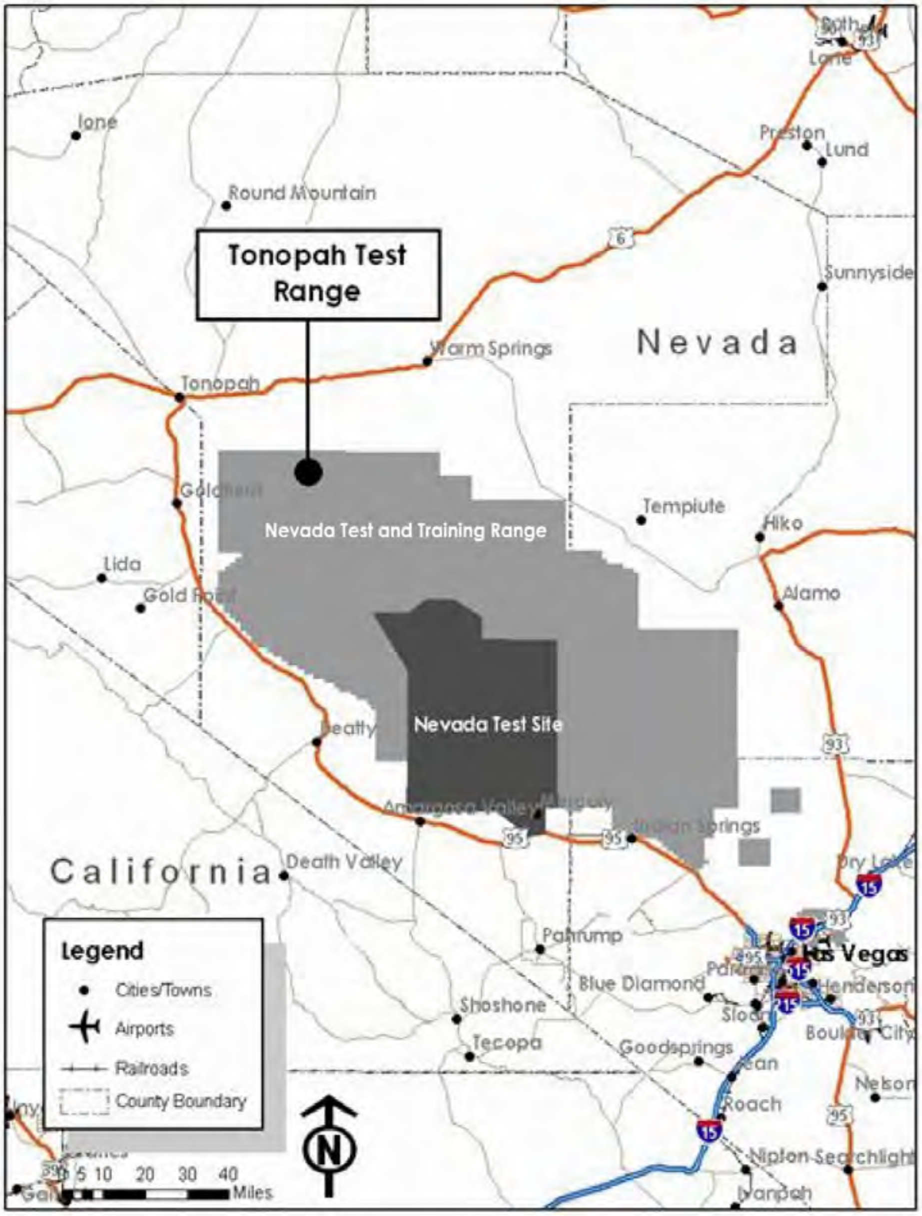


Figure A.8-1—Location of TTR and its proximity to NTS

Conversion of nuclear weapons into JTAs is a multi-step operation. Pantex denuclearizes selected nuclear weapon that become JTAs. These JTAs are not capable of producing nuclear yield. These JTAs may then be further modified at SNL. These JTAs are then dropped from nuclear certified aircraft at various altitudes and velocities. Depleted uranium usually remains in all JTAs but because there is no explosive event, the depleted uranium is contained within the weapon case and fully recovered after each flight test experiment. There is no contamination of the soil as the result of a JTA flight test. In some cases, JTAs are flown at velocities and altitudes of interest and not dropped at TTR. In such cases, the aircraft returns to its base with the JTA onboard. In an average tear, 10 JTAs are tested at TTR. Historically, JTAs included SNM, but NNSA does not plan to use SNM in JTAs after 2008. Therefore, all alternatives assume that SNM would not be present in future JTAs.

In addition to analyzing the impacts associated with the No Action Alternative, four additional alternatives are evaluated in the Complex Transformation SPEIS for conducting NNSA Flight Test Operations. These alternatives are as follows: 1) (1) upgrade the Flight Test Program at TTR; (2) operate the program at TTR in a “campaign” mode; (3) transfer the program to White Sands Missile Range (WSMR) in New Mexico; and (4) transfer the program to NTS. Specific locations within WSMR and NTS are being evaluated to assure that the required geological conditions exist to successfully support all flight testing requirements. Specific locations within WSMR and NTS are being evaluated to assure that the required geological conditions exist to successfully support all flight testing requirements. The locations are also being evaluated for the sufficiency of flight corridors for ingress and egress of test aircraft to the target areas. Infrastructure such as power and roads would also be needed at these new locations or they would have to be constructed to support flight testing activities. NNSA has conducted flight tests at facilities other than TTR, on occasion, when specific test requirements could not be met by TTR assets. Under any of the alternatives considered in this SPEIS, NNSA may continue to conduct one or more flight tests at a different facility, consistent with environmental reviews for that site.

Section A.8.1 describes the No Action Alternative, Section A.8.2 describes the alternative to upgrade TTR, Section A.8.3 describes the alternative to operate TTR in a campaign mode, Section A.8.4 describes the alternative to transfer NNSA’s flight testing mission to WSMR, and Section A.8.5 describes the alternative to transfer the mission to NTS. Analysis of the environmental impacts of the alternatives is contained in Section 5.15. The analysis of alternatives does not affect NNSA’s responsibilities at TTR relating to post-weapons testing by the Atomic Energy Commission, a predecessor agency of DOE (See Section 4.4.6.2.1). Any remediation related to such post-weapons testing is independent of decisions to be made as a result of this SPEIS.

NNSA Flight Test Operations Alternatives

- **No Action.** Continue operations at TTR
- **Upgrade Alternative.** Continue operations at TTR and upgrade equipment with state-of-the-art mobile technology
- **Campaign Mode Operations.** Continue operations at TTR but reduce permanent staff and conduct tests with DOE employees from other sites. Three options are assessed:
    - Option 1—Campaign from NTS: Reduce mission staff and relocate remaining Sandia staff to NTS; O&M and Security taken over by NTS. Additional contract for technical support of equipment is needed for maintenance and upgrade.
    - Option 2—Campaign Under Existing Permit: Reduce mission staff at TTR; campaign additional staff for each test series; SNL to retain O&M responsibilities at TTR; permit would be retained in current form; security responsibilities would be transferred to the Air Force.
    - Option 3—Campaign Under Reduced Footprint Permit: Reduce mission staff at TTR; campaign additional staff for each test series; SNL to retain O&M responsibilities at TTR; permit would be reduced to less that 1 square mile; security, emergency services, power line and road maintenance responsibilities transferred to the Air Force.
- **Transfer to WSMR.** Move NNSA Flight Testing from TTR to WSMR
- **Transfer to NTS.** Move NNSA Flight Testing from TTR to NTS

A.8.1 No Action Alternative

Under the No Action Alternative, NNSA would continue to conduct the flight test mission at TTR. This section describes the NNSA Flight Test Operations Program currently being conducted at the TTR. Figure A.8-1 shows the location of TTR. There would be no construction required at TTR for the No Action Alternative. The current facilities would continue to remain serviceable, assuming adequate funding is provided for the normal maintenance of existing facilities and equipment. Table A.8-1 shows operational requirements for this alternative.

It is noted that the No Action Alternative includes minimal investments to maintain current operations capabilities and to enable a commensurate level of Flight Tests in the future. This investment would maintain the existing TTR capabilities through the year 2030. The TTR can be sustained to meet its present mission requirements only with such minimal reasonable investments in technology and infrastructure. The investment required covers the following areas, the details for each area are described below:

Radar. This includes a transformation of one radar from a maintenance intensive unit to a modern fully functional unit, eliminating the prone to failure systems/parts; a future depot-level maintenance effort for a second radar; and the acquisition of an Identification, Friend or Foe (IFF) system. The acquisition of this IFF system would allow for the elimination of two existing maintenance intensive radar systems.

Optics. The optics group upgrade under this option would consist of three distinct functions: 1) Addition of a Time Space Positioning Information (TSPI) section to collect precise positional data; 2) Addition of an event optics section using telescope tracking mounts to record event data for documentary purposes; and 3) Addition of a photometrics section utilizing both high speed fixed camera arrays to augment the existing still photography capability.

Facilities. TTR will continue to use the existing facilities and maintain them within the normal budget process. A new HVAC system for the control facility and a roof and siding repair on one building would be required under this minimal investment option. Repair to the electrical grid and road surfaces would also be required under this alternative. In addition to these repairs, there are several structures that must undergo D&D in order to continue ongoing operations at TTR.

Table A.8-1—TTR No Action Annual Operational Requirements

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595
Peak electrical demand (MWe)	812
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Range area (sq. miles)	280
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 Mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Solid (yds^3)0**Nonhazardous (sanitary)**	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007

Past weapons destruction tests, unrelated to the Flight Test Program, have contaminated soil at TTR in three distinct areas. These sites have been characterized, and remediation is ongoing. Additional details on this can be found in Section 4.4.6.2.1 of this document. In addition to these remediation projects, there are several structures which must undergo D&D in order to continue ongoing operations at TTR. It is estimated that the soil and structure remediation activities would entail a two-year project involving 80,000 worker hours, and the requirements listed in Table A.8-2. The soil remediation activities are only the petroleum-contaminated areas under the buildings which are scheduled for demolition. The small quantities of LLW and hazardous wastes generated by this effort would be transported to NTS, or a commercial facility, for treatment and disposal. Nonhazardous waste would be disposed of onsite.

Table A.8-2—D&D Associated with TTR Operations—No Action Alternative

D&D Ongoing at TTR	D&D Amounts
Soil D&D (yd^3)	0
LLW generated (yd^3)	20
Non-Hazardous waste (yd^3)	8000
Hazardous waste (yd^3)	3703
Debris/Earth moving equip.(dozers/trucks)	2/3
D&D Related employment	
Peak	20
Total worker hours	80000

A.8.2 Upgrade of Tonopah Test Range Alternative

This alternative would use High-Tech Mobile (HTM) equipment to reduce the operational costs at TTR through the introduction of newer, more efficient, and more technologically advanced equipment. This alternative would lower manpower test operational needs and keep all test equipment highly reliable and operational between test dates, thereby reducing recalibration and startup requirements and costs. Under this alternative, additional range campaign activities could be considered and conducted with minimal additional costs.

A vision of the HTM at TTR is shown in Figure A.8-2. It includes the acquisition of modern, digital equipment that is compatible with other national test range standards. The emphasis is on highly mobile command, telemetry, communications, and radar units which could be readily moved to the different testing locations at TTR. This would not only eliminate duplicative permanent structures, but would also eliminate costly, startup calibration.

The actions required for the HTM option are as follows:

Documentary/TSPI optics. This action would include an additional five combined mount [TSPI and documentary telescopes] units with a separate optics Control Trailer for remote control operations. Encryption capability would be included.

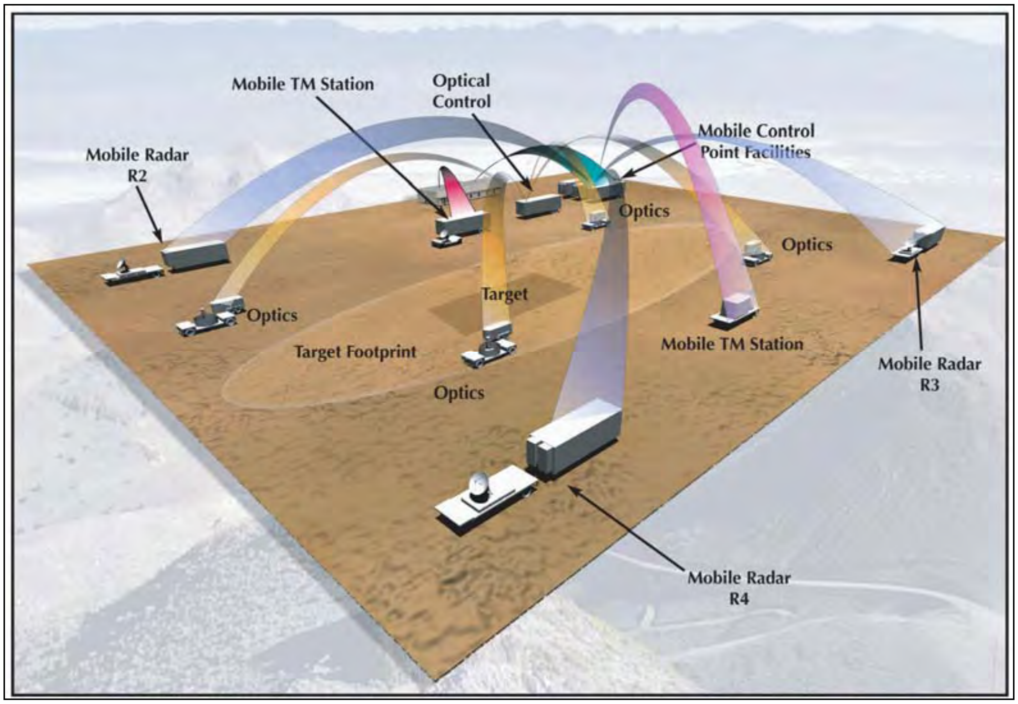


Figure A.8-2—HTM Upgrade Alternative

Radar. The proposal is identical to that proposed above for the minimum investment option.

Telemetry. New telemetry trailers, fully equipped, and antennas would be purchased and all trailers would be DOT-certified. This would allow the telemetry equipment and the antennas to be fully mobile.

Operations control equipment. Two operational control trailers, fully equipped, would be acquired to replace the operations that currently take place in the operational control tower at TTR. Test coordination, communications, and safety would all be housed in these trailers. Operation displays would provide continuous coverage of the test in progress.

Facilities. The proposal is identical to that proposed above for the minimum investment option.

There would be no construction required for the HTM Upgrade Alternative. The HTM Upgrade Alternative would rely on trailer and vehicular modules which would not require any construction. Since this alternative would use existing infrastructure and personnel, without any increases in the number or intensity of tests, the operational resource requirements would be about the same as for the No Action Alternative. TTR would continue to use the existing facilities and maintain them within the normal budget process. A new HVAC system for the control facility and a roof and siding repair on one building would be required under this alternative. Repair to the electrical grid and road surfaces would also be required. In addition to these repairs, there are several structures that must undergo D&D in order to continue ongoing operations at TTR. The requirements for this D&D are listed in Table A.8-2.

A.8.3 Campaign Mode Operation of TTR

An alternative to immediately relocating the entire TTR to another site would be to conduct the JTA tests at TTR on a campaign basis, bringing in employees from other NNSA sites to conduct tests, while doing Work for Others (WFO) as schedule permits. SNL would continue to be the program manager for this operation. Under this alternative, three options are addressed, as described in Table A.8-3.

Table A.8-3—Options for the Campaign Mode Operation of TTR

	Option 1—Campaign from NTS	**Option 2—Campaign under existing permit**	**Option 3—Campaign under reduced footprint permit**
Sandia Staff	Approximately ½ of current TTR staff work from NTS	Approximately ½ of current staff stay at TTR	Approximately ½ of current staff stay at TTR
Campaign Staff	Up to 20 test support personnel campaigned from NTS, Sandia NM & CA	Up to 20 test support personnel campaigned from NTS, Sandia NM & CA	Up to 20 test support personnel campaigned from NTS, Sandia NM & CA
Campaign Period	Each mission would require two week assignment	Each mission would require two week assignment	Each mission would require two week assignment
Campaign Frequency	Up to approximately 12 deployments per year + 1 training period per year	Up to Approximately 12 deployments per year + 1 training period per year	Up to Approximately 12 deployments per year + 1 training period per year
Land Use	180 sq miles	180 sq miles	< 1 sq mile
Technical Contract	New contract required to maintain equipment at TTR during year	None required	None required
O&M Contract	Contractor Managed by NTS	Contractor managed by Sandia	Contractor managed by Sandia
Security	Provided by NTS	Provided by the USAF	Provided by the USAF
Medical and Emergency Servies	Provided by NTS	Downsized -Occupational Medicine and Rescue retained	Downsized -Occupational Medicine and Rescue retained
Infrastructure Maintenance	Provided by NTS	Provided through Sandia contract	Provided by the USAF
Road and Power Line Maintenance	Provided by NTS	Provided through Sandia contract	Provided by the USAF
Deep Recovery of JTAs	Provided by NTS	Provided through Sandia contract	Provided through Sandia contract

Table A.8-3—Options for the Campaign Mode Operation of TTR (continued)

	Option 1—Campaign from NTS	Option 2—Campaign under existing permit	Option 3—Campaign under reduced footprint permit
Equipment investment –	New mobile and transportable equipment	Upgrades to existing equipment	Upgrades to existing equipment

USAF = U.S. Air Force
Source: NNSA 2008a.

<u>Campaign from NTS—additional details:</u>

1. Equipment investment:
   - Radar: Convert one fixed radar to mobile radar and completely refurbish pedestal;
   - Optics: Purchase 3 new documentary telescopes and upgrade 7 cinetheodolites (highly sophisticated optical tracking devices);
   - Telemetry: Replace equipment at risk and refurbish telemetry dish and mounts;
   - Communication Infrastructure: Create Ethernet cell configuration along lake beds and connect Ethernet cells using new fiber optic cable.
2. By the end of 2015, NNSA might decide to:
   - Discontinue NNSA Flight Testing at TTR in approximately 2019 and use the interim period to transition equipment and establish needed infrastructure at NTS or WSMR; or
   - Renew the USAF – DOE permit at TTR (which expires in 2019) and continue work at that site, managed by the Nevada Site Office and SNL.

<u>Campaign Under Existing Permit or Reduced Footprint Permit—additional details:</u>

1. Equipment investment:
   - Radar: Replace electronics in one fixed radar and perform depot level maintenance on pedestal;
   - Optics: Replace all film still and video cameras with modern high frame rate digital units and replace control and pedestal discrete electronics with modern personal computer based commercial-off-the-shelf equipment;
   - Telemetry: Replace equipment at risk and refurbish telemetry dish and mounts;
   - Communication Infrastructure: Use existing radio frequency and fiber backbone and convert custom communications interface to modern commercial-off-the-shelf Ethernet backbone.

This alternative would reduce the number of full-time employees to the level necessary to maintain facilities and equipment; employees from other facilities would complement resident staff in performing the actual tests. The operational requirements for all three options of this alternative are about the same as for the No Action Alternative and are shown in Table A.8-4.

Table A.8-4—TTR Annual Operational Requirements–Campaign Mode

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or cubic yd)	
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Range size (square miles)	280
Employment (workers)	135[1]
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7 x 10^{-6}
Chemical use	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

[1] Total employment – would be split between TTR, AF and SNL employees, as detailed below

For option 1 (Campaign from NTS), this alternative would result in the loss of approximately 92 full-time jobs at TTR through the downsizing of the permanent workforce from 135 to 43. This level of job reductions is different from the two alternatives that terminate all permanent TTR employment through the transfer of flight test operations to another facility. A discussion of the impacts associated with such a reduction in a community where supporting TTR is the primary employer is detailed in the next section. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the no-action alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area.

For option 2 (campaign under existing permit), this alternative would result in the loss of approximately 57 jobs, but would create approximately 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness.

For option 3 (Campaign under reduced footprint permit), this alternative would result in the loss of approximately 70 jobs, but would create 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness.

Under this alternative, the JTA tests would be conducted on a campaign basis at TTR with support from the NTS, Sandia/NM and Sandia/CA. The remaining staff at TTR would also perform Work for Others (WFO) as time and workload permits. There would be no construction required as the existing facilities at TTR would be used and upgraded to sustain reliable test support.

A.8.4 Transfer to WSMR Alternative

This section describes the alternative for transferring the NNSA Flight Test Operations activities, presently being conducted at the TTR, to the WSMR, near White Sands, New Mexico. Figure A.8-3 shows the location of WSMR. Located in south central New Mexico, WSMR is the largest installation in the DoD. WSMR is a Major Range and Test Facility Base (MRTFB) under the Department of the Army Test and Evaluation Command, Developmental Test Command WSMR possesses extensive capabilities and infrastructure used by the Army, Navy, Air Force, NNSA and other government agencies as well as universities, private industry and foreign militaries. No NNSA activities currently take place on the WSMR. The Range spans 3,420 square miles of land space and 10,026 square miles of contiguous restricted airspace fully managed, scheduled and controlled by the WSMR. Holloman Air Force Base is located within and contiguous to the range east boundary with capabilities for air-craft support and staging.

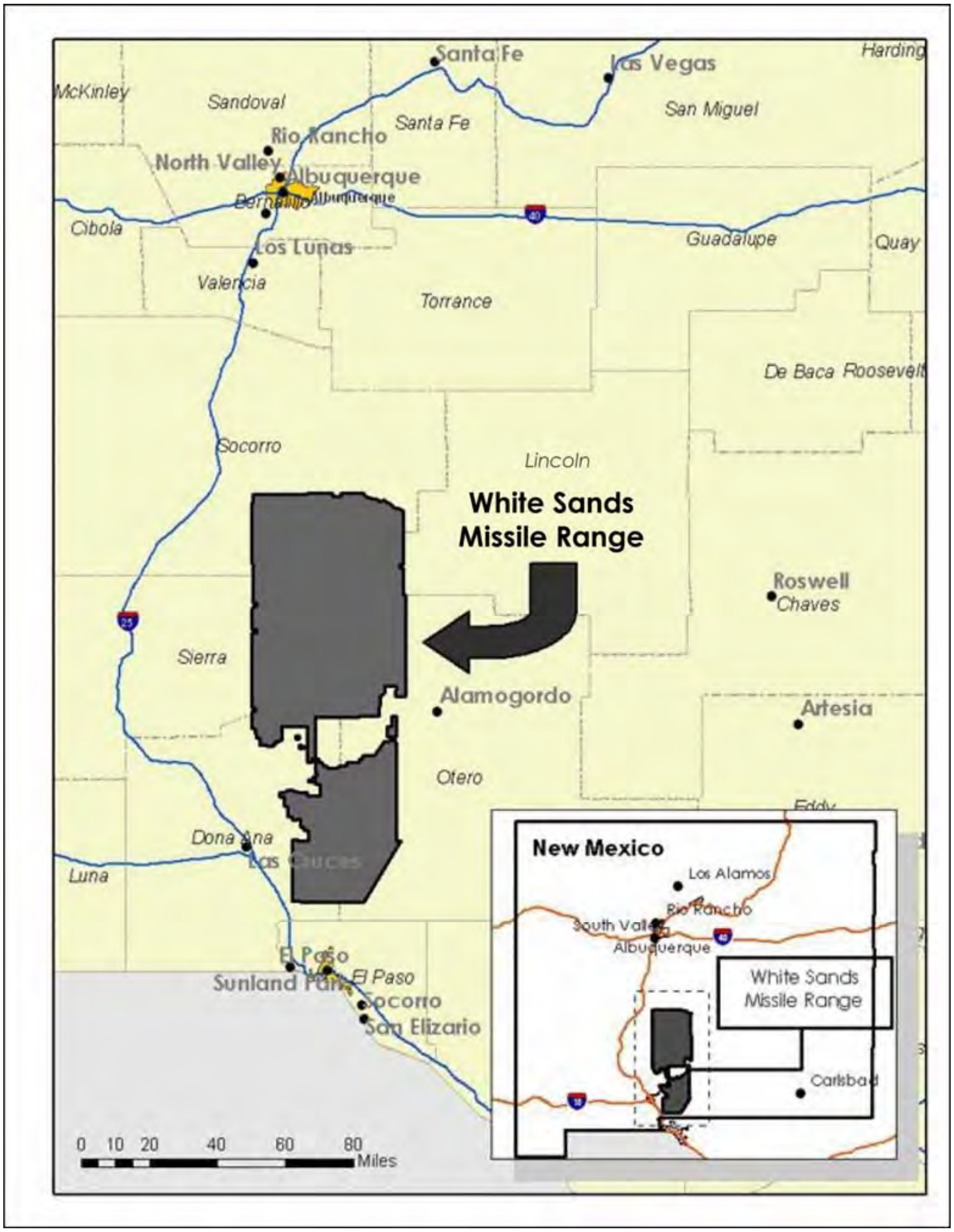


Figure A.8-3—Location of WSMR

WSMR has a full suite of flight test instrumentation including radar, telemetry and optical equipment, which allows complete coverage of NNSA gravity weapons flight testing. As a major range and test facility base, the range infrastructure and instrumentation modernization and maintenance is funded under the DoD Test Resource Management Center and Army Test and Evaluation Command including additional investments made for Air Force, Navy and JTAs. WSMR has extensive experience conducting flight tests with requirements and flight test scenarios similar to the NNSA flight test program to include penetrating weapons, weapons recovery, and handling classified and special materials.

A.8.4.1 *Existing WSMR Capabilities*

Command and Control. The WSMR range control center is a state-of-the-art facility with real-time graphics and telemetry displays, an air traffic control center meteorological data displays, as well as communications centrally connected through the range network infrastructure for data acquisition and distribution across the entire test range.

Optical/video. WSMR has a complete range of optical tracking and video capabilities for event detection, documentation and Time Space and Positioning Information (TSPI) data including position, altitude, aspect angle, and roll rate. WSMR's optical tracking capabilities include mobile and fixed tracking mounts capable of multiple visible, near IR and far IR sensors.

Tracking Radars. The radar suite at WSMR consists mostly of C-band, gated continuous wave (CW), metric radars capable of tracking in skin or beacon mode. There are ten Single Object Tracking radars, of which eight are mobile. In addition, WSMR has two mobile Multiple Object Tracking radars. WSMR also has one mobile Weibel radar Doppler radar.

Telemetry. WSMR has an array of fixed telemetry sites to provide coverage of flight tests across the range and a set of mobile telemetry stations for receiving, recording, and relaying telemetry information at custom locations to meet test requirements. Telemetry data acquisition capabilities include fixed and mobile local and long range secure, multi-stream, and high data rate (excess of 20 megabites per second) telemetry, FM, PCM, PAM, 1553, RS232, 422, IRIG 106, JTIDS/Link 16, and other standard analog and digital data protocols and formats.

Operations Control Center. The Range Control Center (RCC) is a state-of-the-art digital data facility central to test operations, data collection and distribution. The center houses the operations control and data facility, telemetry data center, air traffic control radar facility, network operations center, flight safety engineering, real-time data display and reduction facility, instrumentation controllers, meteorological data center, and test customer and analyst cells.

Photometrics and photography. WSMR has an extensive capability to provide photographic data acquisition, editing, and production for ondemand and planned documentary photo of the test setup and any incidents of interest. Photographic support includes still photography, closed circuit video surveillance, and nontrack optical data video in the visible, image intensification, and IR bands at frame rates up to 2,000 digital and over 20,000 frames per second film.

Communications. WSMR range communications operates the main switch for all telecommunications and network operations including fiber, RF, and hardwire networks. The range utilizes a radio system with repeater systems to provide test conduct and local radio communication service.

Aircraft flight safety. WSMR has a renowned capability and experience in flight safety systems to include modeling and measuring instantaneous impact predictions design, and certification of flight termination systems (FTS), and safe test operations for aircraft and weapons systems. WSMR conducts mission analysis and real-time control and decision making for mission operations including meteorological data considerations, flight profile and instrumentation information for flight safety operations. Aircraft and test operations safety is highly afforded by the control, management and vast restricted air and land space.

Airspace. WSMR controls and manages over 10,000 square miles of restricted airspace with the full authority of the Federal Aviation Administration (FAA). Thus, WSMR is not required to call up or schedule airspace operations or receive FAA approval for operations within the restricted airspace.

Explosive Ordnance Disposal/Recovery. WSMR has trained explosive ordnance disposal and recovery operations personnel for recovery and disposal of explosive ordnance that are utilized either on call or on standby for test operations as required by the test plan and safety operations.

Meteorology. WSMR has a meteorology section that provides a wide range of technical meteorological support including forecasts, warnings, and atmospheric observations and measurements for test data and control.

Trajectory plotting. The graphics facility provides the operational and display environment for the aircraft control operator and the radar director. The displays and the facility are located in the RCC. The trajectory is projected in the RCC operations center for the TD and other test personnel on the same plot as the planned trajectory, allowing the test team to evaluate the aircraft and test unit flight safety.

Security. WSMR has an integral security workforce for operations security, evacuation, and roadblock services across the range. In association with the operation of the nuclear test reactor, WSMR has personnel programs and special security training suitable for NNSA test operation requirements.

Radiological technician. Provided by SNL/NM from Albuquerque. For any tests that require post-test radiography, the equipment and specialists are provided by one of the physics laboratories.

Emergency services. A medical aid station with an ambulance, staffed by highly qualified medical technicians, is located at the Stallion range center within 10 minutes of the planned NNSA test area. Modern full service hospitals are located in the towns of Socorro and Alamogordo, about 20 and 45 miles respectively, from the proposed test location on the range. Additionally, a full-service fire station and Emergency Medical Services (EMS) unit is located at the Stallion range camp.

Shipping and receiving. WSMR performs all requirements to handle, classify, package, and ship hazardous and nonhazardous post-test assets and material off range.

Working space. Workspace for NNSA test operations could be provided by mobile facilities, at the Stallion range camp or at the defense.

Targets. WSMR has a wide variety of targets located throughout the range. Targets similar to those presently used by NNSA at TTR are located in the northern section of WSMR. The final determination of the specific target areas which would be used will be determined by the geological study. Potentially, a concrete target would be constructed in the general area of the penetration target to facilitate all missions in the same location.

Computer facility. The WSMR computer facility is located inside the RCC. This facility provides support to all facets of the test, from safety calculations and basic communications support, to the coordinated real-time radar and video picture so the test team can make instantaneous decisions about range safety and test execution.

A.8.4.2 *Siting Locations*

The northwest area of the WSMR would provide several target area options for flight testing. An Environmental Assessment (EA) is currently being prepared to support core sampling that is Preliminary drilling was conducted at several specific locations within WSMR to determine that the required geological conditions exist to successfully support all flight testing requirements. The locations are being evaluated to assure that the geology would support penetrator testing as well as the sufficient flight corridors for ingress and egress of test aircraft to target areas. Infrastructure such as power and roads would also need to exist or would need to be constructed to support flight testing activities. A review of the preliminary data indicates that this area of the WSMR could accommodate the safety footprints of all current flight test scenarios. Appropriate NEPA analysis would be required, by WSMR, prior to any detailed drilling of any of the candidate sites in order to assess the environmental impacts associated with the required construction of pads and a target and the operations associated with flight testing.

The only construction that would be required to support the JTA flight test operations at the WSMR would be the installation of a circular concrete target. The target aids in recovery of the JTAs used in flight test drops. The concrete target would be constructed of non-reinforced concrete, 500 feet in diameter, with a depth of 12 inches.

Under this alternative, NNSA Flight Testing at TTR would be discontinued. The environmental impacts of discontinuing flight testing at TTR are addressed in Section 5.15.4.2. Table A.8-5 and A.8-4 show the construction and operational requirements for this alternative.

Table A.8-5—WSMR Construction Requirements

Construction Requirements	Consumption/Use
Peak Electrical Energy Use (KW-hr)	40,000
Diesel Generators (Yes or No)	Yes
Concrete (yd3)	800
Steel (t)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000
Range land required (acres)	3,774
Lay down Area Size	Two 11.5 acre sites
Parking Lots	N/A
Total employment (worker years)	37
Peak employment (workers)	30
Construction period	15 months
Waste Generated	**Volume**
Hazardous	
Liquid (gal)	0
Solid (yds^3)	0
Non-hazardous (Sanitary)	
Liquid (gal)	0
Solid (yds^3)	6,000
Non-hazardous (Other)	
Liquid (gal)	0
Solid (yds^3)	45

Table A.8-5—WSMR Operational Requirements (continued)

Operation Requirements	Consumption/Use
Annual electrical energy (MWh)	595
Peak electrical demand (MWe)	812
Fuel usage (gal)	32,150
Other process gas (N, Ar, etc.)	480cu.ft.
Diesel generators	44 (about 20 per test)
Water (Yearly in gallons)	6 million gallons
Steam (tons)	0
Plant footprint (acres)	
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 Mrem
Radionuclide emissions and effluents—	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007

The only construction that would be required to support the JTA flight test operations at the WSMR would be the installation of a circular concrete target and associated pads. The target would be used to aid in recovery efforts. It would also be used for free-fall test units. The concrete target would be constructed of 4000 psi non-reinforced concrete, 500 feet in diameter with a depth of 12 inches. Tables A.8-1 and A.8-2 provide the construction and operational requirements associated with relocating NNSA flight test operations to the WSMR.

The required construction is a small project and it is not anticipated that the employment of 30 construction personnel over a 15-month period would have a significant impact on the existing labor pool of the area.

During flight test operations, the primary noise would be generated by aircraft flying over the WSMR drop areas. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to those employed by WSMR. They would not likely result in any adverse effect on sensitive wildlife species or their habitats, and would be similar to the effects discussed under the No Action Alternative.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased flights at WSMR as a result of NNSA conducting flight test operations. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are remotely located from the flight-path of the aircraft. The public is not allowed on WSMR and noise levels produced by the aircraft are sufficiently reduced at locations where the public would be present to preclude hearing damage.

Sensitive wildlife species are unlikely to be adversely affected by the aircraft noise. WSMR has conducted such tests on a weekly basis over a number of years with no apparent adverse impacts to any species.

In is assumed that operational impacts, as shown in Table A.8-8 would be the same as the operational requirements for the No Action Alternative operation at TTR. Although they will certainly be different, current operational requirements are the best estimate, as there is no reason to believe the actual operation of JTA tests would be sufficiently different from the existing operation.

A.8.5 Transfer to NTS Alternative

This section describes the alternative for transferring the NNSA flight test operations activities, presently being conducted at the TTR, to the NTS. Figure A.8-1 shows the location of TTR and its proximity to NTS. This alternative involves transferring NNSA Flight Test Operations to NTS (Figure 3.10-4). It is estimated that a site of about two acres would be required. A review of three possible Areas at NTS (five separate sites) was conducted (see Figure 3.10-4). NNSA evaluated these locations at NTS to determine if flight testing could be conducted safely with the appropriate ingress and egress corridors for flight test aircraft and if the soil geology was suitable for testing requirements. Preliminary drilling was conducted to assure that the location would have the required soil geology. Appropriate NEPA analysis would be required prior to any detailed drilling of any of the candidate sites in order to assess the environmental impacts associated with the required construction of pads and a target and the operations associated with flight testing. Although the isolation of the NTS is a benefit for security and flight path purposes, the remoteness of these site locations could require an investment in road and utility infrastructure. A preliminary assessment indicates that these sites meet the necessary safety criteria for flight paths and target location to permit the program to use these areas of NTS. Other sites may be available at NTS, but these three sites meet the mission needs and provide a reasonable number of site alternatives for consideration.

If this alternative were to be selected, transition from TTR to NTS could occur as early as the latter part of 2009 and the beginning of 2010. Upgrades would only begin after the construction of the needed facilities was completed and transition of personnel and equipment completed. NNSA would need to construct pads and a target and possibly some road and utility infrastructure. [a1]Flight Test Program system upgrades would only begin after completion of the required NEPA analysis, construction of required infrastructure and facilities, and the completion of transition. The JTA Flight Test Program staff would be housed in CP-40, an existing NTS facility that includes office space and an available high-bay area, which could accommodate high-tech mobile equipment. Minor building preparation could be required. The concrete target would be constructed of non-reinforced concrete, 500 feet in diameter with a depth of 12 inches.

Under this alternative, NNSA flight testing would be discontinued at TTR. The environmental impacts of discontinuing NNSA flight testing at TTR are addressed in Section 5.15.4.2.

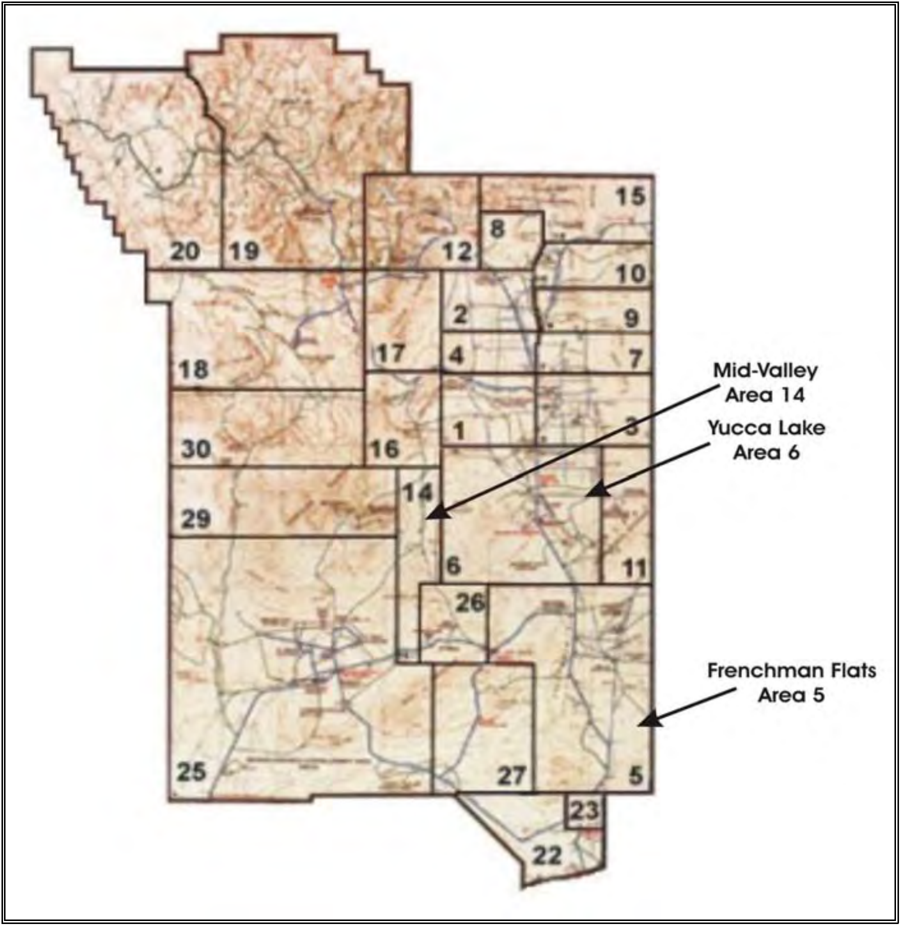


Figure A.8-4—Potential Flight Test Sites at NTS

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Figure A.8-5—CP-40 includes administrative areas and a high bay that would be useful for personnel and assembling test hardware

5/10/2001

Figure A.8-6—CP-20 is an ideal facility for housing the electronics for the Flight Test Program

Existing communications capabilities between the CP facilities located in the southeast portion of Area 6, include a fiber optic link between the CP microwave towers and CP-1, 20, and 40. Microwave data communications are available for connecting data and video requirements from the target area to the CP complex. Setup of the microwave data/video links is a routine test requirement on the NTS. These same communications infrastructure elements can readily be applied to other locations on the site should the JTA Flight Test Program desire to test in different geological regimes.

A.8.5.1 *Construction Requirements*

As mentioned in the sections above, a target area would have to be constructed and a few enhancements to Building CP-40 would have to be made. The following tables give the impacts associated with the required construction and for the operation of the Flight Test Operations Program at NTS. Table A.8-6 and A.8-7 show the construction and operational requirements for the Relocation of Flight Test Operations to NTS Alternative.

Table A.8-6—Construction Requirements for NTS Alternative

Construction Requirements	**Consumption/Use**
Peak Electrical Energy (MWh)	40,000
Diesel Generators (Yes or No)	Yes
Concrete (yd^3)	800
Steel (t)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000
Range land required (acres)	3,774
Laydown Area Size	Two 11.5 acre sites
Parking Lots	N/A
Construction Employment	0
Total employment (worker/yr)	37
Peak employment (workers)	30
Construction period (months)	15
Waste Generated	**Volume**
Low level	
Liquid (gal)	0
Solid (yd3)	0
Mixed Low-level	
Liquid (gal)	0
Solid (yd3)	0
Hazardous	
Liquid (gal)	0
Solid (yd3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	6,000

Table A.8-6—Construction Requirements for NTS Alternative (continued)

Waste Generated	Volume
Solid (yd3)	
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd3)	45

Source: NNSA 2007.

Table A.8-7—Operation Requirements for NTS Alternative

Operational Requirements	Consumption/Use
Annual Electrical energy (MWh)	595
Peak electrical demand (Mwe)	812
Fuel usage (gal)	32,150
Other Process Gas (N, Ar, etc)	480 cubic feet
Water (gal)	6,000,000
Steam (tons)	0
Range land required (acres)	3,047
Employment (workers)	129
Number of Radiation Workers	1
Average annual dose (per Sandia)	<10 mrem
Radionuclide emissions and effluents	0
NAAQS emissions (tons/yr) (per Sandia)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	HCL - 3.7E-06
Chemical Use (per Sandia)	0
Maximum inventory of fissile material/throughout	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds3)	0
Solid (yds3)0Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds3)	15

Source: NNSA 2007.

A.8.6 Transportation

All post-test transportation from the NTS to Pantex would be identical to the transportation requirements of the current TTR process. New agreements replacing NTS as the originating site would replace the TTR agreements. NTS has a long history including formal agreements with Albuquerque for the shipment of SNM and classified components to and from major DOE/NNSA sites and is therefore thoroughly familiar with the processes and procedures for these shipments.

Due to the proximity of all alternative sites, the transportation requirements are similar for all three alternatives. All transportation of nuclear weapons, as well as JTAs, is conducted in DOE safe secure trailers by the DOE Office of Secure Transport, based in Albuquerque, New Mexico. Vehicles are state of the art, and all personnel associated with such shipments are highly trained both initially and on an ongoing basis. Although routes have been determined and environmental impacts evaluated for such transport, specifics of this information are not available to the public.

A.8.6.1 *Removal of Weapons From the Stockpile*

Under the existing operation at TTR, weapons are removed from the stockpile at various locations across the U.S. and abroad and are transported to Pantex. The specific locations are not for public release. Once the weapon has been inspected, the SNM removed from the weapon, and instrumentation added to the weapon, the weapon is considered a JTA. Transportation required to support this activity would be the same as for existing operations and would be the same for all alternatives.

A.8.6.2 *Transport of JTAs to Air Force Installations To Be Loaded Onto Test Aircraft*

Once the JTAs have been inspected and certified at Pantex, they are transported to USAF installations on DOE’s fleet of SST vehicles to be loaded onto test aircraft. Transportation required to support this activity would be the same as for existing operations and would be about the same for all alternatives.

A.8.6.3 *Transport of JTAs From Test Site to Pantex*

Once the JTA test has been completed, the JTA is returned to Pantex for post testing analysis and disposition. For flyover tests, this transportation route would be from the Air Force installation from which the aircraft originated to Pantex. Transportation required to support this activity would be the same for existing operations as it would be for all alternatives. Dropped JTAs would be transported from the test facility to Pantex. Transportation required to support this activity would be site specific and vary for each alternative site. The No Action Alternative, the two TTR Upgrade Alternative, and the relocation to NTS would all be similar, since the distances and routes to Pantex are about the same for TTR and NTS. The transportation route from the relocation to the WSMR Alternative is less than half of the other two alternatives.

A.9 HYDRODYNAMIC TESTING

Hydrodynamic testing (hydrotesting) is the execution of high explosive (HE)-driven experiments to assess the performance and safety of nuclear weapons. Data from experiments including hydrotesting, coupled with modeling and simulation using high performance computers, is used to certify the safety, reliability, and performance of the nuclear physics package of nuclear weapons without underground nuclear testing.

The alternatives for meeting the goal of the National Hydrotest Plan (NHP) are explained in the sections that follow. Section A.9.1 discusses the No Action Alternative, which would continue operations at the existing facilities of LANL, LLNL, NTS, SNL, and Pantex. Section A.9.2.1 discusses an alternative which would downsize the number of hydrotesting facilities at LANL, LLNL, NTS, SNL, and Pantex. Section A.9.2.2 discusses an alternative that would consolidate nonfissile hydrotesting activities at LANL. Section A.9.2.3 discusses a next generation alternative which would consolidate all hydrotesting activities at the NTS.

Hydrodynamic Testing Alternatives

- **No Action. C**ontinue hydrotesting at LLNL, LANL, NTS, Pantex, and SNL/NM
- **Downsize in Place**
  - Consolidate LLNL hydrotesting at Contained Firing Facility (CFF)
  - Consolidate LANL hydrotesting at Dual Axis Radiographic Hydrodynamic Test (DARHT) facility
  - Consolidate NTS hydrotesting to single confined and single open-air sites
  - Discontinue hydrotesting at Pantex and SNL/NM
- **Consolidation at LANL**
  - Integrate hydrotesting program at LANL
  - Construct new CFF-like facility at LANL
  - Discontinue hydrotesting at LLNL once CFF-like facility is operational
  - Maintain BEEF at NTS
  - Discontinue hydrotesting at Pantex and SNL/NM
- **Consolidation at NTS**[1]
  - Integrate hydrotesting program at NTS
  - Construct new DARHT-like facility at NTS
  - Construct new CFF-like facility at NTS
  - Discontinue hydrotesting at LLNL, LANL, Pantex, and SNL/NM

[1] The NTS Alternative is considered a “next generation” alternative because NNSA is not proposing these changes at this time.

Hydrotesting coupled with high performance computer modeling and simulation and data from data processing equipment (DPE), is used to certify the safety, reliability, and performance of the nuclear physics package of nuclear weapons without underground nuclear testing. Radiographic images and other data from hydrotesting help to ensure continued confidence in NNSA’s assessments of nuclear weapons by providing critical experimental data for representative nuclear weapons geometries, fine tuning computer modeling of nuclear weapons performance and behavior, evaluating effects of aging on materials, and evaluating performance of remanufactured or new materials and components.

As described in Section A.9.1, the majority of stockpile stewardship hydrotesting is conducted at LLNL in the Contained Firing Facility (CFF) at Site 300 and at LANL at the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT). The diagnostic capabilities have been developed at these two facilities to meet specific nuclear weapons design and agency needs. Hydrotesting is also conducted at Pantex, SNL/NM, and NTS to support surveillance, production and fundamental equation of state (EOS) research on shock-driven plutonium. No single existing NNSA hydrotest facility offers all of the diagnostic capabilities or capacity necessary to meet the entire hydrotesting requirements for certifying the safety and reliability of the nuclear weapons stockpile.

The goal of NNSA's NHP is to meet the hydrotest requirements for certifying the safety and reliability of the nuclear weapons stockpile. This will require a wide range of facility capabilities to enable scientists from around the Complex to deal with differing issues. In addition, since the large hydrotesting experiments involve the development and detonation of state-of-the-art HE, many of the hydrotesting facilities are well suited for other uses and are therefore used for experiments which fall outside the scope of large-scale hydrotesting. Conversely, many of the HE R&D facilities are able to support hydrotesting experiments.

A.9.1 No Action Alternative

This section describes the hydrotesting facilities and missions currently being conducted at weapons complex sites. A summary of this information may be found in Section 3.11.

A.9.1.1 *Hydrotesting Facilities at LLNL*

LLNL's Site 300 has been used since 1955 to perform experiments that measure variables important to nuclear weapon safety, conventional ordnance designs, and possible accidents (such as fires) involving explosives. The facilities used for Site 300 firing activities consist of four firing point complexes and associated support facilities. The locations of the four firing complexes are indicated in Figure A.9-1.

The Building 801 Complex comprises Buildings 801A, 801B, and 801D, and encompasses approximately 51,000 square feet. The Building 801 Complex is in the northeast quadrant of the site, called the east firing area.

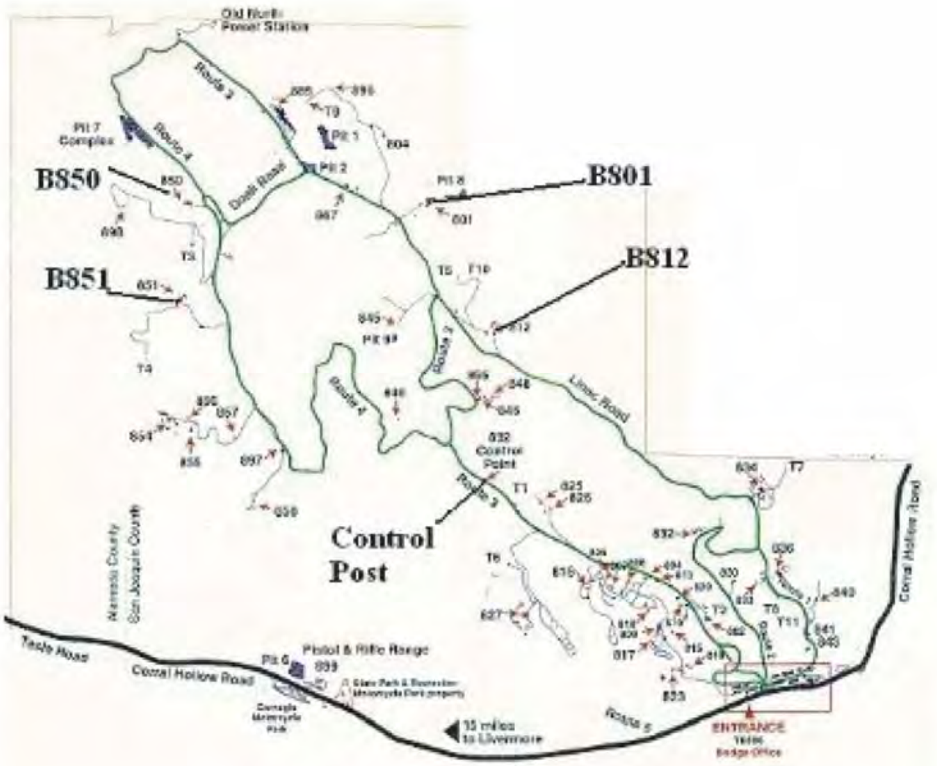


Figure A.9-1—Locations of B801, B812, B850, and B851 at Site 300

Building 801 Complex

The CFF is located at the Building 801 Complex and is capable of full-scale dynamic weapons radiography (Figure A.9-2). Without the validation provided by underground nuclear tests, LLNL and LANL scientists must utilize the results of experiments conducted here to assure the safety and reliability of our Nation's nuclear stockpile as weapons age beyond their originally planned life. The data gathered at the CFF, in conjunction with computer modeling supplies a wealth of information about how the explosives and assemblies in nuclear weapons will behave. The CFF drastically reduces emissions to the environment and minimize the generation of hazardous waste, noise, and blast pressures.

Figure A.9-2—The Contained Firing Facility at the Building 801 Complex

CFF is a permanent, state-of-the-art firing chamber constructed on the site of Building 801's previous open-air firing table. The CFF additions consisted of four components: a firing chamber, a support area, a diagnostic equipment area, and an office/conference module. The heart of the CFF is the firing chamber. Slightly larger than half a small gymnasium (52 by 60 feet and 32 feet high), the firing chamber contains the blast overpressure and debris from detonations of up to 60 kilograms of cased explosive charges. The inside surfaces of the chamber are protected from shrapnel traveling as fast as 1.5 kilometers per second with 38-millimeter-thick mild steel plates. To permit repetitive firings, all main structural elements of the firing chamber are required to remain elastic when subjected to blast. Detonations will be conducted above a 150-millimeter-thick steel firing surface (the shot anvil) embedded in the floor.

All main structural elements of the firing chamber must be able to withstand repetitive firing as well as meet design safety standards. These criteria require the structure to withstand a 94-kilograms TNT blast, which is the equivalent to 60 kilograms of HE. During the testing phase of the project, "overtests" were run using 75 kilograms of HE to assure that the building can withstand planned 60- kilograms detonations.

A key aspect of the new facility is that the rectangular concrete firing chamber was made with low-cost, conventional reinforcement, as opposed to the labor-intensive, laced reinforcement commonly found in many blast-resistant structures. From a materials standpoint, a spherical chamber shape would have been more blast efficient, but a slightly heavier, rectangular shape was cheaper to construct, provides easier and more desirable setup and working surfaces, and encompasses existing diagnostic systems. The thickness of the reinforced concrete walls, ceiling, and floor of the chamber are 3.9, 4.6, and 5.9 feet, respectively. The support area, which measures about 16,000 square feet, is for preparing the nonexplosive components of an experiment and also for equipment and materials storage, personnel locker rooms, rest rooms, and decontamination showers. It also houses filters, scrubbers, and a temporary waste-accumulation area for the waste products from testing.

In addition to the CFF, Building 801 Complex is designed to obtain explosives test data through the use of the flash x-ray accelerator, designed to accelerate charged particles and generate x-rays; a high-speed camera; and a laser-doppler interferometry operation. About 26,000 additional square feet were recently added to Building 801, also the site of LLNL's recently upgraded 18-megaelectron-volt flash x-ray (FXR) machine. Building 801 contains a variety of other advanced, high-speed optical and electronic diagnostic equipment that together constitute a unique capability to diagnose the behavior of HE-driven assemblies. This equipment measures the velocity of explosively driven surfaces. Other electronic and mechanical systems capable of diagnosing various aspects of the high explosives tests are housed in Building 801 Complex facilities.

A.9.1.1.1 Building 812 Complex

The Building 812 Complex is an active open-air explosives firing facility. The complex includes five buildings (Buildings 812A, 812B, and 812C, 812D [currently inactive], and 812E), two magazines, and an open-air firing table. Building 812E is currently used to repair and test portable x-ray equipment. The current total operational building area is 5,532 square feet.

A.9.1.1.2 Building 850 Complex

The Building 850 Complex is an explosives testing facility. This 5,840 square-foot complex consists of Bunker 850 and a magazette in the northwest quadrant of the site (called the west firing area) and comprises an active firing, explosives test, and high-speed camera repair and test facility. The multidiagnostic facility includes a permanently mounted, smooth-bore, 155-millimeter gun for conducting impact experiments, high-speed rotating-mirror cameras, specialized light sources, portable flash x-ray sources, and various other diagnostic equipment.

This facility has an outdoor detonation firing table with gravel-covered pads for stands of concrete, wood, or steel. During an experiment, the explosive is placed on the test stand and fired. The firing debris may consist of wood, plastic, wiring, and gravel. This debris is potentially contaminated with high explosives, beryllium, and depleted uranium.

A.9.1.1.3 Building 851 Complex

The Building 851 Complex is part of the explosive test facility operations. This 13,681 square-foot complex is in the northwest quadrant of the site and houses specialized laser equipment in a laser room, several laboratories, a portable x-ray room, several shop areas, and offices.

Building 851 Complex includes an open-air firing table of gravel-covered pads with stands of concrete, wood, or steel. During an experiment, an explosive device is placed on the test stand and fired. The firing debris may consist of wood, plastic, wiring, and gravel. The debris is potentially contaminated with unexpended explosives, beryllium, and depleted uranium.

Building 851 Complex is equipped for the radiography of explosives devices during detonation testing, including high-speed rotating-mirror cameras; optical interferometry for precise, free-surface velocity measurements; electronic pin timing diagnostics; and various other photo processing operations that involve both manual and automatic film and paper developing.

A.9.1.2 *Associated Support Facilities*

The following list includes facilities that are necessary support facilities for hydrotesting or facilities that are necessary to the operation of Site 300 as a hydrotesting facility:

- Site 300 HE casting and machining facilities (covered under HE R&D);
- Site 300 Shaker and Environmental test facilities (covered under Environmental Testing); and
- Site 300 supporting magazines, shops, offices, observation posts, guard stations, and materials management

Four other facilities which do not conduct hydrotesting experiments, but are necessary for supporting the hydrotest facilities are not addressed here, since they are addressed in the HE R&D or Environmental Testing Sections. These four facilities are as follows:

A.9.1.2.1 Building 806 Complex

The Building 806 Complex is located in the process area in the southeast quadrant of Site 300 and consists of Buildings 806A and 806B. This 8,314 square foot complex is used for machining and inspecting explosive parts. Explosives are also temporarily stored at the complex.

A.9.1.2.2 Building 810 Complex

The 5,079 square-foot Building 810 Complex is located in the process area, in the southeast quadrant of Site 300, and consists of Buildings 810A, 810B, and 810C. Building 810A and 810B are used to assemble explosives parts into test components. Building 810A is also used for the temporary storage of explosives components. Building 810C is used for storing nonexplosive parts for test components. The test components may also include beryllium, lithium, tritium, thorium, or depleted uranium.

A.9.1.2.3 Building 823 Complex

The 2,748 square-foot Building 823 is in the southeast quadrant of Site 300 and consists of two buildings. Building 823A contains office space, a darkroom with a radiographic film processor, and control panels for three real-time imaging systems housed in Building 823B. These units include a transportable 9-million-electron-volt (MeV), a 2-MeV, and 120-thousand-electron-volt (KeV) x-ray machines. Building 823B contains staging and real- time imaging systems, and a doubly encapsulated cobalt-60 isotope source in a lead-shielded radiographic projector. The isotope source is no longer operational and is being stored in Building 823 until it is sent back to the manufacturer for disposal. This complex provides the means for radiographic inspection of pressed explosives parts and weapon test components. After x-ray film has been exposed in

Building 823B, it is processed through the automatic film processor in Building 823A.

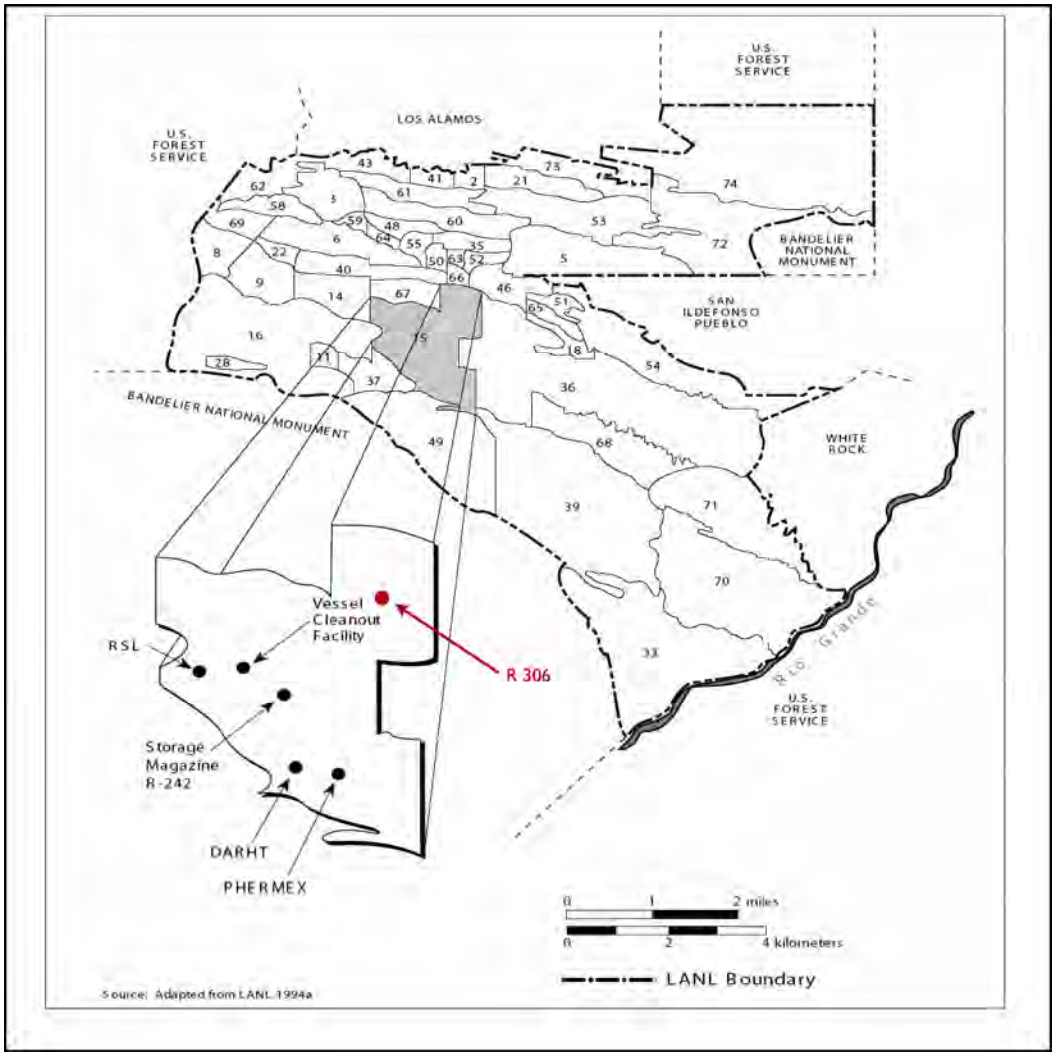
Building 823B has an earthen berm on two sides that provides radiation shielding for the office/control building located east of the berm. The Varian 9-million-electron-volt LINAC is used in Building 823B to beam into the open space directly to the west.

A.9.1.2.4 Building 845, Explosive Waste Treatment Facility (EWTF)

The EWTF is a 666 square-foot facility located in the north-central section of Site 300. The EWTF replaced Building 829, which had been closed. The EWTF consists of an earth-covered control room, Building 845A; an inert storage area, Building 845B; a thermal treatment unit (burn cage), an open burn unit (burn pad), and an open detonation unit (detonation pad). The EWTF is permitted under a hazardous waste permit issued by the California Department of Toxic Substance Control for the treatment of explosives waste. Treatment of other hazardous, radioactive, or mixed waste materials is prohibited.

A.9.1.3 *Hydrotesting Facilities at LANL*

The Hydrotesting Facilities at LANL are located within one of the five TAs that contain HE R&D facilities. TA-15, located approximately 2.6 miles from the main administrative area,in the central portion of LANL, is the location of two firing sites: the DARHT, which has an intense high-resolution, dual-machine radiographic capability, and Building 306 (R306), a multipurpose facility where primary diagnostics are performed (see Figure A.9-3). Currently, there exists no permanent radiographic capability at R306. Figure A.5.1-4 shows the location of TA-15 at LANL. The Pulsed High Energy Radiation Machine Emitting X-Rays (PHERMEX) Facility, a multiple-cavity electron accelerator capable of producing a very large flux of x-rays, was disabled in 2004. D&D of this facility has not yet been completed. LANL conducts about 100 hydrotest experiments a year.



Source: Adapted from LANL 1994a

Figure A.9-3—TA-15 at LANL

DARHT is a state-of the-art, full scale radiography facility and is used to investigate weapons functioning and systems behavior in nonnuclear testing. DARHT is designed to include two high intensity x-ray machines whose beams cross at right angles. Each machine has been designed to generate radiographs of far higher resolution than anything previously obtainable—the resolution required for stockpile stewardship without underground nuclear testing. The first axis became operational in 1999, and the second axis was tested in late 2002. In 2003, LANL began refurbishing failing accelerator cells Facility Axis II in order to bring them up to design specifications. The injector for the second axis of DARHT is now being "tuned" in preparation for undergoing commissioning tests. When DARHT becomes fully operational, its multi-axis large scale hydrodynamic tests will allow researchers to obtain three-dimensional as well as time-resolved radiographic information. Figure A.9-4 shows the DARHT facility.

The DARHT x-ray machines are based on linear induction accelerators, a technology derived from that of the Fusion Energy Research Program at Lawrence Berkeley Laboratory. An intense pulsed electron beam strikes an x-ray target, creating x-rays. The first machine provides a pulse 60 nanoseconds long. In the second machine, a "macropulse" 1.6 microseconds long will be chopped into four shorter pulses, providing four snapshots in quick succession. One of the pulses from the second axis will be able to be synchronized with that of the first axis so that three-dimensional information can be reconstructed..

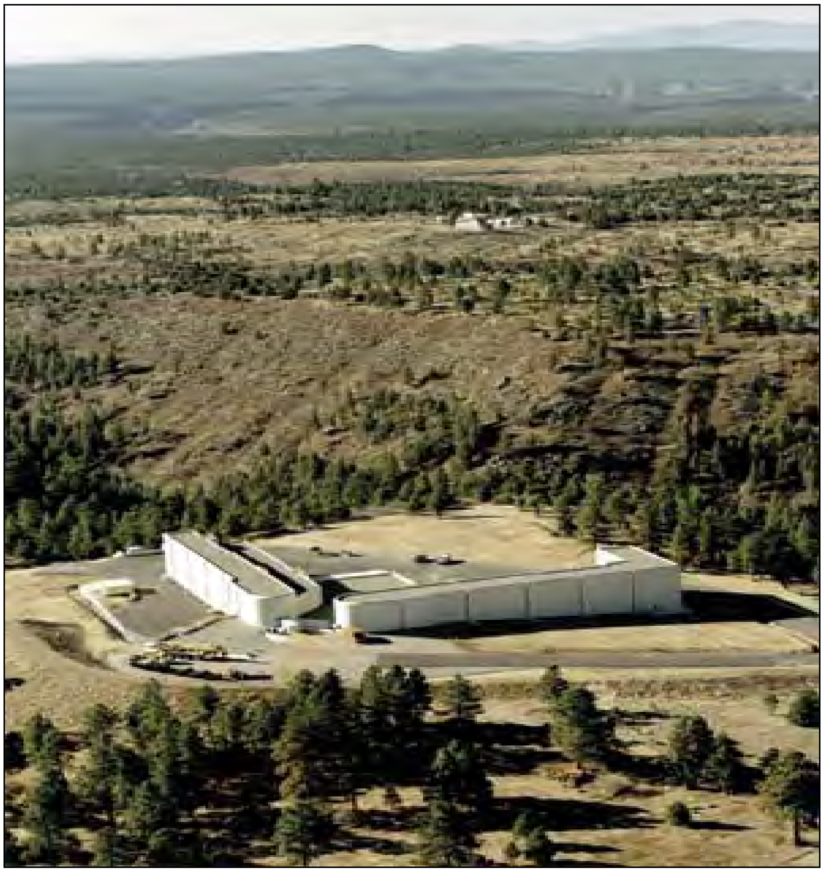


Figure A.9-4—The DARHT at LANL

TA-15 also includes office space for approximately 100 staff in buildings 494, 484, and 183. The DARHT uses office space at Building R306. Also in TA-15, is the Vessel Preparation Building that serves as a facility to clean out the steel vessels used in hydrodynamic testing. The Vessel Preparation Area also includes a low-energy x-ray calibration facility, a carpenter shop, and a warehouse.

Additional facilities required to support hydrotesting are located in six other TAs, at LANL. The Test Device Assembly Building is one such facility. The Test Device Assembly Building provides the capacity to assemble test devices ranging from full-scale nuclear-explosive-like assemblies (where fissile material has been replaced by inert material) to materials characterization tests. In addition to assembly operations, other facilities conduct explosives testing support and radiography examinations of the final assemblies. Other activities conducted at these support facilities support HE R&D. LANL also performs R&D and fabrication of high-power detonators at these facilities.

A.9.1.4 *Hydrotesting Facilities at Pantex, SNL/NM, and NTS*

Smaller hydrotest facilities, which are not capable of dynamic weapons radiography, are also located at Pantex, SNL/NM, and NTS. Both Pantex and SNL/NM have several outside blasting table facilities which are primarily used for HE R&D activities and can only handle small hydrotesting experiments. NTS has several facilities which are utilized for very large explosion-type experiments. The BEEF is one such facility at NTS, which is the only NNSA facility where some experiments, due to the amount of HE utilized, can be conducted. Three additional and similar facilities at Pantex conduct both HE R&D and hydrotesting experiments. All three will require upgrades within the next several years. The upgrades will include two open-air firing sites with bunkers and one facility containing indoor firing chambers. SNL/NM has several small HE R&D firing sites and the Explosives Component Facility and ancillary facilities, which have been used for hydrodynamic tests. Because none of SNL/NM's facilities are used primarily for hydrotesting, they are described more completely in the No Action Option for HE R&D in Section 3.7.2.1. The Explosives Component Facility and its ancillary locations support the design, development, and life cycle management of all explosive components outside the nuclear package.

A.9.2 Action Alternatives

A.9.2.1 *Downsize in Place Alternative*

This option would continue hydrotesting activities by consolidating LANL activities at the DARHT, consolidating LLNL activities at Building Complex 801 and the CFF, closing some of the smaller facilities at both of these sites, and moving tests requiring larger amounts of HE to the BEEF at NTS and LANL. Although outside the scope of large-scale hydrotesting, six firing sites at Pantex, used for HE production, development, and surveillance, and also previously used on an intermittent basis for hydrotesting experiments, will be decommissioned and decontaminated. SNL/NM would continue to operate several small HE R&D firing sites and the ECF and its ancillary locations, which would be available for hydrodynamic tests.

This alternative would entail the closure of a number of facilities both at LLNL and LANL. It could also entail the closure of facilities at Pantex and SNL/NM. At LLNL, this would entail the closing of at least Building 812 Complex, Building 850 Complex and Building 851 Complex. The associated support facilities probably would not be impacted by this alternative. At LANL, this would entail the closing of all hydrotesting facilities except those located on TA-15. At TA-15, several of the support facilities would be consolidated into one facility and closure of the idle PHERMEX would continue. At Pantex, at least six outdoor burn areas would be closed. At SNL/NM, at least three outdoor burn areas could be closed if their joint sponsor program, HE R&D, were to concur with a decision from the Hydrotesting Program that these facilities were no longer needed. NTS would maintain operations at BEEF and continue DPE operations at U1a.

Closure of over a dozen facilities would entail a substantial cleanup and D&D effort. Although not heavily contaminated, these facilities all have a substantial amount of reinforced concrete and steel structures designed to withstand sizeable HE explosions. It is estimated that at least 100,000 square feet of hardened concrete and steel structures would have to be dismantled, razed and disposed of.

A.9.2.2 *Consolidation at LANL*

This option integrates all large-scale hydrotesting at the single location of LANL. Since LLNL and NTS both have required capabilities not presently at LANL, this alternative would entail maintaining those facilities presently at LLNL until such time that a new facility which has the capabilities presently at the CFF and Building 801 Complex at LLNL could be constructed. For a description of what such a new facility entails, see Section 3.5.7.1, Building 801 Complex. There are three potential sites at LANL where such a "CFF–like" facility could be constructed. Figure A.9-5 shows these three alternative locations at LANL.

Until such time as these capabilities could be established at LANL, the CFF capabilities at LLNL would have to remain in operation. In addition, it is not anticipated that it would be possible to transfer the capability to conduct experiments requiring very large amounts of HE, presently being conducted at the BEEF, to LANL. Accordingly, under a consolidation of hydrotest capabilities at LANL, the BEEF would still be required to maintain its operational status at NTS and continue DPE operations at U1a.

This alternative would entail a large amount of cleanup and D&D associated with the closure of all hydrotest facilities at LLNL, SNL/NM (based on a joint agreement of the HE R&D Program and the Hydrotesting Program), and Pantex and a substantial number of facilities at LANL. It is estimated that this alternative would entail the closure and clean-up of close to 170,000 gross square feet of hardened concrete and steel structures designed to withstand very large HE explosions.

In this process it would make sense to collocate distant support facilities (storage, staging, and assembly) during the construction of such a facility. The construction of such a facility would involve a two- to three-year process resulting in an 8,000–12,000-square-foot primary structure with two to three smaller support buildings situated on a five to seven acre site.

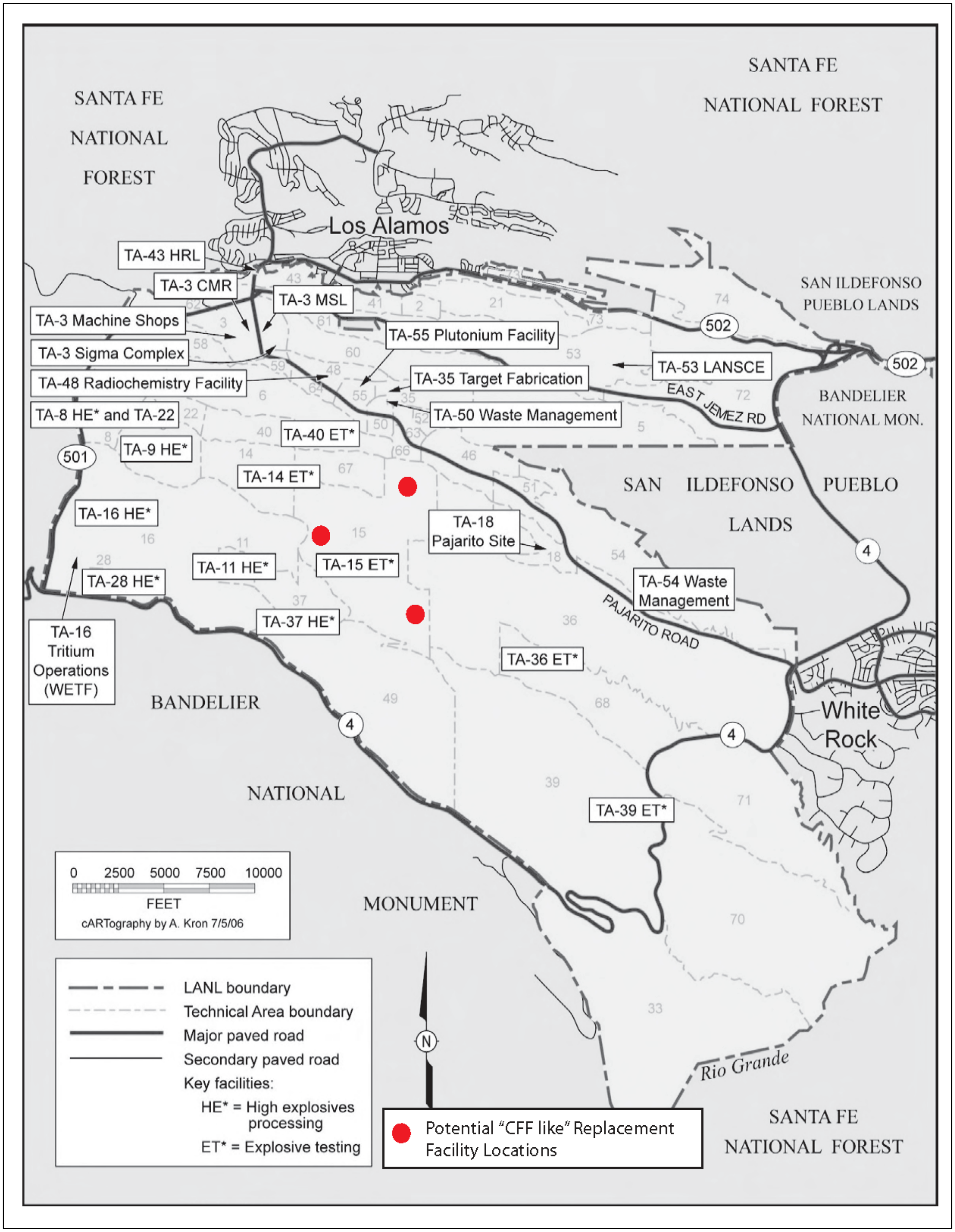


Figure A.9-5—Potential Locations of "CFF-Like" Replacement Facility at LANL

A.9.2.3 *Consolidation at NTS—A Next Generation Alternative*

The next generation hydrodynamic experimental facility would be an improved SNM-capable radiographic facility that would provide for imaging on two or more axes, each with multiple time frame capability, though the number of axes and time frames is still subject to requirements definition and design evolution. The facility would be used to better reveal the evolution of weapon primaries implosion symmetry and boost-cavity formation under normal conditions and in accident scenarios. Due to the nature of the dynamic plutonium experiments and hydrodynamic testing with SNM to be conducted at the facility, the next generation hydrodynamic experimental facility would probably be considered for location at NTS only.

A next generation hydrodynamic experimental facility, either aboveground or underground, would require new building construction and considerable infrastructure (i.e., facilities, equipment, and personnel) in support of test events. Existing infrastructure at NTS might be used to the extent practical. The construction and operational requirements for the next generation hydrodynamic test facility might be greater than that of the DARHT Facility. The impacts associated with construction and operation of facilities based on the different technology approaches could be significantly different. For example, the acreage required could be comparable to or somewhat larger than the nine acres of land resources required for DARHT, but use of proton radiography could require an accelerator comparable in scale to the kilometer-long Los Alamos Neutron Science Center (LANSCE) or to other large accelerators operated by DOE. Based on information on the DARHT Facility, it is estimated that over 250 additional workers would be required for construction and operation of the next generation hydrodynamic test facility. Construction and operation of the next generation hydrodynamic test facility is not anticipated to use large quantities of water. New construction activities would be expected to result in an increase in short-term air emissions. Operation of the next generation hydrodynamic test facility would be expected to have a minimal impact on the air quality considering the impacts projected for DARHT operations. The next generation hydrodynamic test facility would not be expected to impact existing community infrastructure or services in the area; however, depending on the specific design, a proton accelerator could require significant electrical power resources. Waste volumes would not be expected to increase substantially over existing operations at NTS, and waste management associated with dynamic experiments with plutonium at NTS could require additional infrastructure.

In addition to the next generation facility which would be constructed for the consolidation at NTS Alternative, an alternative to also construct a new CFF-like facility at NTS in the 2040 timeframe is also being considered. This facility would be similar to the facility described in the LANL Consolidation Alternative (see Section 3.11.2.2).

A.10 MAJOR ENVIRONMENTAL TEST FACILITIES

Environmental testing supports a primary DOE/NNSA mission of maintaining and demonstrating the safety, reliability and performance of the nation's nuclear weapons systems. The ETFs to support environmental testing are divided into two categories—base ETFs and system ETFs. The base ETFs are those facilities and laboratory scale (or "table-top") items used to evaluate components or subassemblies in the environments defined by the Stockpile-to-Target

Sequence (STS) and the military characteristics requirements for each nuclear weapon in the enduring stockpile. Every laboratory within the DOE/NNSA Complex has some base capability essential for day-to-day operations. The system ETFs are those facilities used to test full-scale weapons systems (with or without SNM or A/D) or those unique major facilities that are applied to development and certification of components, cases, accessories, subsystems, and systems. This SPEIS is focused on the subset of base and system environmental testing facilities, referred to as “major” ETFs that are costly to maintain or have potentially significant environmental impacts. Major ETFs are located at SNL, LANL, LLNL, and NTS.

Section A.10.1 discusses the No Action Alternative, which would continue operations at the existing facilities at SNL, LANL, LLNL, and NTS. Section 3.12.2 discusses an alternative which would downsize facilities in-place. Section 3.12.3 discusses an alternative that would consolidate major ETFs at one site (NTS or SNL), with an option to move the LLNL Building 334 ETF capabilities to Pantex. The analysis of the environmental impacts of the alternatives is contained in Section 5.17.

Major ETF Alternatives

- **No Action.** Maintain status quo at each site. All facilities would be maintained, or upgraded to meet safety and security standards.
- **Reduce-in-place.** No duplication of capability within a given site, but there may be duplication from site to site—phase out aging and unused facilities.
- **Consolidate ETF capabilities at one site (NTS or SNL/NM).** Would entail closings at sites not selected and construction of new facilities if NTS were selected. This alternative also includes an option to move the LLNL Building 334 ETF capabilities and the LLNL Site 300 Building 834 Complex to Pantex.

A.10.1 No Action Alternative

Under the No-Action Alternative, DOE/NNSA would continue to operate the existing ETFs at the current levels of activity. Only those upgrades and maintenance required to allow for the current activities would take place. ETFs are located at three national laboratories (SNL/NM, LANL, and LLNL) and the NTS. It should be noted that ETF laboratories and capabilities also exist at Pantex and SRS. These facilities, however, are not involved in the R&D or weapon system/component design and qualification process, but instead, utilizes ETF capabilities as an integral part of the production/certification process. Without these ETF capabilities, these sites could not complete their mission. Accordingly, they have not been included in this analysis. Table A.10-1 lists the existing ETF facilities at the three DOE/NNSA laboratories and the NTS.

Table A.10-1—ETFs at LANL, LLNL, Sandia, and NTS

Facility	Size (ft^2)
LANL	
K Site Environmental Test Facility	8,452
Weapons Component Test Facility	22,075
Thermo-Conditioning Facility	6,795
PIXY	6,245
Total	**43,567 ft^2**
SNL	
Simulation Tech Lab	56,886
PBFA Saturn and Sphinx	42,052
ACRR and Sandia Pulsed Reactor Facility[1]	13,793
Radiation Metrology Lab`	1,774
Gamma Irradiation Facility	12,514
Low Dose Rate Gamma Irradiation Facility	206
Auxiliary Hot Cell Facility	13,358
Model Validation and System Certification Test Center	18,842
Centrifuge Complex (including outdoor centrifuge)	15,360
Complex Wave Test Facility	3,459
Sled Track Facility	9,368
Light Initiated HE Test Facility	4,138
Aerial Cable Facility and Control Building	6,808
Radiography Building and Nondestructive Test Facility	6,397
Photometrics/Data Acquisition Complex	13,079
Mechanical Shock Facility	6,600
Mobile Guns Complex	2,400
Thermal Test Complex	15,712
Vibration Acoustics and Mass Properties Lab	8,950
Engineered Sciences Experimental Facility	19,416
Component Environmental Test & Advanced Diagnostic Facility	44,091
Electromagnetic/Environmental/Light Strategic Defense Facility	103,185
SNL/CA Environmental Test Complex	65,964
Total	**484,352 ft^2**
LLNL	
Dynamic Testing Facility (836 Complex)	12,913
Building 834 Complex	4,289
Building 834	6,300
Total	**23,502 ft^2**
NTS	
Device Assembly Facility Area (DAF)	4,790
U1a Complex	2,100
Total	**6,890 ft^2**
Complex Total	**558,311 ft^2**

[1] The reactor itself has been moved to NTS

A.10.1.1 *Environmental Test Facilities at LANL*

LANL has four primary ETFs located within three different Tech Areas: 1) The K Site Environmental Test Facility; 2) The Weapons Component Test Facility; 3) The Thermo-conditioning Facility; and 4) The Pulsed Intensive X-Ray Facility with sled track (PIXY) X-Ray

Building with sled track. The K Site is a large complex consisting of 11 major structures and is located on TA-11. The total size of all facilities at the K Site is 8,452 square feet· Both the Weapons Component Test Facility and the Thermo-Conditioning Rest House are located at TA-16. Together, these two facilities total 28,870 square feet. The PIXY facility is a 6,245 square feet facility located on 194 acres at TA-36. In all, the ETF structures at LANL total 43,567 square feet and are operated by a staff of about 30. Figure A.10-1 shows the location of the LANL ETF facilities. A more detailed description of this facility is as follows:

K Site Environmental Test Facility. The K Site Environmental Test Facility consists of 11 separate structures and is located at TA-11. In all, these 11 structures consist of a total of about 8,452 square feet and occupy a total area of about 10 acres. LANL also has a substantial number of closed ETF facilities which are a function of old age and past downsizing programs. These facilities occupy an area of about 50 acres and are in the process of undergoing D&D and being cleaned up. The following is a description of the 11 existing ETF facilities presently operating at the K Site Environmental Test Facility at LANL:

11-0001 Storage Building. This building was built in 1945 and is used for storage of test equipment that is used to support many of the laboratory and field testing done by LANL/ WT-4.

11-0002 Test Building. TA-11-0002 was built in 1945 and is being used for the angular acceleration test apparatus. It contains various data acquisition systems used to support the angular acceleration testing, as well as other various tests that are conducted in building 11-0002. It has been used in the past for the air-bearing currently housed in TA-16-207, as well as other various tests. It is one of three—11-0002, -0003, and -0004—approved bunkers for personnel protection during high hazard test operations.

11-0003 Control Building. TA-11-0003 was built in 1945 and is currently used as the control room for the TA-11 firing site. It was also used as the control room for the drop tower and burn pit described below. There are various data acquisition systems used to support tests conducted at the drop tower, firing site and burn pit. It is one of three—11-0002, -0003, and -0004—approved bunkers for personnel protection during high hazard test operations.

11-0004 Control Room. TA-11-0004 was built in 1945 and is currently used as the control room for the shock and vibration testing conducted in 11-0030. It contains various data acquisition systems used to support shock and vibration testing, as well as other various tests that are conducted in the building 11-0030. There are capabilities in 11-0030 for remote control of shock and vibration testing in 11-0030. It is one of three—11-0002, -0003 and -0004—approved bunkers for personnel protection during high hazard test operations.

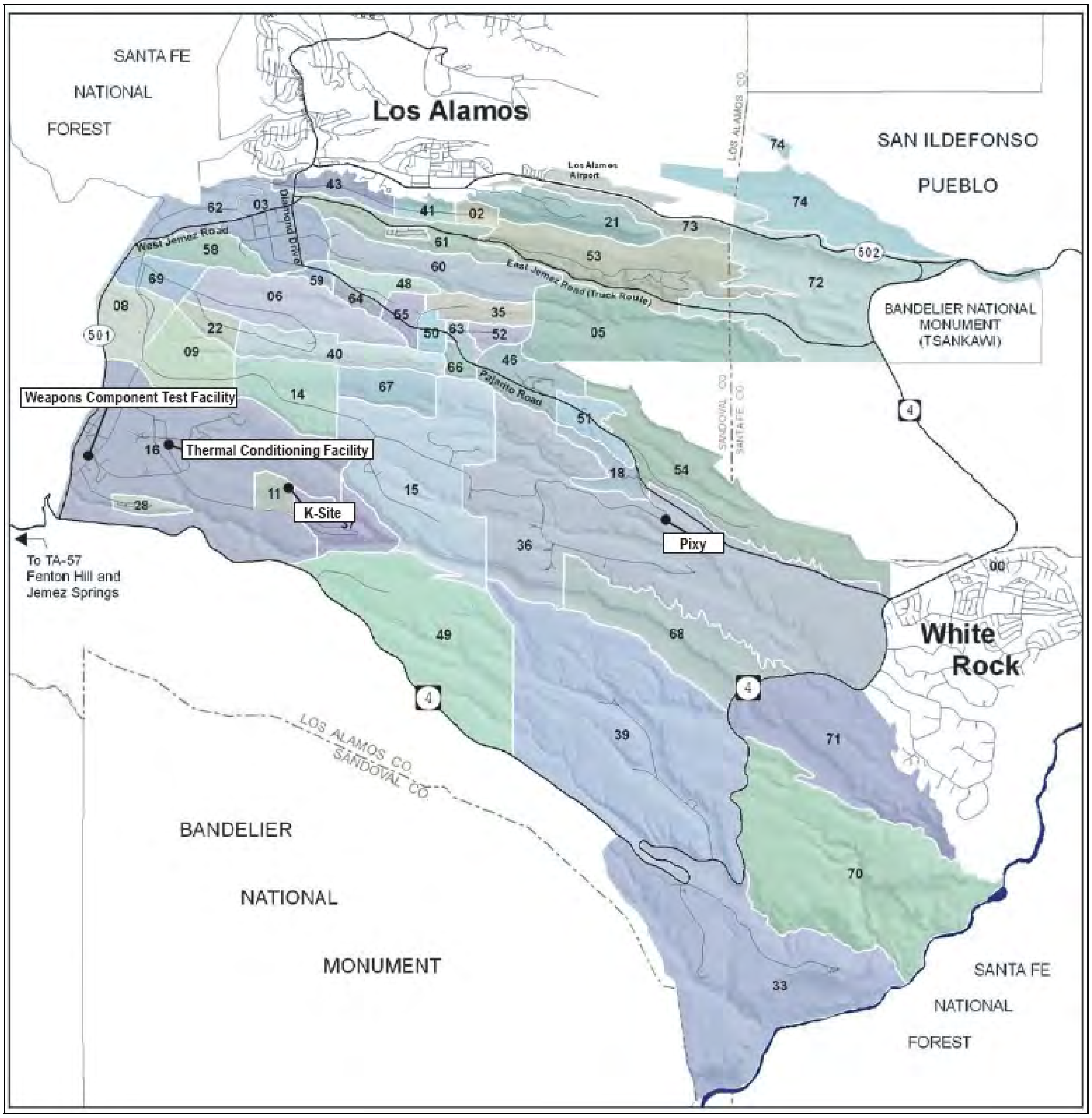


Figure A.10-1—Location of LANL ETFs

11-0024 Office/Shop/Assembly Building. TA-11-0024 was built in 1957 and is currently used an office space for five ETFs, and has housed as many as eight. It is also used as a staging and preparation area for nonhazardous tests. It contains data acquisition systems used to support many tests that are performed by LANL/WT-4. It contains a small staff shop used for basic fixture manufacture and modification.

11-0025 Drop Tower. TA-11-0025 is 165 feet drop tower and was built in the early 1960s. It was used to drop test units from as high as 150 feet. Typical test units included full-up weapons systems, shipping containers as well as other DOE and DoD test units. The drop tower was also used for HE sensitivity test, where HE was dropped from ever-increasing heights until detonation occurred. Acceleration, strain, overpressure and various other data were acquired during testing activities. The drop tower was decommissioned in 2005.

11-0030 Shock and Vibration Test Facility. TA-11-0030 was built in 1957 and now houses the shock and vibration facilities. There are two vibration exciters, an Unholtz-Dickie T-1000 and an Unholtz-Dickie T-4000. These vibration exciters are controlled remotely from 11-0004. Ambient, hot or cold tests can be performed; either alone or in conjunction with shock or vibration on the vibration exciters. 11-0030 also houses a high-g drop machine. This drop machine is approximately 22 feet tall, with a capable drop height of 20 feet. Ambient, hot or cold shock tests can also be performed. TA-11-0030 is also used for free-fall drop testing. Testing with up to 100 pounds of HE can be performed in TA-11-0030

11-0030A Shock and Vibration Amplifier Room. TA-11-0030A houses the power amplifiers used for the Unholtz-Dickie vibration exciters detailed above.

11-0033 Equipment Room. TA-11-33 was built in 1962 and houses an air compressor that supplies house air to TA-11-0030 and TA-11-0030A.

11-0036 HE Magazine. TA-11-0036 was built in 1966 and is a transient HE magazine used for short term storage of HE prior to being used for testing at TA-11-0025.

11-0076. TA-11-0076 was built in about 2004 and is an awning that covers a 2,500-gallon liquid nitrogen Dewar used for thermal testing in TA-11-0030.

Table A.10-2—K Site Environmental Test Facility

	Consumption/Use
Electrical usage	750 KW max
Water usage	1,000,000 GPY
Site size (acres)	10
Building footprint (sq. feet)	8,452
Employment (no. of workers)	3
Total	3
Rad Workers	3
Average Dose to Rad Worker (mrem)	0
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	0
Non-hazardous (yd^3)	0
Emissions	
NAAQS (tons/yr)	No Monitoring
Radionuclide emissions (Ci/yr)	No Monitoring
Hazardous air pollutants (tons/yr)	No Monitoring

Weapons Component Test Facility. The Weapons Component Test Facility is located at TA-16. Originally built in the 1950s, this 22,075 square foot building was completely refurbished in the early 1990s. The facility is located on about an acre and a quarter site and supports nuclear weapons stockpile surveillance by providing high-fidelity testing for explosive valves, the portable high-speed data acquisition systems and test instrumentation, and QC-1 R10 compliant testing. An Advanced Diagnostics capability is housed in 16-0207 to develop, design, fabricate, qualify, field, and analyze new measurement applications. These systems include HE Radio Telemetry and fiber optic sensors. A main focus of this capability is not only flight testing of our weapon systems, but the development of new fiber based measurements for a broader customer base. The measurements capabilities include quasi-static component and miscellaneous laboratory and field testing and data analysis on many different systems and components. The data acquisition systems used are NIST-traceable and meet A2LA requirements and are capable of up to 120 channels of long-term logging and high-speed data collection of up to 1 sample per microsecond.

Table A.10-3—Component Test Facility

	Consumption/Use
Electrical usage	450KW
Water usage (gallons per year)	400,000
Site area (acres)	1.25
Building footprint (square feet)	22,075
Employment (no. of workers)	
Total	24
Rad Workers	18
Average Dose to Rad Worker (mrem)	0
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0.25
Hazardous(yd^3)	0
Non-hazardous (yd^3)	0
Emissions	
NAAQS (tons/yr)	No Monitoring
Radionuclide emissions (Ci/yr)	No Monitoring
Hazardous air pollutants (tons/yr)	No Monitoring

Thermo-Conditioning Facility. Also located at TA-16 is the Thermo-Conditioning Facility. This 6,795 square foot facility, consisting of five structures, is located on about a three-quarter acre site, and houses the thermal conditioning capabilities. The facility consists of a walk-in thermal chamber and a small stand alone thermal chamber. HE and non-HE tests can be performed with up to 500 pounds of HE. There are also tensile test machines that can be used in conjunction with thermal testing.

Table A.10-4—Thermo-Conditioning Facility

	Consumption/Use
Water usage	250,000 GPY
Site area (acres)	.75
Building floor space (square feet)	6,795
Employment (no. of workers)	2
Total	
Rad Workers	2
Average Dose to Rad Worker (mrem)	0
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	0
Non-hazardous (yd^3)	
Emissions	No Monitoring
NAAQS (tons/yr)	No Monitoring

Table A.10-4—Thermo-Conditioning Facility (continued)

	Consumption/Use
Radionuclide emissions (Ci/yr)	No Monitoring
Hazardous air polluants (tons/yr)	0

Pulsed Intense X-Ray (PIXY) Facility with sled track. The PIXY is a world class radiographic facility with a combined sled track and gun range capability. This 6,245 square foot facility, located on a large site of about 194 acres. The x-ray capability of the facility is less than 100-nanosecond pulse and stops all motion, even at hypersonic speeds. The X-Ray penetrates 6 inches of steel and the timing of PIXY and other diagnostics to 3 nanoseconds. The facility is capable of high speed photograph to 2,000,000 frames per second. There are oil storage tanks that support PIXY at this site.

Table A.10-5—Pulsed Intense X-Ray Facility with Sled Track (PIXY)

	Consumption/Use
Water usage	Minimal
Site area (acres)	194
Building and structure footprint(ft^2)	6,245
Employment (no. of workers)	
Total	0
Rad Workers	0
Average Dose to Rad Worker (mrem)	0
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	0
Non-hazardous (yd^3)	0
Emissions	
NAAQS (tons/yr)	0
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

A.10.1.2 *Environmental Test Facilities at LLNL*

As a nuclear weapons design facility, LLNL has been involved with weapons testing virtually since its inception in 1952. However, the construction of large scale environmental testing facilities didn’t begin until the late 1950s and early 1960s. By 1970 there were a total of 37 buildings associated with weapons testing with approximately 48 people assigned to weapons testing activities. Weapons testing at LLNL was at its peak in 1985 with 46 buildings and roughly 55 people working on testing related activities. Today, LLNL’s ETF program consists of seven people operating three facilities consisting of nine operational buildings. These three facilities consist of a total area of 23,502 square feet occupying a total site area of 17.75 acres. There is not a specific and dedicated crew of test technicians or engineers assigned to any of the individual test facilities listed below. Rather, the Weapons Test Group (WTG) that operates the ETF facilities has stewardship to maintain all the facilities and provide support staff to the appropriate building in order to conduct and complete the necessary testing. The WTG has a total of six workers, which provide support over all the facilities listed below. Specifically there are three test technicians and three test engineers. The technicians and engineers rove to each of the buildings on an as-needed basis to perform the required testing. The following is a description of the three LLNL ETF facilities:

Building 334 (Hardened Engineering Test Building). Bulding 334 is a 6,300 square foot facility located on a 2.5-acre site in the Superblock section of the LLNL main site. This facility is often referred to as the Hardened Engineering Test Building (HETB). The building is primarily used for environmental testing of SNM. One half of the building is the Radiation Measurement Facility, including the Intrinsic Radiation (INRAD) Bay, and the other half is the ETF, consisting of the Engineering Test Bay (ETB). The two bays are separated from each other by a thick concrete wall. The HETB is a unique facility within the Nuclear Weapons Complex (NWC). With regard to INRAD measurement testing, it is currently the only building within the NWC that allows intrinsic radiation detection of SNM on configured assemblies (outside of drums or containers) and without significant background radiation present. The INRAD facility supports measurement operations for Nonproliferation, Homeland and International Security Division (NHI), the Accident Response Group (ARG), the Joint Technical Operations Team (JTOT), and radiation detector development work. With regard to environmental testing, Building 334 is currently the only building within the NWC that can facilitate environmental testing of SNM (i.e., pits and secondary assemblies containing SNM). Environmental testing includes vibration, shock, thermal conditioning, or combinations of these environments. Figure A.10-2 shows the location of Building 334 in Superblock, at LLNL.

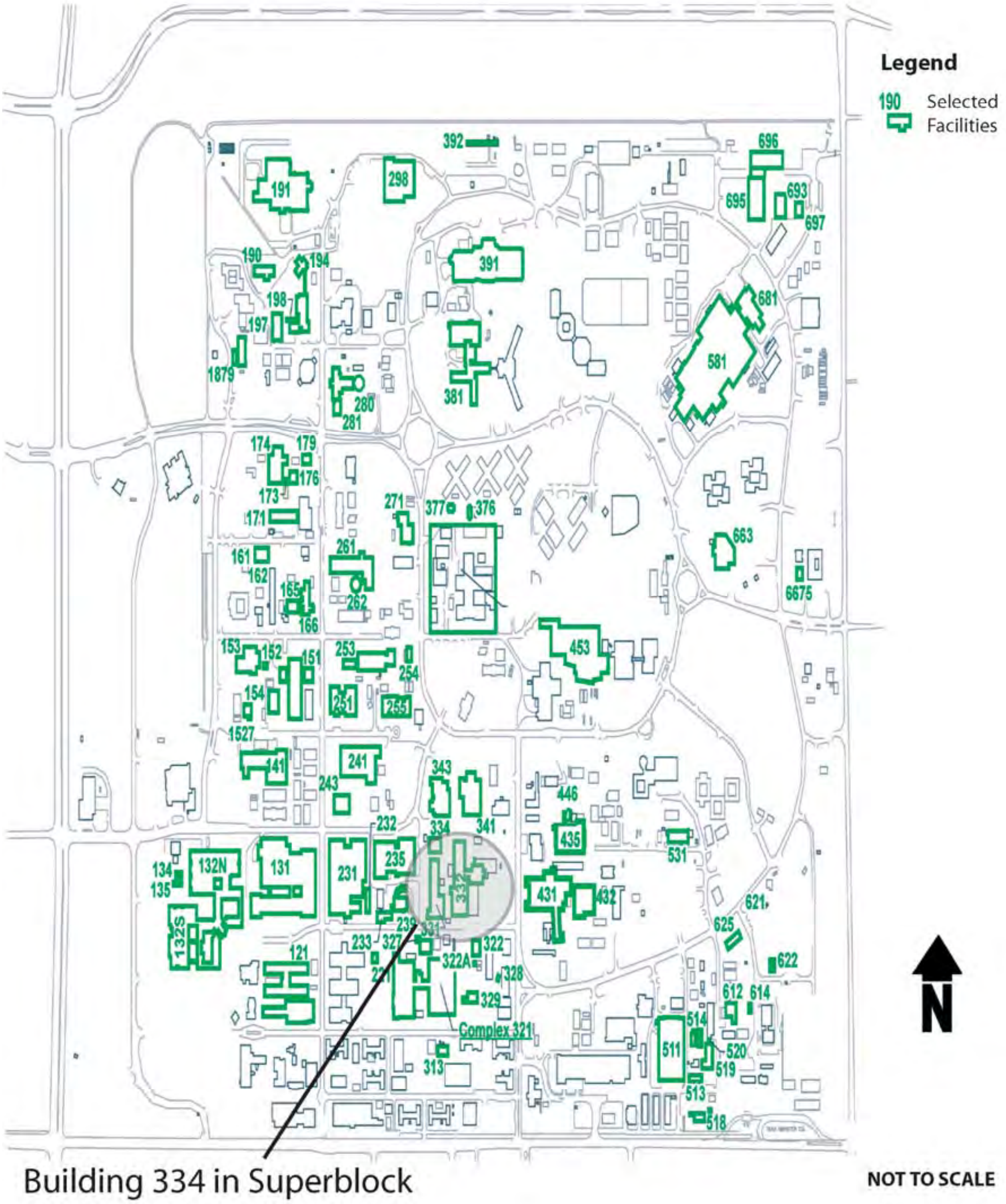


Figure A.10-2—Building 334 in Superblock at LLNL

Table A.10-6—Data Table for Building 334

Date of Construction	June 1985
Type of Building	Reinforced concrete
Building Footprint (ft^2)	6,300
Annual Electrical Energy Use (MWh)	~ 480
Water Requirements (gal per year)	< 2000
Average Steam (tons)	0
Chemical use	~ 0 (incidental use of isopropyl alcohol, standard degreasers, and epoxies
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0.006
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Figure A.10-3—Build. 834 Complex and Build. 836 Complex at Site 300

Building 834 Complex at Site 300. The 834 Complex is comprised of four buildings totaling 4,289 square feet located of an 11.5 acre site in the Site 300 area of LLNL. The facilities located at this complex are used for thermal and humidity testing of weapons components and systems. The original layout had a total of 12 buildings, but through downsizing efforts now only four are used for thermal testing (one control room, two test cells, and one temporary storage magazine). The strength of the test facilities at the 834 Complex is the ability to test large weapon assemblies with large quantities of HE. In addition to testing of HE, the 834 Complex has the authorization basis to test other hazardous materials commonly found in legacy weapon assemblies. Figure A.10-3 shows the location of Building 834 Complex, at Site 300, at LLNL.

Table A.10-7—Data Table for Building 834 Complex

Number of ETF Buildings	4
Date of Construction	June 1960
Type of Building	Reinforce concrete and modular steel framed
Site area (acres)	11.45
Combined Building Square Footage (ft^2) (combined for all 4 buildings)	4,289
Annual Electrical Usage MWh	~ 400
Water Requirements (gal per year)	< 4000
Average Steam (tons)	0
Chemical use	~ 0 (incidental use of isopropyl alcohol, standard degreasers, and epoxies
NAAQS emissions	
CO (tons/yr)	0.0026
NOx (tons/yr)	0.0120
PM10 (tons/yr)	0.0009
SOx (tons/yr)	0.0008
HAPs (tons/yr)	0.0002
POC's (tons/yr)	0.0010
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Building 836 Complex at Site 300. The Building 836 Complex consists of four buildings, with a total size of 12,913 square feet, located of a 3.75-acre site in the Site 300 Area of LLNL. This facility is used for dynamic testing of full-up weapon assemblies containing high explosives or other hazardous materials. The four buildings include: one control room, two test cells, and one storage building. The strength of the test facilities at the 836 Complex is the ability to test large weapon assemblies with large quantities of live HE. The authorization basis also allows for testing of other hazardous materials commonly found in Legacy systems. The types of testing performed in the complex are vibration, shock, spin, jerk, and some impact. The test cells are also capable of providing simultaneous thermal conditioning during testing. Figure A.10-4 shows the location of Building 836 at Site 300, at LLNL.

Figure A.10-4—Building 836 Complex at LLNL

Table A.10-8—Data Table for Building 836 Complex

Number of ETF Buildings	4
Date of Construction	June 1970 (3), June 1982 (1)
Type of Building	Reinforce concrete
Site area (acres	3.75
Combined Building Footprint (sq. ft.) (combined for all 4 buildings)	12,913
Annual Electrical Use (MWh/yr)	~ 450
Average Water Requirements (gal/yr)	< 4000
Average Steam (tons)	0
Chemical use	~ 0 (incidental use of isopropyl alcohol, standard degreasers, and epoxies
NAAQS emissions	
CO (tons/yr)	0.0039
NOx (tons/yr)	0.0182
PM10 (tons/yr)	0.0013
SOx (tons/yr)	0.0012
HAPs (tons/yr)	0.0003
POC’s (tons/yr)	0.0015
Lead (tons/yr)	0
OZONE (tons/yr)	0

A.10.1.3 *Environmental Test Facilities at Sandia National Laboratory*

SNL/NM has 19 major ETF complexes, each with multi-operational capability. These facilities have a combined footprint of 462,390 square feet. These facilities as shown in Figure A.10-5 are briefly described below.

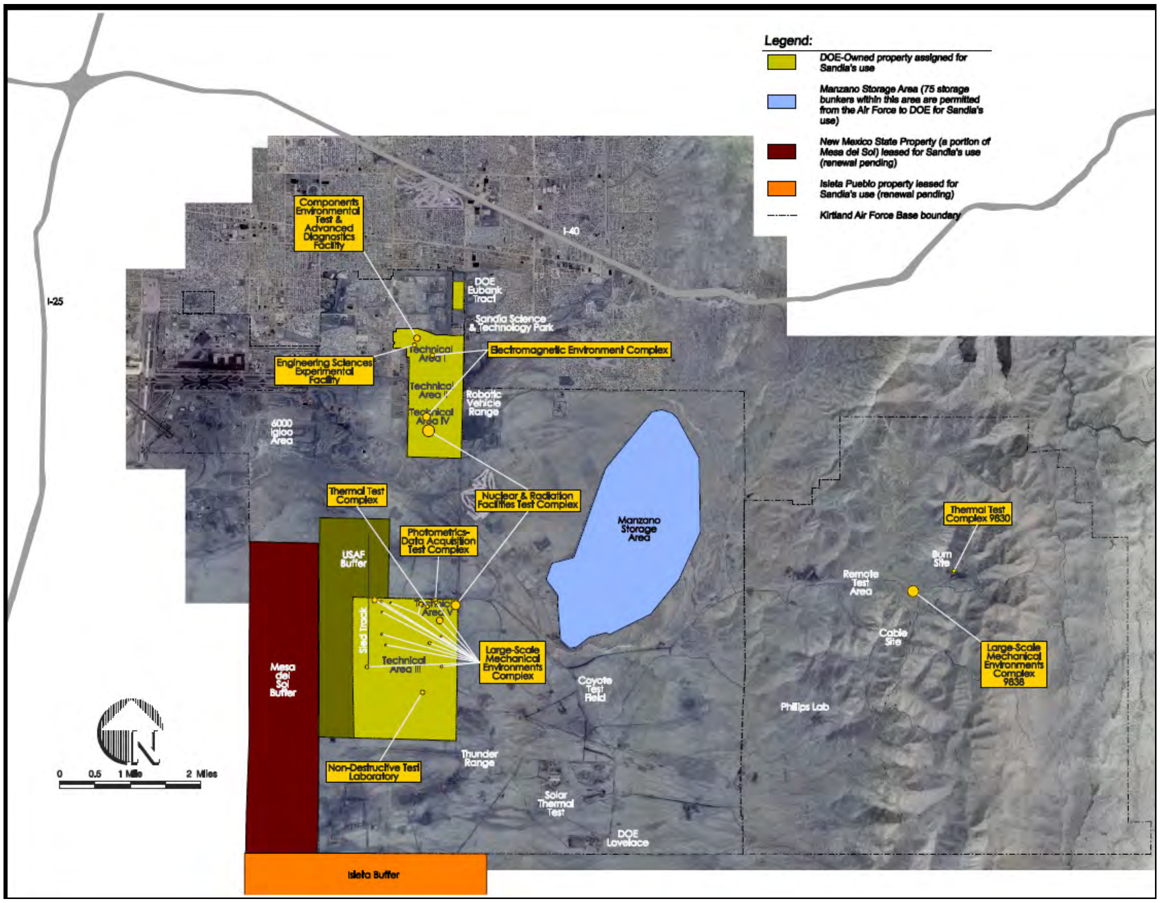


Figure A.10-5—ETF Facilities at SNL/NM

Simulation Tech Lab Hermes III and Repetitive High Energy Pulsed Power. HERMES III is a 56,886 square foot FXR facility located on about 14.5 acres. HERMES III produces high-energy x rays (up to ~20 MeV) by the bremsstrahlung process, providing high spectral and temporal fidelity environments for physical simulation testing to STS prompt gamma radiation requirements. No other U.S. facility can provide these testing capabilities at the subsystem level. Without HERMES III, reentry systems cannot be qualified to STS prompt gamma requirements. The capability is critical for qualifying electronic subsystems. In the large test cell, these bremsstrahlung sources can also stimulate high-fidelity source region electromagnetic pulse (SREMP) environments for nuclear weapon as well as other military system testing. In addition, physical simulation modes utilizing direct deposition of the accelerator's electron beam in experiment objects have been developed and utilized for structural response model development and validation. There are no high-fidelity testing facilities for these responses, and validated models are critical for adequate system qualification.

HERMES III operations are conducted by a crew of 23 that maintains and operates the Saturn, HERMES III, and SPHINX facilities, with certain specialized skills shared amongst the set.

Eight full-time equivalent positions from this crew are associated with HERMES III, with various mechanical and electrical engineering and technician positions along with administrative and ES&H personnel. In addition, the facility relies upon the corporate infrastructure to provide the various areas of ES&H support and Facility Maintenance and Operations Committee (FMOC) maintenance of real property.

Table A.10-9—HERMES III & RHEPP

Site size (acres)	14.4
Building Square Footage (ft^2)	56,886
Electrical Use (MWh per year)	~ 480
Water Requirements (gal/yr)	2000
Average Steam (tons)	0
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0.006
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

PFBA Heavy Lab Saturn and Sphinx. Saturn is designed to produce intense x-ray pulses, providing physical simulation for STS hot and cold x-ray requirements. Saturn can be configured for either bremsstrahlung x-ray sources or plasma radiating sources (PRS).

In bremsstrahlung mode, Saturn simulates hot x-ray environments, producing a broad spectrum of x rays peaking near 50 keV energy, extending up to nearly 2 MeV. The x rays are generated in a 17-nanosecond full width at half maximum (FWHM) pulse providing high spectral and temporal physical simulation (testing) fidelity for hot x-ray requirements for heavily shielded full subsystems such as an arming, fuzing and firing (AF&F) subsystem. No other U.S. facility can provide adequate x-ray environments. Without Saturn, reentry systems cannot be qualified to STS x-ray requirements. Physical simulation (testing) at Saturn is required for system qualification to hot x-ray requirements. In bremsstrahlung mode, Saturn also provides critical physics discovery and model validation data for microelectronics and circuit x-ray response.

In PRS mode, Saturn provides atomic line or combined atomic line/continuum x-ray sources up to 3 keV in energy. There are no U.S. facilities to provide adequate cold or warm x-ray testing environments. Therefore, the PRS sources on Saturn are used to acquire material property data for model development and model validation, including support for system qualification computational simulations.

Saturn operations are conducted by a crew of 23 that maintains and operates the Saturn, HERMES III, and SPHINX facilities, with certain specialized skills shared amongst the set. Fourteen FTE positions from this crew are associated with Saturn, with various mechanical and electrical engineering and technician positions, along with administrative and ES&H personnel. In addition, the facility relies upon the corporate infrastructure to provide the various areas of ES&H utilities, and maintenance of real support.

SPHINX has both bremsstrahlung and direct electron beam deposition modes of operation. Accelerator power is approximately a factor of 250 below that of Saturn. SPHINX provides fast turnaround capability (cycle time, five minutes) for dose-rate studies of microelectronic devices as well as material response research in direct electron beam mode. SPHINX has supported qualification of the W76-1 electronic subsystems as well as the W76-0, W76-1, and W78 neutron generators. SPHINX provides a cost-effective capability for a large volume of experiments that would otherwise be done at significantly more expensive facilities (on a per test item-shot basis) such as Saturn.

SPHINX operations are conducted by a crew of 23 that maintains and operates the Saturn, HERMES III, and SPHINX facilities, with certain specialized skills shared amongst the set. One FTE position from this crew is associated with SPHINX (primarily an electrical/mechanical technician with some administrative and ES&H support). In addition, the facility relies upon the corporate infrastructure to provide the various areas of ES&H support and FMOC maintenance of real property.

Table A.10-10—Saturn and SPHINX

Site area (acres)	2
Building Square Footage (ft^2)	42,052
Electrical Usage (MWh/yr)	450
Average Water Requirements (gal/yr)	1000
Employment	24
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC’s (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0

Table A.10-10—Saturn and SPHINX (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Annular Core Research Reactor (ACCR) and Sandia Pulsed Reactor. The ACCR is a 13,793 square foot facility, which is a critical element in the neutron vulnerability and hardness testing and certification of stockpile weapon systems electronic components (e.g., transistors, integrated circuits), subsystems (e.g., fire sets, neutron generators), and systems (e.g., AF&F system). The ACRR is also a critical element in the hostile environment testing of weapon system physics packages (both primary and secondary) at the full-up system level, as well as material sample tests. In addition, the ACRR performs neutron radiographic nondestructive examinations of weapons systems components (e.g., neutron generators). The Complex Transformation strategy includes the need for a responsive infrastructure to design, develop, and field new weapon systems if needed, and/or repackage current systems. As noted above, the ACRR would be critical to the neutron vulnerability and hardness testing and certification in such cases. Also, the ACRR would be critical to the neutron vulnerability and hardness testing and certification of primary and secondary components and systems for the RRW program.

The ACRR directly subjects the part/device being tested to a neutron (and gamma) irradiation environment that simulates the neutron spectrum anticipated from an endo-atmospheric threat. The environment can be produced over long periods of time (e.g., minutes to hours) in a steady-state operation mode or very short periods of time (10–100 milliseconds) in a pulse-operation mode. The irradiation location is accessible for cables that transmit power/signals to the device being tested, and/or receive operational and diagnostic signals from the device being tested. Under appropriate work controls, the device being tested can even include components which contain explosives that can be detonated while being irradiated. These testing capabilities allow for a customer to determine and/or assess the function, failure, and recovery characteristics of the device being tested within neutron-gamma irradiation test environments that simulate STS threat levels. In addition, the ACRR also has a neutron radiography capability to allow customers to perform nondestructive examination of components to search for small defects or other conditions not otherwise detectable.

The ACRR facility includes a relatively modern control room panel with computer-aided control and diagnostic systems, and a newly installed (2005–2006) heat rejection system for long duration steady-state operations. Aging reactor power monitoring devices are being replaced as time and funding allow.

Table A.10-11—Annular Core Research Reactor and Sandia Pulsed Reactor

Site area (acres)	2
Building Square Footage (ft^2)	13,793
Electrical Usage (MWh/yr)	475
Average Water Requirements (gal/yr)	2000
Employment	42
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC’s (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

The Sandia Pulsed Reactor (SPR) Facility shown in Figure A.10-6 is a 6,099 square foot facility located on about two tenths of an acre, in conjunction with the ACRR. The SPR was a fast-burst reactor used for neutron testing. The SPR directly subjected the part or device being tested to a neutron (and gamma) irradiation environment which simulated the neutron spectrum anticipated from an exo-atmospheric threat. The reactor, itself, as well and the SNM from the SPR, has already been moved to NTS and the facility is not presently in operation.

Figure A.10-6—Sandia Pulsed Reactor

Table A.10-12—Sandia Pulsed Reactor

Site area (acres)	.2
Building Square Footage (ft^2)	6,099
Electrical usage (MWH/yr)	450
Average Water Requirements (gal/yr)	2000
Employees	42
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0

Table A.10-12—Sandia Pulsed Reactor (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Radiation Metrology Laboratory (RML). The RML is a 1,774 square foot facility, which provides measurement of dosimetry for high-dose applications of exposure to neutron and gamma environments (Table A.10-13). This critical capability provides the underpinning for the SNL/NM radiation effects experimental facilities for dose and dose rate measurements. Dosimeter measurements for neutron environments specifically include the fast burst reactors (SNL/NM-SPR, WSMR-FBR), epithermal reactors (ACRR), gamma irradiation environments (Gamma Irradiation Facility [GIF], Low Dose Rate GIF [LDRGIF], HERMES), along with other NNSA test facilities as requested (LANSCE). The RML includes a wide variety of radiation measurement tools, dosimetry, and equipment, including alanine, sulfur, thermoluminescent dosimeter (TLD), alpha spectroscopy, and germanium detectors. The main RML facility is located at SNL/NM TA V, with a satellite laboratory in TA IV to support the pulsed power facilities. All system calibrations are traceable to the National Institute of Standards and Technology (NIST), and measurement procedures follow American Society for Testing Materials (ASTM) international consensus standards.

Table A.10-13—Radiation Metrology Laboratory

Site area (acres)	1
Building Square Footage (ft^2)	1,774
Electrical Usage (MWh/yr) Energy	205
Average Water Requirements (gal/yr)	1000
Employment	3
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
Sox (tons/yr)	0
HAPs (tons/yr)	0
POC’s (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	

Table A.10-13—Radiation Metrology Laboratory (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd^3)	0

Along with radiation effects facility experiment support, the RML provides numerous radiation interrogation techniques for a variety of experiments including: specialty R&D projects in the field of radiation testing and measurements, fuel enrichment confirmations, and flux profile mapping of subcritical experiments. The laboratory also has supported environmental analyses for underground storage, such as confirmation of actinide migration through salt columns and other geologic strata. In past operations, the facility has provided direct support to NTS for underground testing as well as mobile testing support for other NNSA laboratories and universities.

Gamma Irradiation Facility (GIF). The GIF is housed in a 12,514 square foot building. The GIF provides for testing, experimentation and system/component performance when exposed to Co-60 gamma environments. The GIF provides extensive flexibility in both high dose rate and total dose testing to support a wide array of radiation effects and experimental needs. Activities include electronic component hardness, survivability, and certification tests for military and commercial applications, weapon component degradation, radiation effects on material properties, and experiments containing radioactive and strategic nuclear materials testing. Typical experimental customers include radiation damage computer modeling testing, support of Qualification Alternatives to Sandia Pulsed Reactor (QASPR) modeling, and National Aeronautics and Space Administration (NASA) and SNL/NM radiation hardnesstesting for space communications, lasers, and satellite systems. The GIF complements the ACRR facility in that it allows for gamma exposure discrimination to better understand both neutron and gamma damage in radiation environments. The GIF is used to precondition neutron dosimeter transistors used for experimental applications in neutron environments, and organic materials R&D testing in nuclear environment applications.

The facility supports calibration of TLD measurement systems used in support of reactor and pulsed-power machine dose measurements. It has also been utilized for the radiation hardness testing for robotic systems used in nuclear material retrieval devices (i.e., “dirty bombs”). The facility is working with LLNL to determine feasibility of relocating the instrumentation calibration capability from NTS to SNL/NM in support of underground testing, should it be required in the future.

The GIF provides three concrete, dry test cells and a 5.5 meters (approximately 18 feet) deep pool for a variety of gamma irradiation experiments with different test configurations, dose rates, and dose levels. To accommodate these specific irradiation needs for experiments, custom features have been incorporated into the GIF design as follows:

- Configurable radiation sources provide different geometries for the source array (e.g., point, planar, circular).
- Shielded windows allow for experiment observation during irradiation.
- Remote manipulators available to facilitate experiment or source handling.

The in-cell facilities are dry, shielded rooms where irradiations are performed with a high-intensity gamma ray source. Typical irradiations performed in the dry cells are at high dose rates (typically on the order of 3 mrem/hr at >1 m [approximately 3.3 ft] from the source) and for short to intermediate durations lasting up to a few days. The facility also provides for future experimental and testing capabilities that would require the radiation shielding provided by the facility experimental test cells.

For the in-pool testing, radioactive sources are held in a submerged irradiation fixture near the bottom of the 5.5-meter (approximately 18 ft) deep pool of demineralized water. Typical irradiations performed in the pool are at moderate and low dose rates and for long durations lasting days, weeks, or months. Dry experiment canisters, which contain test units, are immersed in the pool and positioned in preset locations in the irradiation fixtures. The fixtures are voided of water to provide an unshielded path between the source and the test unit. The pool can store up to 1.5 mega curies of cobalt-60 ($_{60}$Co). The sources are in the form of pins and can be shared between the in-cell irradiation facilities and the in-pool irradiation facilities.

This Hazard Category 3 facility is operated by a facility supervisor and a facility operator as dedicated staff, as well as system engineers, safety basis analysts, facility maintenance techcnicians, a radiological cotnrol technician, and department management.

Table A.10-14—Gamma Irradiation Facility

Site area (acres)	2
Building Square Footage (ft^2)	12,514
Electrical Usage (MWh/yr) Energy	450
Average Water Requirements (gal/yr)	2000
Employment	4
Rad Workers	4
Avg dose to rad worker	20 mrem/yr
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
Sox (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0

Table A.10-14—Gamma Irradiation Facility (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Low Dose Rate Gamma Irradiation Facility (LDRGIF). The LDRGIF is a 206 square foot facility. The LDRGIF provides the ability to perform Enhanced Low Dose Rate Sensitivity (ELDRS) effect testing to a large number of piece parts for extended periods of time (several years in many cases). The program personnel supported in this application are weapons systems component developers responsible for certifying the reliability of their designs maintained in storage configurations over decades. Additionally, satellite piece parts have been tested to predict device degradation over the lifespan of the program mission. A separate exposure room is equipped with a combination of temperature-controlled ovens and radioactive sources that permit the simultaneous exposure to thermal and gamma radiation environments. Finally, WFO customers, in support of DoD missions, use the facility.

Attractive features of the facility are simplicity of operation, adequate shielding for personnel working in manned spaces, the use of special form sources, low inventories of source materials, security controls for classified components, an existing infrastructure of radiation protection, industrial hygiene (IH), training, maintenance, administrative, and security support.

The facility is operated by a single operator [1 FTE] with approximately 10 percent of an FTE for supervision and management. This radiological facility is supported by approximately 7.5 percent of an FTE.

Figure A.10-7—Low Dose Rate Gamma Irradiation Facility

Table A.10-15—Low Dose Rate Gamma Irradiation Facility

Site area (acres)	.5
Building Square Footage (ft^2)	206
Electrical Usage MWh/yr)	450
Average Water Requirements (gal/yr)	2000
Employement	2
Rad Workers	2
Avg dose to rad worker	20 mrem/yr
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Generation	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0

Table A.10-15—Low Dose Rate Gamma Irradiation Facility (continued)

Waste Generation	
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Auxiliary Hot Cell Facility (AHCF). The AHCF is a 13,358 square foot facility. The AHCF is used for characterizing and repackaging nuclear materials, radioactive materials, and mixed waste materials. The AHCF is designed to allow SNL/NM to safely characterize, treat, and repackage radioactive material for reuse, recycling, or ultimate disposal. It is designed to be operated as either a radiological or Hazard Category 3 nuclear facility, depending on material at risk quantities campaigned within the facility. The facility's main purpose is to support the de-inventory of security category 3 and 4 nuclear materials from SNL/NM. The facility systems provide for remote handling capabilities for existing and future items. SNL/NM has an inventory of legacy nuclear materials that are excess to SNL/NM but not necessarily excess to the DOE Complex. Some of these materials have been designated as "no defined use" (NDU). Current disposition plans specify that some of the materials will ultimately be sent to DOE disposal facilities.

The AHCF also provides short-term storage for radioactive materials and wastes. In addition to handling low-level radioactive material, the AHCF has remote-handling capabilities to allow for the characterization and repackaging of high-level radioactive materials and waste. The AHCF is located in the high-bay area of Building 6597 at SNL/NM. The AHCF consists of three parts: 1) A hot cell with two storage silos in the floor (inside the cell) and access ports in the roof; 2) A work area next to the hot cell with a permanent shield wall, a fume hood, and six storage silos in the floor; and 3) Space for material storage. The building contains remotely operated bridge cranes, hot cell manipulators, and video capability. Six-inch floor silos are available for short-term storage of materials during material campaign processing. The silos are 15 feet deep; four are 9-inch diameter and two are 30-inch diameter. A remote electric chain hoist is used in conjunction with the bridge cranes to introduce material into the hot cell. The hot cell is a 10 feet by 10 feet square, it is lined with stainless steel for ease of decontamination, and it contains a one-ton jib crane.

The AHCF is currently not operational. DOE has not granted authorization for operation because of limitations and concerns in the DSA for the facility. The facility is being planned for use as a radiological facility to handle low quantities of nuclear materials for disposal processing.

Many of the Legacy material packages will require repackaging at the AHCF because of their Hazard Category quantities or because their form requires remote-handling capabilities. These packages contain uranium oxide in various forms, miscellaneous radioactive materials, depleted uranium, experiment packages and scrap parts, metallographic samples, a small quantity of thorium, and several Americium Beryllium sources.

During operations, the facility is staffed with one facility supervisor, two facility technicians, a radiological control technician, and department management. As a Hazard Category 3 nuclear facility, additional support staff include system engineers, safety basis analysts, and facility maintenance techcnicians.

The AHCF is a temporary life facility and is intended to support material removal. Its project length of operation is approximately eight years from initial startup.

Table A.10-16—Auxiliary Hot Cell Facility

Site area (acres)	1.7
Building Square Footage (ft^2)	13,358
Electrical usage (MWh/yr)	450
Average Water Requirements (gal/yr)	2000
Employement	2
Rad Workers	2
Avg dose to rad worker	500 mrem/yr
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC’s (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Large Scale Mechanical Environments Complex. The Large Scale Mechanical Environments Complex is a collection of test facilities used to simulate a wide variety of mechanical environments that a weapon system or subsystem might experience as specified by the STS document. These facilities support development, qualification, and acceptance testing; model validation experiments; and other weapon systems evaluations. The facilities included in this complex for purposes of this EIS are: the Model Validation and System Certification Test Center, Centrifuge Complex, Complex Wave Test Facility, Sled Track Facility, Aerial Cable Test Facility, Radiography Building and NDT Test Facility, Photometrics/Data Acquisition Test

Complex, Mechanical Shock Facility, and Vibration-Acoustics and Mass Properties Facility. In addition to the tests that utilize facilities, open air firing of explosives (>1 Kg) are used to expose nuclear weapon systems and subsystems to shock environments as part of the qualification process for abnormal or hostile environments. These impulses provide loadings to drive structural responses that can be measured and analyzed in conjunction with computational results. These detonations can be used to drive planar pressure waves using blast tubes, spherical pressure waves using a free charge, or high velocity flyer plates for impact studies. These tests are typically conducted in the open area at the sled track facility, but can also be conducted in open areas at other approved facilities in the Large Scale Mechanical Environments Complex such as the aerial cable and burn site facilities. The complex also includes advanced diagnostic capabilities which are used to analyze system response, interpret hardware failures, and to support model validation efforts. The core of this complex is the Model Validation and System Certification Test Center, which supports all of the centrifuge, mechanical shock, rocket sled tracks, radiant heat (part of the thermal test complex), vibration, and complex wave facilities that are remotely located to allow for testing of hazardous items.

Model Validation and System Certification Test Center (MVSCTC). The MVSCTC is located in TA-III and housed in Building 6584. This 18,842 square foot building, located on a 3.5-acre site, supports development, qualification, and acceptance testing; model validation experiments; and evaluation of weapon components and other hardware. In addition to providing an office complex for staff, it contains laboratories that support the development and fielding of advanced diagnostics. The MVSCTC contains a small chemical inventory, but no radioactive materials. The chemicals used are typical cleaners, lubricants, solvents, paints, and adhesives that could typically be found in a light lab setting. The building also houses classified and unclassified computing capabilities, a visualization complex for the interpretation of experimental data, and control capabilities to allow for the remote control of seven experimental capabilities in TA-III. characteristics and site infrastructure requirements of the MVSCTC and are shown in Table A.10-17.

The 29-foot centrifuge supports both the vibrafuge and the superfuge capabilities. These are unique capabilities developed at SNL/NM that allow additional environments (vibration and vibration/spin) to be applied to systems while being spun by the centrifuge.

Table A.10-17—Model Validation and System Certification Test Center

Site area (acres)	3.5
Building Square Footage (ft^2)	18,842
Electrical usage (MWh/yr)	750
Average Water Requirements (gal/yr)	1000
Employement	0
Rad Workers	0
Avg dose to rad worker	0
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0

Table A.10-17—Model Validation and System Certification Test Center (continued)

NAAQS emissions	
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd3)	0
TRU	
Liquid (gal)	0
Solid (yd3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd3)	0
Hazardous	
Liquid (gal)	0
Solid (yd3)	0

Centrifuge Complex. Located in TA III, the Centrifuge Complex consists of an outdoor 35-foot centrifuge with five support buildings and an indoor 29-foot centrifuge with three support buildings. The complex encompasses a total floor space of 15,360 square feet, situated on a site of about four and a half acres. The two centrifuges in this TA III facility generate high-acceleration environments to certify weapons components and systems, satellite systems, guidance systems, and transportation containers. Both the 35-foot (outdoor) and 29-foot (indoor) centrifuges simulate Reentry Vehicle (RV) launch and reentry environments, aircraft maneuvering accelerations, crash and impact decelerations, and other acceleration environments within the STS envelope, and support environmental sensing device testing on bomb and missile systems. The 29-foot centrifuge supports both the vibrafuge and superfuge capabilities. These are unique capabilities developed at SNL/NM that allow additional environments (vibration and vibration/spin) to be applied to systems while being spun by a centrifuge. Four technical personnel operate both centrifuges.

The Centrifuge Complex contains a small chemical inventory but no radioactive materials as shown in Table A.10-19. Cleaners, lubricants, solvents, paints, and agents are used in small quantities. Compressed gases used in the assembly areas include acetylene and oxygen, argon, and helium. Chemical emissions, including alcohols, ketones, and other solvents, are associated with various aspects of surface preparation, cleaning, and material processing, including quality control. Small amounts of airborne emissions, including carbon monoxide and lead, are released during explosives tests. Radioactive air emissions are not produced at this facility. Noise from centrifuge operation, collision impacts, and explosive testing does occur. Fragments resulting from centrifuge-launched explosives are recovered shortly after test events.

Table A.10-18—Centrifuge Complex

Site area (acres)	4.5
Building Square Footage (ft^2)	15,360
Electrical Usage (MWh/yr)Energy	750
Average Water Requirements (gal/yr)	2000

Table A.10-18—Centrifuge Complex (continued)

Employement	10
Rad Workers	0
Avg dose to rad worker	0
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd3)	0
Hazardous	
Liquid (gal)	0
Solid (yd3)	0

The 29-foot centrifuge (Figure A.10-8) generates high-acceleration environments to certify weapons components and systems, satellite systems, guidance systems and transportation containers. There are no radioactive materials at this facility, only cleaning and degreasing chemicals are used at this facility.

Figure A.10-8—29-Foot Centrifuge

Table A.10-19—29-Foot Centrifuge

Site area (acres)	2
Building Square Footage (ft^2)	12,671
Electrical Usage (MWh/yr)Energy	750
Average Water Requirements (gal/yr)	2000
Employment	10
Rad Workers	0
Avg dose to rad worker	0
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
Sox (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
OZONE (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0

Table A.10-19—29-Foot Centrifuge (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	0
Solid (yd^3)	0

Complex Wave Test Facility. The Complex Wave Facility, located in Building 6610 in TA-III, is a 3,459 square foot facility located on a little more than a half acre site. This facility supports development, qualification, and acceptance testing of weapon systems for normal shock and vibration environments. The facility can be operated remotely, which enables testing of systems that include hazardous and explosives materials. The electrodynamics shakers, control systems, and data acquisition systems are located within a vault-type room (VTR), which simplifies logistics associated with testing of classified articles. Characteristics and site infrastructure requirements of the Complex Wave Test Facility are shown in Table A.10-20.

Building 6610 has the highest force-rated shakers at SNL/NM and is used extensively for system-level tests of full-scale assemblies or items requiring high vibration levels. For fast and efficient setup, two UD T4000 electrodynamic shakers have been dedicated for vertical and horizontal testing, respectively. The facility has state-of-the-art control and data acquisition systems, allowing for up to 200 channels of data sampled at 102 kilohertz.

Controlled dynamic simulations are performed on test articles ranging from small subsystem components to full-scale assemblies. Tests include random vibration, shock on shakers, sinusoidal vibration, mixed-mode vibration, tracked resonant dwells, and combined temperature and vibration. Recent testing has included weapons, satellite subsystems, rockets and payloads, reentry vehicles, and shipping configurations.

Table A.10-20—Complex Wave Test Facility

Site area (acres)	0.5
Building Square Footage (ft^2)	3,459
Electrical usage (MWh/yr)	750
Average Water Requirements (gal/yr)	1000
Employement	1
Rad Workers	1
Avg dose to rad worker	20 mrem/yr
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
Sox (tons/yr)	0
HAPs (tons/yr)	0
POC's (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0

Table A.10-20—Complex Wave Test Facility (continued)

Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd^3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0

Light Initiated High Explosive (LIHE) Facility. The LIHE Facility is a 4,138 square foot facility located on a little more than a two acre site. The primary purpose of the SNL/NM LIHE facility is to simulate cold x-ray-induced shock loading from an exo-atmospheric nuclear blast, primarily investigating structural response. This one-of-a-kind facility and technique can induce load levels in varying distribution (such as cosine distributions), including load discontinuities. The facility accomplishes this testing by the remote-controlled spray application of a sensitive primary explosive onto the surface of complex structural shapes. The explosive is simultaneously detonated over the sprayed surface by exposing it to an intense flash of light generated by 40 kilovolts to 208 kiloJoules capacitor bank. An emerging technology at the LIHE facility is to drive a thin metallic flyer plate with the silver acetylide-silver nitrate (SASN) explosive. Targets of various geometries, such as flats, rings, cylinders, cones, and RVs can be impacted with representative impulse distributions as well as varying pressure pulse profiles. The LIHE facility is chartered by SNL/NM in concurrence with DOE/NNSA to: 1) Establish and maintain the LIHE impulse testing capability at SNL/NM; 2) Maintain the LIHE facility to modern operating standards; 3) Support the development and qualification testing of nuclear weapons for DOE/NNSA; and 4) Provide test data for use in validation of computer models developed for the Stockpile Stewardship Program.

The LIHE facility operated continually from 1971 to 1992, when it was mothballed at the end of the Cold War. In 2001, a decision was made to reconstitute the cold x-ray impulse test capability at SNL/NM by restoring the facility to its prior capabilities. Because of the onsite New Mexico Environmental Department permitted Thermal Treatment Facility, where excess explosive and explosive contaminated materials are treated, the restoration of the LIHE facility was constrained to its original location at Building 6715 in TA-III. During the time between mothball and restart, the physical condition of 6715 deteriorated to the point that a full renovation of the building was required. Characteristics and site infrastructure requirements of the LIHE Facility are shown in Table A.10-21.

Table A.10-21—Light Initiated High Explosive Facility

	Consumption/Use
Electrical usage(KW/yr)	550
Water usage(gal/yr)	2,000
Site area (acres)	2
Total building square footage	4,138

Table A.10-21—Light Initiated High Explosive Facility (continued)

Employment (no. of workers)	
Total	6
Rad Workers	
Average Dose to Rad Worker (mrem)	
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	0
Non-hazardous (yd^3)	0
Emissions	
NAAQS (tons/yr)	0
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

Sled Track Facility. The 10,000-foot sled track is on a 1,941 acre site consisting of 16 support buildings located in TA-III. The support buildings include observation towers, storage sheds, transformer pads, a total of about 9,368 square feet of buildings. This facility supports weapons system qualification testing and weapons development efforts that must simulate penetration, flight, high-acceleration, and high-shock environments. The simulated environment may be provided through impact, reverse ballistic, or ejection testing. This testing includes shock/laydown tests for bombs, sled ejection tests to verify parachute and laydown performance, impact tests on transportation and container systems, impact fuze tests for reentry vehicles, and a variety of other DOE and DoD system tests that require high-speed impacts.

In addition to tests using the sled track, open air explosive firings greater than one kilogram are used to expose nuclear weapon systems and subsystems to shock environments as part of the qualification process for abnormal or hostile environments. These impulses provide loadings to drive structural responses which can be measured and analyzed in conjunction with computational results. These detonations can be used to drive planar pressure waves using blast tubes, spherical pressure waves using a free charge, or high velocity flyer plates for impact studies. These tests are typically conducted in the open area at the sled track facility, but can also be conducted at other approved facilities in the Large Scale Mechanical Environments Complex such as the aerial cable and burn site facilities.

Small amounts of chemicals are maintained for use in assembling rocket sleds and test payloads in buildings 6741, 6743, and 6736. These include various adhesives and epoxies used to fasten transducers and similar items. Cleaners, lubricants, solvents, paints, and other such agents may also be used in small quantities. Compressed gases are used in the assembly areas, including acetylene and oxygen (for welding), argon, and helium; and dry nitrogen and carbon dioxide are used for pneumatic actuators. Characteristics and site infrastructure requirements of the Sled Track Facility are shown in Table A.10-22.

Table A.10-22—Sled Track Facility

	Consumption/Use
Electrical usage (KW/yr)	550
Water usage(gal/yr)	2,000
Plant footprint (acres)	1,941
Total building square footage	9,368

Table A.10-22—Sled Track Facility (continued)

Employment (no. of workers)	
Total	0
Rad Workers	
Average Dose to Rad Worker (mrem)	
Waste Generation	
TRU (yd^3)	
Low Level(yd^3)	
Hazardous(yd^3)	
Non-hazardous (yd^3)	
Emissions	
NAAQS (tons/yr)	
Radionuclide emissions (Ci/yr)	
Hazardous air pollutants (tons/yr)	

Figure A.10-9— Sled Track Facility

Aerial Cable Test Facility. The Aerial Cable Test Facility, located in the Coyote Test Field, is a 5,022 square foot facility, consisting of three structures located on about a 2.5-acre site. This facility performs gravity drop and accelerated pull-down tests in support of bomb qualification tests and weapons development activities. This test capability provides controlled simulations of the worst-case impact environments experienced by weapons systems and shipping containers. Gravity drop tests are performed from a cable suspended between two peaks, giving up to a 600-foot vertical distance for acceleration. A rocket-assisted (320-foot sled track) pull-down technique is used to provide higher impact velocities when gravity tests are not adequate. Characteristics and site infrastructure requirements of the Aerial Cable Test Facility are shown in Table A.10-23.

Operations require the use of a variety of chemicals (corrosives, solvents, organics, and inorganics) in gaseous, liquid, and solid forms, in relatively small quantities. No radioactive emissions are routinely produced at this facility. Compressed gases used in the assembly areas include acetylene and oxygen, argon, and helium. There are some chemical emissions, including alcohols, ketones, and other solvents. Small amounts of airborne emissions, including carbon monoxide and lead, are released during explosives tests. Operations associated with preparation of test payloads, fixtures, and rocket sleds involve machining that generates residues, bonding of parts with epoxies, cleaning of parts, and wiping of excess materials.

Table A.10-23—Aerial Cable Test Facility

	Consumption/Use
Electrical usage (KW/yr)	400
Water usage(gal/yr)	2,400
Site area (acres)	2.5
Total building square footage	6,808

Radiography Building and Non-Destructive Test Facility. The Non-Destructive Test Laboratory is a two-building facility, 6635 and 6639, with a total floor space of 6,397 square feet, located on about a 7.5-acre site. The purpose of this facility is to allow the radiographic inspection of full weapon systems that contain HE and/or rad materials. These inspections are often necessary to determine the state of the weapon prior to testing in the large-scale facilities in TA-III. After testing, it is required to inspect the system prior to shipping to assure that the mechanisms have remained in a safe position. The high-energy capabilities of the facility allow for imaging through numerous layers of materials or thick sections. In addition to its primary function, the facility has also been used to evaluate other items such as solid rocket motors and recovered waste drums to quantify the contents to determine if the drums can be processed without further evaluation. Characteristics and site infrastructure requirements of the Radiography Building and Non-Destructive Test Facility are shown in Table A.10-24.

Table A.10-24—Radiography Building and Non-Destructive Test Facility

	Consumption/Use
Electrical usage (KW/yr)	400
Water usage (gal/yr)	2,400
Site area (acres)	7.5
Total building square footage	6,397
Employment (no. of workers)	
Total	6
Rad Workers	0

Photometrics/Data Acquisition Test Complex. The Photometrics/Data Acquisition Test Complex, consists of a 1.2-acre site, a 13,079 square foot building which houses photometric cameras, a collection of mobile data acquisition systems, and two mobile laser trackers. Personnel use high speed digital and film cameras to quantify the performance of test articles subjected to a range of test environments. Typical measurements include velocity, acceleration, angle of attack, and impact angle. The photo results are used to verify the applied boundary and initial conditions in a test, to quantify the response of the test unit to the applied stimulus, and to assist in the development and validation of models for use in our computational simulation tools. At the end of the day, the core of any major experiment is the quality of the data obtained. The capability to obtain time-accurate and spatially resolved information is critical to the qualification of weapon systems and for the development of mathematical models.

Laser Tracker II and III represent unique national assets that provide TSPI and photographic coverage currently unavailable by other means. Historically, the trackers (and slaved video data acquisition) have been used to collect data during rocket sled tests, missile firings, weapon development tests and aerial cable pull-downs. The trackers have supported every major Sandia weapon development program, along with significant work for the DoD. The laser trackers routinely track missiles, rocket sleds, smart munitions, parachute systems, aircraft, and other test items. Test-item ranges up to 25,000 feet and velocities up to 20,000 feet per second can be accommodated with a single tracker system. For trajectories that range beyond 25,000 feet, both trackers can be used in tandem. Under good atmospheric conditions, test ranges up to 50,000 feet can be provided. Targets with speeds up to 6,000 feet per second can be acquired on the fly. Current laser tracker capabilities include:

- Azimuth and elevation pointing accuracy of +/-13 microradians;
- Maximum slew rates of 10 radians/second;
- Maximum accelerations of 150 radians/second/second; and
- Trajectory data rate of 1,000 Hz real-time data to disk.

The mobile instrument unit (MIU) and the mobile instrumentation data acquisition system (MIDAS) are used to record accelerations, pressures, and temperatures with transducers that are hardwired to a test unit that may be positioned in a remote location.

SNL has a host of cameras to choose from to capture photometric information. These capabilities are essential given the variety and types of experiments performed in TA-III. These include infrared cameras, high-speed digital cameras (color and black-and-white), high-speed film, digital still cameras, and other specialized equipment such as streak and framing cameras.

Characteristics and site infrastructure requirements of the Photometrics/Data Acquisition Test Complex are shown in Table A.10-25.

Figure A.10-10—Mobile Laser Tracker

Figure A.10-11—Mobile Instrument Unit

Table A.10-25—Photometrics/Data Acquisition Complex

	Consumption/Use
Electrical usage (KW/yr)	0
Water usage (gal/yr)	0
Plant footprint (acres)	1.2
Total building square footage	13,079
Employment (no. of workers)	
Total	0
Rad Workers	0
Average Dose to Rad Worker (mrem)	0
Waste Generation	0
TRU (yd^3)	0
Low Level (yd^3)	0
Hazardous (yd^3)	0
Nan-hazardous (yd^3)	0
Emissions	
NAAQS (tons/yr)	0
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

Mechanical Shock Facility. The Mechanical Shock Facility, located in TA-III and housed in Building 6570, is a 6,600 square foot facility. The facility provides controlled impact and shock environments to support subsystem- and component-level development and qualification testing and to model development and validation activities. This facility houses two horizontal pneumatic actuators (18 inch and 12 inch) and their associated sled tracks (95 feet and 75 feet, respectively) (Figure A.10-12) and two bungee-assisted vertical shock machines. Each actuator can support sled and reverse ballistic speeds up to 250 feet per second. Characteristics and site infrastructure requirements of the Mechanical Shock Facility are shown in Table A.10-26.

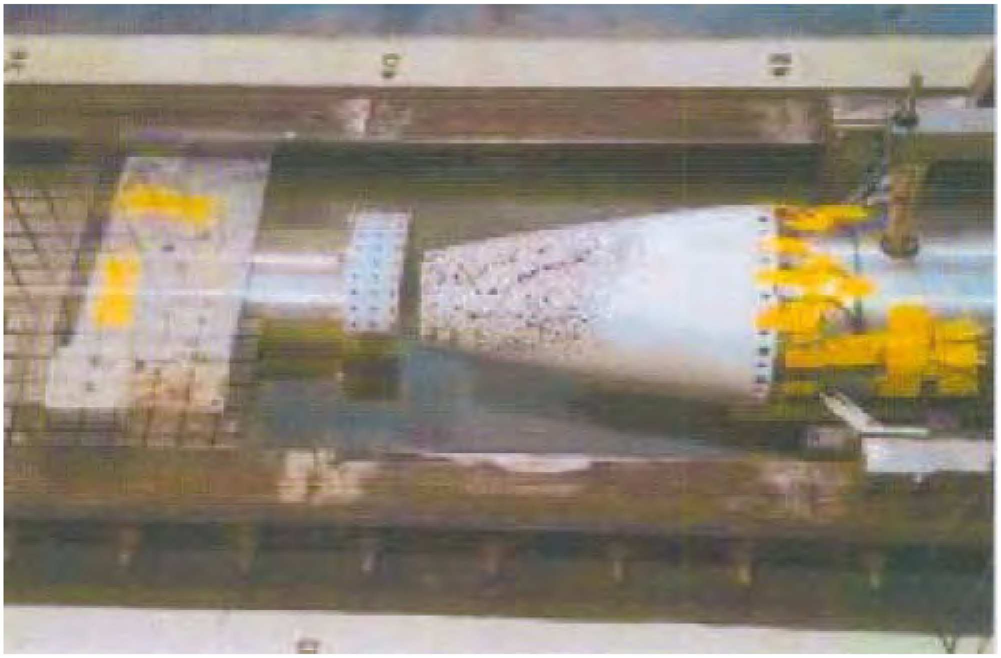


Figure A.10-12—Mechanical Shock Facility Pneumonic Actuator and Sled Track

Table A.10-26—Mechanical Shock Facility

	Consumption/Use
Site area (acres)	
Building Square Footage (ft^2)	6,600
Electrical Usage (MWh/yr) Energy	
Average Water Requirements (gal/yr)	
Employment	
Rad Workers	
Avg dose to rad worker	
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POCs (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd^3)	0
TRU	
Liquid (gal)	0
Solid (yd3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0

Vibration-Acoustics and Mass Properties Facility. The Vibration-Acoustics and Mass Properties Facility, located in TA-III and housed in Building 6560, is an 8,950 square foot facility. The large-scale vibration-acoustics facility also houses mass properties operations, providing system-level vibration and shock environment testing capabilities to certify weapons systems (bombs, missile warheads, and reentry systems) to the normal STS environment specifications and to support model development and validation activities. These environmental requirements include transportation, launch, flight, and reentry shock and vibration simulations on full-scale weapons systems. The test capabilities include normal shock and vibration, combined vibration and acoustics, and combined thermal and vibration environments The Mass Properties Facility provides capabilities to completely characterize the mass properties (weight, center of gravity, moments of inertia, and products of inertia) of full weapon systems.

All of the capabilities have the option of being operated and monitored remotely for tests involving HE or other hazardous materials. Recent improvements have included converting the building into a limited area and creating a VTR in the mass properties high bay.

Characteristics and site infrastructure requirements of the Mechanical Shock Facility are shown in Table A.10-27.

Figure A.10-13—Vibration-Acoustics and Mass Properties Facility

Table A.10-27—Vibration-Acoustics and Mass Properties Facility

	Consumption/Use
Site area (acres)	
Building Square Footage (ft2)	8,950
Electrical Usage (MWh/yr) Energy	
Average Water Requirements (gal/yr)	
Employment	
Rad Workers	
Avg dose to rad worker	
Chemical use	
NAAQS emissions	
CO (tons/yr)	0
NOx (tons/yr)	0
PM10 (tons/yr)	0
SOx (tons/yr)	0
HAPs (tons/yr)	0
POCs (tons/yr)	0
Lead (tons/yr)	0
Ozone (tons/yr)	0
Waste Category (accumulated quantities from 2002 to 2006)	
Low level	
Liquid (gal)	0
Solid (yd3)	0
TRU	
Liquid (gal)	0
Solid (yd3)	0
HLW/Spent Fuel	
Liquid (gal)	0
Solid (yd3)	0
Hazardous	
Liquid (gal)	0
Solid (yd3)	0

Mobile Guns Complex. The Mobile Gun Complex (Figure A.10-14) is a large multi-acre facility with no permanent buildings. The Mobile Gun Complex consists of three Davis guns and one gas gun. The Davis guns are smooth-bored guns in 8-, 12-, and 16-inch diameters, mounted on mobile carriers. These barrels are open at both ends and employ a moving mass recoil system. This recoil system allows the guns to be trailer mounted and mobile. The 8- and 12-inch barrels are interchangeable on the same trailer, while the 16-inch gun has a dedicated trailer. Each Davis gun trailer includes a hydraulic power unit, a winch for hoisting the load into the barrel, and the hydraulic cylinders necessary to elevate the barrel and operate the stabilizers. The gas gun is a six-inch diameter gun. It is also trailer mounted for mobility. It contains an onboard compressor and two air storage tanks with a capacity of 27 cubic feet each. These tanks are fed directly by the compressor and are capable of storing compressed air up to 5000 psi. These storage tanks feed the firing chamber, which is 7.2 cubic feet. All guns are hinged to allow firing angles from horizontal to vertical. Characteristics and site infrastructure requirements of the Mobile Guns Complex are shown in Table A.10-28.

The guns have limitations on the size and weight of the projectiles they can deliver. The 16-inch guns can achieve a launch velocity of approximately 1,200 feet per second for a 2,000-pound, 16-inch projectile, including sabot and pusher plate assemblies. The maximum weight of a gas gun projectile/sabot assembly is approximately 120 pounds for similar impact velocities.

These mobile guns are unique in that they provide a capability for component (fuze), subsystem, or full-scale penetration testing into in situ target materials (limestone, granite, layered geologies, etc.) in addition to engineered targets. The mobile guns provide a controlled environment for Hi-G impact conditions (velocity, angle of obliquity, angle of attack, etc.) along with high-fidelity photometric coverage or other off-board measurements. These unique capabilities provide cost-effective alternatives for risk mitigation, qualification, and failure investigations to sled or flight testing.

The mobile guns primarily provide support to penetrating weapons programs for DoD and DOE. The guns are also used in support of other Federal agencies, including the Japanese Lunar A space program. Recently, DoD has performed more full-scale testing with the Davis guns, while DOE programs have utilized the gas gun for component qualification and acceptance testing. SNL/NM maintains a capability for full-scale testing of its NW Penetrator, the B61-Mod11 test with the Davis guns. There are no permanent structures, and the guns are mobile. Seven staff are required to manage and operate this program.

Figure A.10-14—Mobile Guns Complex

Table A.10-28—Mobile Gun Complex

	Consumption/Use
Electrical usage	400
Water usage (gal/yr)	2,000
Site area (acres)	1
Total building square footage	2,400
Employment (no. of workers)	
Total	7
Rad Workers	0
Average Dose to Worker (mrem)	
Waste Generation	
TRU (yd^3)	
Low Level(yd^3)	
Hazardous(yd^3)	
Non-hazardous (yd^3)	
Emissions	
NAAQS (tons/yr)	
Radionuclide emissions (Ci/yr)	
Hazardous air pollutants (tons/yr)	

Thermal Test Complex (TTC). The TTC is a four-building complex, with a total floor space of 15,712 square feet, located on a 10-acre facility in TA-III. This facility demonstrates through testing that the nuclear weapon stockpile is safe from inadvertent nuclear detonation in abnormal thermal environments. All weapons systems, as part of the weapons design, qualification, and initial certification process, have to demonstrate that they fail safely in fire environments. TTC contains the test facilities, diagnostics, and highly trained personnel to perform such qualification work. Characteristics and site infrastructure requirements of the TTC are shown in Table A.10-29.

Numerous risk assessments have demonstrated that fire, either alone or in combination with other environments, is a dominant contributor to risk. During accidents, fire occurs frequently when in the presence of fuels, such as are common in transportation modes. Further, fire presents a severe thermal threat to weapon systems. They are not intended to survive, but they must safely fail.

Computational advancements in the coming decades will improve ability to cost effectively test weapons systems as part of design, qualification, and certification but will not replace testing for at least another century. It must be shown that the weapon system maintains a positive safety margin throughout a failure transient so pervasive that the system is rendered irreversibly inoperable. Failure is atomistic in nature and the length scale range is beyond scientific prediction until computational machines become many orders of magnitude larger. On the other hand, engineering prediction has become an invaluable design-of-experiment tool and is considered an indispensable part of the testing process. Cost-effective testing is not possible without computational modeling.

Historically, it has not been necessary to conduct abnormal thermal environment testing with SNM. Acceptable measurement and computational methods exist for making the extrapolation from test articles without SNM. There is no evidence to suggest that the future will force a change in what has been accepted historically in this regard. If anything, it can be expected that advancements in computing will only solidify the testing basis without SNM.

Weapon system owners use the TTC during all phases of design and initial qualification. It is also used to address significant findings and for nonroutine testing to support the technical basis for annual assessments. Testing includes safety critical components such as capacitors, subsystems, fire sets, and full-up systems. The facility includes multiple environment capability. Examples include ovens and humidity chambers for prepping hardware, test bays for evaluating thermal properties of materials such as thermal diffusivity, and test chambers for fire environments. Fire environments can be cost effectively simulated electrically using radiant heat panels as is often done during the design phase. Fires can be created with gaseous or liquid fuels up to 20 MW.

The TTC consists of Fire Laboratory for the Accreditation of Models and Experiments (FLAME), Cross-wind Test Fire Facility (XTF), radiant heat cells, laboratories, and an outdoor test site in Lurance Canyon for larger, open fires. The FLAME and the XTF were designed with optical access for advanced optical diagnostics to further the multidisciplinary sciences underlying turbulent reacting flow as part of the goal to make fire models more predictive. In addition to weapon system owners, other nuclear weapons users include the computational model developers. The test facilities within the TTC are unique in the world in that they were specifically designed (by CFD fire models) to provide controlled, reproducible boundary conditions necessary to validate fire and thermal response models. The TTC is operated by a staff of twelve.

Table A.10-29—Thermal Test Complex

Electrical usage (MWh/yr)	5.6
Water usage (gal/yr)	4,000
Plant footprint (acres)	10

Table A.10-29—Thermal Test Complex (continued)

Total building square footage	15,712
Employment (no. of workers)	
Total	12

Electromagnetic/Environmental/Lighting, Strategic Defense Facility. The Electromagnetic Environs Complex consists of three buildings located on approximately 19.5 acres. This 103,185 total square foot facility consists of the following capabilities: Mode-Stirred and Anechoic Chambers—The Mode-Stirred and Anechoic Chambers are used alone or in combination for Radio Frequency (RF) measurements. The Mode-Stirred Chamber provides a reverberant environment in which electromagnetic fields are statistically uniform, providing 360-degree, homogeneous coverage of test items in a single test run regardless of test item orientation. The Anechoic Chamber simulates a free-field environment where test items are illuminated in a directional manner dependent on the source antenna. Both types of testing have their advantages and disadvantages, but the combination supports the strengths of both. In addition, testing in these chambers can be done at 220 megahertz (MHz) and above. The combination of these chambers with the Electromagnetic Environments Simulator (EMES) in TA-I (250 MHz and below) allows for electromagnetic characterization over a very broad frequency range.

Electromagnetic Environments Simulator (EMES). EMES is a building-sized Transverse Electromagnetic (TEM) cell, which supports electromagnetic plane wave illumination of test objects. Two electromagnetic (EM) sources are used at the facility, low-frequency Electromagnetic Radiation (EMR) and an Electromagnetic Pulse (EMP) simulator. The TEM cell structure can theoretically support frequencies as low as DC (or 0 hertz [Hz]); however, the current amplifier at the facility can be used from 100 kHz to 250 MHz. This gives good low-frequency coverage to support higher frequency measurements in the Mode-Stirred and Anechoic Chambers in TA-IV. The EMP simulator design is based on Mil-Std 2169B requirements and is unique in its fast-rise-time pulse combined with a large range of electric field amplitudes that can be generated.

EMES supports a portion of the frequency range of nuclear-weapon STS EMR environments as well as high-altitude EMP environments. Every weapon has these environmental requirements in most, if not all, weapon stages called out in their respective STSs. EMES was used during 2006 in the EMR mode to characterize electromagnetic leakage into the air-launch cruise missile (ALCM) and Advanced Cruise Missile as part of the W80-3 qualification effort. While the W80-3 program was cancelled, the cruise missile information is still useful for the W80-1 stockpile system, and it has been planned to include this information in the W80 STS. EMES was also used in 2003 and 2004 to conduct EMP testing of commercial items for the congressionally chartered EMP commission.

SNL/NM Lightning Simulator. The SNL/NM Lightning Simulator can replicate severe direct-strike lightning to meet stockpile needs for assuring nuclear safety in lightning environments. The Lightning Simulator can also be used to generate nearby lightning environments, which are a normal-environment concern for reliability of electronic systems. It can generate lightning-like pulses that meet the top one percent requirements for peak current, pulse width, and rise-time in nuclear weapon STS requirements documents. In the last two years, the Lightning Simulator has been used to characterize a variety of stockpile and new development Lightning Arrestor

Connectors and to qualify the nuclear safety of the W76-1 in lightning environments. The SNL/NM Lightning Simulator is housed in Building 888 on the east end of TA-I at SNL/NM. In the past, an F4 airplane was instrumented and tested at this facility. This part of TA-I has been significantly developed, virtually eliminating the opportunity to test large items outdoors.

Table A.10-30—Electromagnetic Environmental Complex

Electrical usage (MWh/yr)	150
Water usage (gal/yr)	4,000
Site area (acres)	19.5
Building footprint (Sq. feet)	103,185
Employment (no. of workers)	
Total	11
Rad Workers	
Average Dose to Worker (mrem)	0
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	0
Non-hazardous (yd^3)	80
Emissions	
NAAQS (tons/yr)	.3
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

SNL/CA Environmental Test Complex. The California Environmental Test Complex provides a number of table-top capabilities (shock, vibration, acceleration, climatic chambers, mass properties, radiography, etc.) used for proof and qualification of weapon systems, subsystems, and components. In addition to the ongoing weapon design activities between LLNL and SNL/CA, this complex also supports WFO (DoD, Department of Homeland Security, Engineering Campaign Six, Model Validation) projects. The shock, vibration, and climatic chambers have been used by the W80 Program for margin testing. They are also used for weapon JTA and GTS activities.

Table A.10-31—SNL/CA Environmental Test Complex

Electrical usage (KW/yr)	550 KW
Water usage (gal/yr)	4,000
Site area (acres)	8.5
Total building square footage	58,038
Employment (no. of workers)	
Total	6
Rad Workers	6
Average Dose to Worker (mrem)	3 mrem/yr
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	40
Non-hazardous (yd^3)	80
Emissions	
NAAQS (tons/yr)	.3
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

A.10.1.4 *Environmental Test Facilities at Nevada Test Site*

Two environmental testing facilities are located on NTS, the DAF and the U1a Facility. Both DAF and U1a are considered "user facilities," operated by LLNL and LANL respectively on behalf of the NNSA Nevada Site Office with the site manage and operation providing support, primarily in the area of facility maintenance. Under this concept, the facility is maintained in a "warm standby" condition ready to accept programmatic work. The assigned personnel maintain the facility, its authorization basis, and ensure that programmatic work is properly authorized. The actual programmatic work is conducted by project teams that deploy to the facility to conduct their activities. Thus staffing levels would only reflect the personnel required to maintain the facility in a warm standby condition and not programmatic work. In general, waste streams are associated with project activity and not routine day-to-day activities. These facilities are described below:

Device Assembly Facility Area (DAF). The DAF (Figure A.10-15) is a collection of more than 30 individual steel-concrete buildings connected by a rectangular common corridor. The entire complex, covered by compacted earth, spans an area of 120,000 square feet. It is located within a 19-acre high security area. The operational buildings in the DAF include five assembly cells (Gravel Gerties); four high bays; three assembly bays, one of which houses a glovebox, and one of which houses a down draft table; and two radiography bays. Five staging bunkers provide space for staging nuclear components and high explosives. All material packages arrive or depart the DAF through either of two shipping or receiving bays. The support buildings include three small vaults for staging quantities of high explosives, or SNM; two decontamination areas; two buildings providing laboratory space; and an administration area. Supporting the DAF are an entry guard station and a mechanical/electrical building.

In support of the Critical Experiments Facility (CEF) project, a portion of the DAF (two assembly cells, two high bays, two staging bunkers, and one of the laboratory areas) is undergoing modifications to house the critical assembly machines being moved from Los Alamos TA-18. The nuclear material associated with CEF has been moved to the DAF. This material is being used by various programs to measure the radiation signature of the nuclear material in different configurations. The DAF also supports the assembly of subcritical experiment packages and has been designated as the site for receipt of a damaged nuclear weapon that can not be taken to Pantex. The Nevada Site Office has received direction from NNSA's Principal Assistant Deputy Administrator for Operations to have the approved safety authorization basis for the DAF in place to support a September 2009 operational readiness date to perform specific weapons program work. DAF is being proposed as one siting option for the Engineering Test Bay (Building 334, LLNL), and the ACRR (SNL/NM) has one option within the DAF PIDAS (security area).

Figure A.10-15—DAF at NTS

Table A.10-32—Device Assembly Facility

Electrical usage (MWh/yr)	3,700
Water usage (gal/yr)	4,000
Site area (acres)	19
Building footprint (sq. feet)	4,790
Employment (no. of workers)	
Total	85
Rad Workers	60
Average Dose to Rad Worker (mrem)	30 mrem/yr
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	40
Non-hazardous (yd^3)	80
Emissions	
NAAQS (tons/yr)	.3
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

U1a Complex. The U1a Complex (Figure A.10-16) is a standard industrial hazard facility with demonstrated capabilities to safely conduct nuclear activities including dynamic experiments involving the combination of HE with SNMs. In its current configuration it consists of approximately 1.25 miles of underground drifts located approximately 1,000 feet beneath the surface. Three shafts connect the underground drifts with the surface and provide personnel access, extensive materials handling capabilities, numerous utility systems, and a large diagnostic cable inventory. Improved structures, aboveground, are small and sufficient to enter and exit the facility. Additional underground space can be mined out and tailored to meet experiment/facility requirements. Offices, shops, and diagnostic recording facilities, and parking are located on the surface.

Because of its unique location, 1,000 feet beneath the surface, U1a offers the potential for greatly reducing security costs associated with nuclear facilities and of mitigating any potential offsite exposure to radiation. It has been proposed as a potential site for ACRR (SNL/NM) and for the ETB (Building 334, LLNL).

Figure A.10-16—U1a Complex at NTS

Table A.10-33—U1a Complex

Electrical usage (MWh/yr	3,700MW
Water usage (gal/yr)	5,000
Site area (acres)	2
Building footprint (sq. feet)	2,100
Employment (no. of workers)	
Total	85
Rad Workers	60
Average Dose to Rad Worker (mrem)	30 mrem/yr
Waste Generation	
TRU (yd^3)	0
Low Level(yd^3)	0
Hazardous(yd^3)	40
Non-hazardous (yd^3)	80
Emissions	
NAAQS (tons/yr)	.3
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	0

Appendix B
ENVIRONMENTAL IMPACT METHODOLOGY

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This appendix briefly describes the methods used to assess the potential direct, indirect, and cumulative effects of the alternatives in the Complex Transformation Supplemental Programmatic Environmental Impact Statement *(Complex Transformation SPEIS). Included are impact assessment methods for land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and archeological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, waste management, and cumulative impacts.*

B.1 LAND RESOURCES

B.1.1 Description of Affected Resources and Region of Influence (ROI)

The analysis of impacts to land use considers land use plans and policies, zoning regulations, and existing land use as appropriate for each site analyzed. The potential impacts associated with changes to land use as a result of the alternatives are also discussed.

B.1.2 Description of Impact Assessment

Land use changes associated with the implementation of the Complex Transformation SPEIS could potentially affect both developed and undeveloped land at each site. Potential changes in land use, if any, would likely occur within the existing boundaries of the alternative sites. However, the use of lands adjacent to or in the vicinity of U.S. Department of Energy (DOE) sites (i.e., non-DOE land) could be affected by these changes, including new or expanded safety zones.

Land use changes associated with construction and operation of new facilities could potentially affect both developed and undeveloped land. Land use impacts were assessed based on the extent and type of land that would be affected. The land use analysis also considers potential direct impacts resulting from the conversion of, or the incompatibility of, land use changes with special status lands such as national parks/monuments or prime farmland, and other protected lands such as Federal- and State-controlled lands (e.g., public land administered by the Bureau of Land Management (BLM) or other Government agencies). DOE did not consider the indirect land use impacts that could result from construction and operation of new facilities. In assessing impacts to land, the programmatic and project-specific methodologies were the same.

B.2 VISUAL RESOURCES

B.2.1 Description of Affected Resources and Region of Influence

Visual resources include natural and man-made physical features that give a particular landscape its character and value. The feature categories that form the overall impression a viewer receives of an area include landform, vegetation, water, color, adjacent scenery, rarity, and manmade (cultural) modifications.

B.2.2 Description of Impact Assessment

Criteria used in the visual resources analysis include scenic quality, visual sensitivity, distance, and/or visibility zones from key public viewpoints. The analysis is comparative in nature and consists of a qualitative examination of potential changes in visual resources, scenic values (attractiveness), and view corridors (visibility). Aspects of visual modification examined include site development or modification activities that could alter the visibility of structures at each of the alternative sites or obscure views of the surrounding landscape, and changes in land cover that could make structures more visible. In assessing impacts to visual resources, the programmatic and project-specific methodologies were the same.

B.3 SITE INFRASTRUCTURE

B.3.1 Description of Affected Resources and Region of Influence

Potentially affected site infrastructure resources include ground transportation systems, electrical distribution systems, fuels (primarily natural gas), and water. The ROI is considered to be all the land area and resources within the site boundary

B.3.2 Description of Impact Assessment

The assessment of potential impacts to site infrastructure focuses on the ability of the sites to support any of the facilities assessed in the SPEIS. The programmatic analysis focuses on supporting electrical power requirements. Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS. The analysis addresses whether there is sufficient available and peak capacity to support Complex Transformation. Projections of electricity availability, site development plans, and other DOE mid- and long-range planning documents are used to project site infrastructure conditions. The project-specific analyses identify any significant infrastructure demands. In general, the infrastructure demands of all the project-specific alternatives would be minor compared to the existing infrastructure that exists at the sites analyzed.

B.4 AIR QUALITY AND NOISE

B.4.1 Nonradiological Air Resources

B.4.1.1 *Description of Affected Resources and Region of Influence*

The air quality assessment evaluates the consequences of criteria and hazardous/toxic air pollutants associated with each alternative at each candidate site. The criteria pollutants are specified in 40 *Code of Federal Regulation* (CFR) Part 50, the U.S. Environmental Protection Agency (EPA) Regulations on National Primary and Secondary Ambient Air Quality Standards (NPSAAQS). The hazardous/toxic air pollutants are listed in Title III of the 1990 *Clean Air Act* (CAA) Amendments, the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61), and standards or guidelines proposed or adopted by the respective States.

Current information on emissions from existing operations and ambient air concentrations have been obtained for each alternative site (e.g., site annual reports, recent Environmental Impact Statements [EISs]).

B.4.1.2 *Description of Impact Assessment*

Industrial Source Complex Model 3 (ISC3) is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. This model can account for settling and dry deposition of particles; downwash; point, area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment. ISC3 operates in both long-term and short-term modes. The screening version of ISC3 is SCREEN3. The impacts of construction emissions are evaluated based on results of SCREEN3 dispersion model and Industrial Source Complex Short Term (ISCST) model. The SCREEN3 model estimates pollutant concentrations (in units of ug/m^3) as a function of distance from the source. EPA-approved conversions are applied to adjust the predicted concentrations for comparison to the ambient air quality standards (NRC 2005). Pollutant emissions that contribute to or cause a violation of air quality standards are considered to have a major impact. Mitigation measures are identified where appropriate.

For the programmatic alternatives, which have the potential to disturb significant land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent.

The impacts of nonradiological emissions from operations are evaluated based on results of the ISCST3 dispersion model. The predicted concentrations at the nearest site boundary are added to regional background concentrations for comparison with the ambient air quality standards to assess compliance. Additional qualitative evaluation is applied to describe potential adverse impacts for proposed sites that are located within 50 miles of a Federal Class I area. Pollutant emissions that contribute to or cause a violation of air quality standards are considered to have a major impact.

For the project-specific alternatives, increases in air emissions were compared to emissions from existing operations to determine if detailed modeling was necessary to demonstrate National Ambient Air Quality Standards (NAAQS) compliance. For minor increases and/or situations in which the ambient concentrations of pollutants are well below NAAQS standards, modeling was not necessary.

B.4.2 Radiological Air Resources

B.4.2.1 *Description of Affected Resources and Region of Influence*

Inhalation and ingestion are the two primary modes of exposure from radionuclide emissions. Inhalation occurs while the radionuclides are still airborne. The ROI for inhalation exposure is considered the DOE site boundary because Federal regulations limit the airborne dose exposures at the site boundary.

Radionuclide emissions will eventually settle back to the earth onto vegetation, soils, and waterbodies. Vegetation can then absorb radionuclides from the soils, and fish can absorb radionuclides from the water. When people and wildlife eat the plants or fish, they can potentially ingest radionuclides. Wildlife and waterbodies are generally not confined within the site boundary; therefore, ingestion impacts can extend to a larger region, but are generally bounded within 50 miles of the point of release.

Current information on dose to non-involved workers, maximally exposed individual (MEI), and collective dose to surrounding population due to radiological releases from existing operations has been obtained from each alternative site (e.g., site annual reports, recent EISs). Impacts from implementation of Complex Transformation programmatic alternatives were modeled at each potentially affected site using the CAP-88 computer model, version 3. The CAP-88 model was developed by EPA for assessments of both collective populations and MEIs.

B.4.2.2 *Description of Impact Assessment*

It is expected that radiological impacts from Complex Transformation to workers and surrounding population will be predominantly via the air pathway because no effluents are anticipated to be released. The impacts from implementation of Complex Transformation at each site are based on a combination of site-specific and technology-specific data. Site-specific data required for modeling include meteorology (e.g., wind speed, wind direction, precipitation), population distribution (for impacts on population), agricultural production (distribution about the release, types and quantity produced), and distances and directions to the fenceline (or other locations at which the public could be exposed; and for MEI calculations).

Operations data required for the calculations include release rates (i.e., curies per year by nuclide) and modes of release (e.g., stack height, stack velocity, diffuse release area). Doses have been calculated for the general population and for non-involved workers (i.e., onsite workers not directly involved in the pit manufacturing operations). Doses were converted to impacts as explained in Section B.11.2. For the project-specific tritium analysis, radiological emissions associated with tritium alternatives were used to estimate potential impacts based on comparisons to the impacts from other tritium emissions. There were no other radiological releases associated with other project-specific analyses.

B.4.3 Noise

B.4.3.1 *Description of Affected Resources and Region of Influence*

Current information on noise from existing operations has been obtained from each alternative site (e.g., site annual reports, recent EISs). Resources potentially affected by noise include wildlife and sensitive receptors in the vicinity of the project site. Construction noise levels would generally be higher than operation noise levels; therefore, the ROI is the radial area within 500–1,000 feet of the project site, depending on the specific conditions affected noise propagation that include topography and presence of large structures or dense vegetation.

B.4.3.2 *Description of Impact Assessment*

The methodology used to determine environmental impacts of Complex Transformation at each of the alternative sites with respect to noise involves a two-step analysis. The first step is to identify noise levels associated with implementation of Complex Transformation and determine if they are likely to exceed noise levels defining ambient background conditions. If these noise levels could exceed ambient conditions, the analysis determines whether the impacts are significant, using a qualitative assessment of the increase or decrease in noise level experienced by receptors near the source.

In the noise assessment, DOE included a description of the noise sources and noise levels anticipated for construction. Unmitigated logarithmic sound attenuation is assumed to estimate the distance needed for sound levels to achieve an acceptable level for both human and wildlife populations. It is anticipated that operational noise levels would be consistent with other noise sources at the site, and that they would not impose an appreciable change to the overall noise environment. In assessing noise impacts, the programmatic and project-specific methodologies were the same.

B.5 WATER RESOURCES

B.5.1 Surface Water

B.5.1.1 *Description of Affected Resources and Region of Influence*

Surface waters include rivers, streams, lakes, ponds, playas, and reservoirs. An inventory of surface water resources in the project ROI, a description of areas in the ROI currently using surface water, general flow characteristics, reservoirs, and an identification of classifications applicable to the surface water have been used to determine the affected environment at each alternative site. Emphasis has been placed on those waterbodies that have the potential to be impacted during the facility's operations over the timeframe analyzed. Current wastewater treatment facilities and discharges have also been described in the baseline.

The affected environment descriptions for water quality of potentially affected receiving waters for each site have been developed by reviewing current monitoring data to identify parameters that exceed water quality criteria. Monitoring reports for discharges permitted under the National

Pollutant Discharge Elimination System (NPDES) program and state regulations have been examined for exceeding permit limits or requirements. In addition, surface water quality has been evaluated in terms of whether the water body supports the designated use assigned by the individual states under the *Clean Water Act* (CWA).

B.5.1.2 *Description of Impact Assessment*

The assessment of potential water quality impacts includes evaluation of the type (wastewater effluent), rate, and potential discharge constituents. Environmental consequences may result if: 1) The surface water flow rate is decreased to the point where the capacity of the receiving waterbody to assimilate discharges is noticeably diminished; 2) The proposed increases in discharge cannot comply with NPDES permit limits on flow rates; 3) The proposed increases in discharges contribute to receiving waters already identified as exceeding applicable surface water quality criteria; or 4) The proposed increases in effluent cannot comply with pretreatment limits on flow rates or specific constituent contributions without additional treatment. In addition, any expected increases in surface water runoff are discussed along with the potential impact to surface water features at each site.

B.5.2 Groundwater

B.5.2.1 *Description of Affected Resources and Region of Influence*

As part of the affected environment section of the SPEIS, groundwater is described in terms of the local aquifers' extent and yield, thickness, EPA classification, and recharge and discharge areas for each site. Areas in the ROI currently experiencing groundwater overdraft and related problems, and areas that have experienced large water table declines are described if applicable. Current potable and process water supplies and systems, water rights agreements, and water allocation of the site areas are also described. The latest environmental data, including maps, reports, and other literature, are used to the maximum extent possible to evaluate these conditions.

The affected groundwater quality at the site was evaluated by reviewing current monitoring data and identifying any parameters that exceed State water quality standards, drinking water standards, and DOE derived concentration guides for radionuclides in water. Parameters that exceed water quality criteria are further described and contaminant plumes delineated, where possible.

B.5.2.2 *Description of Impact Assessment*

An assessment of potential groundwater quality environmental consequences associated with pollutant discharges during facility modification and operation phases (e.g., process wastes and sanitary wastes) is examined for each site to determine if a direct input to groundwater could occur. The results of the groundwater quality projections are then discussed relative to Federal and State groundwater quality standards, effluent limitations, and safe drinking water standards to assess the acceptability of each alternative. Operation parameters from the alternatives with the potential to further degrade existing groundwater quality have been identified.

The potential effects to groundwater availability are assessed for each alternative at each candidate site by evaluating whether the proposed project: 1) Increases groundwater withdrawals in areas already experiencing overdraft and other related problems (e.g., land subsidence); 2) Potentially decreases groundwater levels causing a substantial depletion of the resource; 3) Water requirements exceed the allotment, water rights, or available supply limits, if present; or 4) Reduces or ceases the flow of one or more major springs. Suitable mitigation measures to reduce impacts are identified and discussed. In assessing impacts to water resources, the programmatic and project-specific methodologies were the same.

B.5.3 Floodplains

Floodplains include any lowlands that border a water body and encompass areas that may be covered by overflow during flood stages. As part of the affected environment discussion at each site, floodplains are identified from maps and environmental documents. Any potential facility location within a 100-year floodplain or a critical action in a 500-year floodplain is assessed for environmental consequence. The 500-year floodplain evaluation is of concern for activities determined to be critical actions for which even a slight chance of flooding would be intolerable. Appropriate mitigation measures are identified to minimize potential floodplain impacts. In assessing impacts to floodplains for both the programmatic and project-specific alternatives, if any potential facility were located in a 100-year or 500-year floodplain, this was identified.

B.6 GEOLOGY AND SOILS

B.6.1 Description of Affected Resources and Region of Influence

The analysis of geology and soils examines the ROI, or lands occupied by and immediately surrounding each alternative site. Information on the regional structural geology, stratigraphy, and soils have been collated and summarized.

In addition, the seismicity of the region surrounding each site is evaluated to provide a perspective on the probability of earthquakes in the area and their likely severity. This information is used to provide input to the evaluation of accidents due to natural phenomena.

B.6.2 Description of Impact Assessment

The proposed project areas at each site are evaluated for the amount of disturbance that may affect the geology and/or soils of the areas under study. These impacts may include, among others, potential erosion impacts and impacts to potential geologic economic resources. Impacts, if any, have been evaluated and a determination made as to severity. Possible mitigation has also been identified for adverse impacts. In assessing impacts to geology/soils, the programmatic and project-specific methodologies were the same.

B.7 BIOLOGICAL RESOURCES

B.7.1 Description of Affected Resources and Region of Influence

The affected biological resources may include both terrestrial and aquatic plants and animals. Subsets of these categories include threatened and endangered (T&E) species, and specific protected habitats, such as wetlands. Biological resources have been described within the ROI, which is defined by the lands occupied by and immediately surrounding each alternative site. In the case of T&E species, and other special interest species, biotic information includes species distribution within the county of each alternative site location. Biological data from earlier projects, wetlands surveys, and plant and animal inventories of the proposed sites were reviewed to identify the locations of plant and animal species and wetlands and to identify the impact from physical, chemical, or radiological stressors. Descriptions are at a summary level and focus within four categories: terrestrial resources, wetlands, aquatic resources, and T&E species.

B.7.2 Description of Impact Assessment

During construction, impacts to biotic resources, including terrestrial resources, wetlands, aquatic resources, and T&E species, may result from land-clearing activities, erosion and sedimentation, and human disturbance and noise. Operations may affect biotic resources as a result of changes in land use, emission of radionuclides, water withdrawal, wastewater discharge, and human disturbance and noise. In general, potential impacts have been assessed based on the degree to which various habitats or species could be affected by an alternative. Where appropriate, impacts have been evaluated with respect to Federal and State protection regulations and standards.

The analysis of impacts of Complex Transformation programmatic alternatives to biological resources were addressed at a level that was appropriate to allow for a comparison of alternatives using the best information available. In general, the programmatic analysis of impacts to biological resources presented in the Complex Transformation SPEIS is qualitative rather than quantitative. Quantitative analyses would be performed in follow-on site- and project-specific *National Environmental Policy Act* (NEPA) documentation. For the project-specific analyses, the analysis evaluated the amount of land disturbed, and if any critical habitats or special status species could be affected, these were identified.

B.7.2.1 *Terrestrial Resources*

Impacts of the Complex Transformation proposed alternatives on terrestrial plant communities have been evaluated by comparing data on site vegetation communities to proposed land requirements for construction and operation. The analysis of impacts to wildlife is based to a large extent on plant community loss or modification, which directly affects animal habitat. The loss of important or sensitive habitats and species is considered more important than the loss of regionally abundant habitats or species. Impacts on biotic resources from the release of radionuclides were not evaluated because there are no data to suggest that biotic resources are more adversely affected than humans.

B.7.2.2 *Wetlands*

The potential direct loss of wetlands resulting from implementation of Complex Transformation have been addressed in a way similar to the evaluation of impacts on terrestrial plant communities; that is, by comparing data on site or area wetlands to proposed land requirements. Sedimentation impacts have been evaluated based on the proximity of wetlands to Complex Transformation project areas. Impacts resulting from wastewater discharge and other transport pathways (e.g. spills) into a wetland system have been evaluated, recognizing that effluents would be required to meet applicable Federal and State standards. In assessing impacts to wetlands, the programmatic and project-specific analyses identified whether any wetlands would likely be affected by new facilities.

B.7.2.3 *Aquatic Resources*

Impacts to aquatic resources resulting from sedimentation and wastewater discharge have been evaluated as described for wetlands. Potential impacts from radionuclides have not been addressed for the same reasons described for terrestrial resources.

B.7.2.4 *Threatened and Endangered Species*

Impacts on T&E species and other special interest species have been determined in a manner similar to that used to describe terrestrial and aquatic resources since the sources of potential impacts are similar. A list of species potentially present on each candidate site or in proximity to the candidate site or area has been developed using information obtained from the U.S. Fish and Wildlife Service (USFWS) and appropriate State agencies' databases. This list, along with consideration of site environmental and engineering data, and provisions of the *Endangered Species Act*, have been used to evaluate whether the various Complex Transformation siting alternatives could impact any threatened or endangered plant or animal (or its habitat). In assessing impacts to T&E species, the programmatic and project-specific analyses identified whether any T&E species would likely to be affected by new facilities.

B.8 CULTURAL AND ARCHEOLOGICAL RESOURCES

B.8.1 Description of Affected Resources and Region of Influence

Cultural resources are those aspects of the physical environment that relate to human culture and society, and those cultural institutions that hold communities together and link them to their surroundings. For this SPEIS, cultural resources are divided into three general categories: archeological resources, historic resources, and Native American resources. A cultural resource can fall into more than one of these categories due to use through a long period of time or multiple functions.

Archeological resources mean any material remains of past human life or activities which are of archeological interest (Public Law 96-95; 16 USC 470aa-mm). By definition, these resources predate written records. Historic resources include the material remains and landscape alterations that have occurred since the arrival of Europeans to the area. Due to the focus of this SPEIS on DOE facilities, historic resources often include resources associated with the Manhattan Project, World War II, and the Cold War. Native American resources are material remains, locations, and natural materials important to Native Americans for traditional religious or heritage reasons (Public Law 101-601). These resources are rooted in the community’s history or are important in maintaining cultural identity.

The ROI includes the area within which cultural and archeological resources could be physically impacted by construction and operation activities include the area in and around the footprint of the proposed facilities. The ROI for all alternatives also includes cultural resources nearby that could have their historic settings adversely affected by the introduction of the new facility into the viewshed.

B.8.2 Description of Impact Assessment

The analyses of potential impacts to cultural and archeological resources are very similar because the two types of resources can be affected by the alternatives in much the same manner. The analyses address potential direct and indirect impacts at each candidate site from construction activities and operation of the facility. Most potential impacts are those resulting from groundbreaking activities; however, other types of impacts are considered, such as reduced access by practitioners to resources, introduction of visual, audible, or atmospheric elements out of character with the resources, and increased visitation to sensitive areas. Analyses of impacts take into consideration the location of the reference site, the acreage required for the proposed facility, and the likelihood of resources being located in that area. In assessing potential impacts to cultural and archeological resources, the programmatic and project-specific methodologies were the same.

B.9 SOCIOECONOMICS

The analysis of socioeconomics describes impacts on local and regional socioeconomic conditions and factors including employment, economy, population, housing, and community services at each alternative site considered in the Complex Transformation SPEIS. The potential for socioeconomic impacts is greatest in those local jurisdictions immediately adjacent to each site. Therefore, potential socioeconomic impacts are assessed using a geographic ROI. ROIs are used to assess potential effects on the economy as well as effects that are more localized in political jurisdictions surrounding the sites.

For each site, socioeconomic impacts were estimated using two geographic areas. First, an ROI was identified based on the distribution of residences for current DOE and contractor employees. The ROI is defined as those counties where approximately 90 percent of the current DOE and contractor employees reside. The ROI for each candidate site is presented in Table B.9-1. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site and is used to estimate the future distribution of direct workers associated with the each alternative. The evaluation of impacts is based on the degree to which change in population affects the housing market and community services.

The ROI for each site encompasses an area that involves trade among and between regional industrial and service sectors. It is characterized by strong economic linkages between the communities located in the region. These linkages determine the nature and magnitude of multiplier effects on economic activity (i.e., purchases, earnings, and employment) at each candidate site. Demographic characteristics included in the socioeconomic analysis within the ROI include population, housing, and community services.

The U.S. Bureau of Economic Analysis measures multiplier effects of interindustry linkages with the Regional Input-Output Modeling System (RIMS II). RIMS II is based on an accounting framework called an input-output table. An input-output table shows, for each industry, industrial distributions of input purchased and outputs sold. RIMS II Total Direct-Effect Multipliers has been used in the Complex Transformation SPEIS to estimate additional regional employment and income generated by employment and income directly associated with the Proposed Action. In assessing potential impacts to socioeconomics for the project-specific alternatives, the analysis focused on identifying jobs lost or added and compared these changes to the baseline. For the flight testing alternatives that would cease operations at the Tonopah Test Range (TTR), a more detailed socioeconomic analysis was performed, due to the potential to cause more significant impacts. That specific methodology is described in Section 5.15.4.2.1.

Table B.9-1—Candidate Sites' Region of Influence

LANL	LLNL	NTS	TTR	Pantex	SNL	WSMR	SRS	Y-12
New Mexico	**California**	**Nevada**	**Nevada**	**Texas**	**New Mexico**	**New Mexico**	**Georgia**	**Tennessee**
Los Alamos	Alameda	Clark	Esmeralda	Armstrong	Bernalillo	Dona Ana	Columbia	Anderson
Rio Arriba	Contra Costa	Nye	Nye	Carson	Sandoval	Lincoln	Richmond	Knox
Santa Fe	San Joaquin	Lincoln	Lincoln	Potter	Torrance	Otero	**South Carolina**	Loudon
	Stanislaus			Randall	Valencia	Sierra Socorro	Aiken Barnwell	Roane

B.10 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, signed by President William J. Clinton in February 1994, requires each Federal agency to formulate a strategy for addressing environmental issues in human health and environment related programs, policies, planning and public participation processes, enforcement, and rulemaking. The White House memorandum accompanying the Executive Order directs Federal agencies to "analyze the environmental effects…of Federal actions, including effects on minority communities and low income communities when such analysis is required by NEPA."

Any disproportionately high and adverse human health effects on minority populations or low-income populations that could result from Complex Transformation at any of the proposed alternative sites have been analyzed. The minority population and low-income population composition of the area surrounding the proposed alternative sites will be compared to that of a larger geographic area to determine whether possible impacts of siting Complex Transformation at a particular site will have a disproportionately high and adverse impact on minority or low-income populations. In assessing potential environmental justice impacts, the programmatic and project-specific methodologies were the same. As a first step, the analysis focused on whether there would be any high and adverse human health effects. If none were determined, then there was no need to determine if these high and adverse human health effects were disproportionate. For this PEIS, none of the health effects were determined to be both high and adverse.

B.11 HEALTH AND SAFETY

Potential impacts of construction and operation of facilities on public and worker health and safety include cancer fatalities resulting from exposure to radionuclides, and occupational injuries and illnesses resulting from facility construction and operation. Included in this appendix is a brief discussion of the methodology for analysis of impacts to public and worker health and safety.

B.11.1 Description of Affected Resources and Region of Influence

Potential impacts to human health and safety posed by Complex Transformation include radiological and nonradiological exposure pathways and occupational injuries, illnesses, and fatalities resulting from construction activities and normal (accident-free) operations of the completed facility. Exposure pathways include inhalation, immersion, ingestion, and exposure to external sources. Occupational regions of influence include involved and uninvolved workers. Nonoccupational ROIs for the public include the MEI and the general population surrounding the candidate sites.

Because NNSA operations have the potential to release measurable quantities of radionuclides to the environment that result in exposure to the worker and the public, NNSA conducts environmental surveillance and monitoring activities at its sites. These activities provide data that are used to evaluate radiation exposures that contribute doses to the public. Each year, environmental data from the NNSA sites are collected and analyzed. The results of these environmental monitoring activities are summarized in an Annual Site Environmental Report (ASER). The environmental monitoring conducted at most NNSA sites consists of two major activities: effluent monitoring and environmental surveillance.

Effluent monitoring involves the collection and analysis of samples or measurements of liquid (waterborne) and gaseous (airborne) effluents prior to release into the environment. These analytical data provide the basis for the evaluation and official reporting of contaminants, assessment of radiation and chemical exposures to the public, and demonstration of compliance with applicable standards and permit requirements.

Environmental surveillance data provide a direct measurement of contaminants in air, water, groundwater, soil, food, biota, and other media subsequent to effluent release into the environment. These data verify the NNSA site's compliance status and, combined with data from effluent monitoring, allow the determination of chemical and radiation dose and exposure assessment of NNSA operations and effects, if any, on the local environment. The effluent and environmental surveillance data presented in the ASERs were used as the primary source of data for the analysis of radiation exposure to the public for the No Action Alternative.

The public health consequences of radionuclides released to the atmosphere from normal operations at NNSA sites are characterized and calculated in the applicable ASER. Radiation doses are calculated for the MEI and the entire population residing within 50 miles of the center of the site. In this SPEIS, dose calculations from normal operations were made using the CAP-88 package of computer codes, version 3 (EPA 2008), which was developed under EPA sponsorship to demonstrate compliance with 40 CFR Part 61, Subpart H, which governs the emissions of radionuclides other than radon from DOE facilities. This package implements a steady-state Gaussian plume atmospheric dispersion model to calculate concentrations of radionuclides in the air and on the ground and uses Regulatory Guide 1.109 (NRC 1977) food-chain models to calculate radionuclide concentrations in foodstuffs (vegetables, meat, and milk) and subsequent intakes by humans.

Meteorological data used in the calculations were in the form of joint frequency distributions of wind direction, wind speed class, and atmospheric stability category. For occupants of residences, the dose calculations assume that the occupant remained at home (actually, unprotected outside the house) during the entire year and obtained food according to the rural pattern defined in the NESHAP background documents (EPA 1989). This pattern specifies that 70 percent of the vegetables and produce, 44.2 percent of the meat, and 39.9 percent of the milk consumed are produced in the local area (e.g., a home garden). The remaining portion of each food is assumed to be produced within 50 miles of the site. The same assumptions are used for occupants of businesses, but the resulting doses are divided by two to compensate for the fact that businesses are occupied for less than one-half a year, and that less than one-half of a worker's food intake occurs at work. For collective effective dose equivalent (EDE) estimates, production of beef, milk, and crops within 50 miles of the site was calculated using production rates provided with CAP-88.

B.11.2 Description of Impact Assessment

Radiological impacts have been assessed for workers (both involved and non-involved in Complex Transformation operations) and for the public (MEI and population). Health impacts to involved workers from Complex Transformation operations are based on information from the Complex Transformation alternative data report [NNSA 2007]. NNSA converted radiological doses to health effects (latent cancer fatalities [LCF]) using a multiplier of 600 fatal cancers per 10^6 person-rem based on "Radiation Risk Estimation from Total Effective Dose Equivalents (TEDEs)," (Office of Environmental Policy and Guidance, Washington, DC. August 9.) Similarly, health impacts to the MEI and population are based on doses calculated by the radiological air analyses. Continuous exposure over the year is assumed. For worker exposures, impacts were estimated based on estimates of the number of radiation workers and the average radiological dose, based on information from the Complex Transformation alternative data report [NNSA 2007]. In assessing potential human health impacts, the programmatic and project-specific methodologies were the same.

B.11.3 Occupational Safety

Occupational injury, illness, and fatality estimates are evaluated using occupational incidence rates of major industry groups, DOE, and DOE contractors. When site-specific evaluations are performed, DOE Computerized Accident/Incident Reporting System (CAIRS) data is used. Since activities similar to Complex Transformation operations or facility construction are not being performed at all of the potential Complex Transformation sites, U.S. Department of Labor, Bureau of Labor Statistics (BLS) injury, illness and fatality information for similar activities have been used. These rates are compared to person-hour estimates for the project. Occupational injury, illness, and fatality categories used in this analysis are in accordance with Occupational Safety and Health Administration (OSHA) definitions. Incident rates were developed for facility construction and facility operations.

Facility operations were evaluated to determine if any chemical-related health impacts would be associated with normal (accident-free) operations. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as Integrated Safety Management System (ISMS), work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness. In assessing potential human health impacts, the programmatic and project-specific methodologies were the same.

B.12 ACCIDENT ANALYSIS

B.12.1 Description of Affected Resources and Region of Influence

Potential impacts to human health and safety from postulated accidents include radiological and nonradiological exposures. For both radiological and chemical accidents associated with operations, the affected resources are the facility and site workers and the offsite population. Specifically, for radiological accidents, the impact is incremental adverse health effects (i.e., LCFs) for a noninvolved worker, the offsite MEI, and the offsite population within 50 miles of each alternative site. For nonradiological accidents, airborne concentrations and potential health effects have been calculated for the noninvolved worker and the offsite MEI.

B.12.2 Description of Impact Assessment

Postulated accidents can be initiated by internal operations (e.g., fire, spill, criticality), external events (e.g., airplane crash), or natural phenomena (e.g., earthquake, flood). The Complex Transformation SPEIS evaluates unmitigated accident scenarios chosen to reflect the range and kinds of accidents that are postulated. The range of accidents is from low frequency high consequence events (probabilities as low as approximately 10^{-6}) to high frequency-low consequence events (probabilities as high as approximately 10^{-2}) in order to assess potential risks. The spectrum of accidents and their calculated impacts should provide a baseline for each site that can be used to judge the environmental implications of locating particular facilities and missions at different sites. The accident analyses were performed in accordance with the *Recommendations for Analyzing Accidents Under the National Environmental Policy Act* (DOE 2002b). Appendix C provides additional information on the accident methodology.

For radiological accidents, point estimates of radiation dose and, for the offsite population, corresponding incremental LCFs were calculated for a hypothetical noninvolved worker from release points at proposed sites, the offsite MEI, and the offsite population within 50 miles of each alternative site. For nonradiological accidents, estimates of airborne concentrations of chemical substances have been calculated for a hypothetical noninvolved worker and the offsite MEI.

It should be noted that the purpose of this SPEIS is to assist NNSA in making site selection decisions. Since nuclear weapons activities or facilities would be the same regardless of location, the risk to involved workers is independent of where the activity occurs or the facility is located and would not be a discriminating factor for programmatic siting decisions. For the project-specific analyses, potential impacts to involved workers were considered and discussed as appropriate.

For radiological and chemical accidents, the following general analytical steps were followed:

1. Screen operations at the facilities to identify those with the potential to contribute to offsite risk.
2. Identify and screen postulated accident scenarios associated with those operations.
3. Calculate source terms (release rates and frequencies) for these unmitigated scenarios assuming no mitigation of releases or frequencies.
4. Calculate onsite and offsite consequences (impacts to the health and safety of workers and the general public) of these scenarios.

The unmitigated consequences of accidental releases of radioactivity were calculated using the MELCOR Accident Consequence Code System Version 2 (MACCS2) with the radiological source term values described above. In addition to the source term data, the following input data for the MACCS2 code were obtained:

- Estimated location of specific facilities and their distance from the site boundary;
- Release heights (i.e., stack release, building release, or ground level release);
- Local meteorological conditions;
- Offsite population distribution (using the 2000 census data); and
- Offsite agricultural and economic data.

The consequences of accidental releases of hazardous chemicals were calculated using the Aerial Location of Hazardous Atmospheres (ALOHA) code based on information from the Complex Transformation alternative data report [NNSA 2007]. In addition to the source term data, input data for the ALOHA code is similar to that required for the radiological accident analysis, with the exception that offsite agricultural and economic data are not required.

For accident scenarios involving multiple operations within nuclear weapons facilities, such as those that might be caused by natural phenomena, estimates of radiation dose and corresponding incremental LCFs and estimates of airborne concentrations of chemical substances were calculated for the same receptors as described previously.

B.12.3 Terrorist Attacks

Analyses of the potential impacts of terrorist attacks are in a classified appendix to this SPEIS. The impacts of some terrorist attacks would be similar to the accident impacts described earlier in this section, while others would have more severe impacts. This section describes the methodology NNSA uses to assess the vulnerability of its sites to terrorist attacks and then designs its systems to prevent and deter those threats.

B.12.3.1 *Assessment of Vulnerability to Terrorist Threats*

In accordance with DOE Order 470.3A, Design Basis Threat Policy, and DOE Order 470.4, Safeguards and Security Program, NNSA conducts vulnerability assessments and risk analyses of its facilities and sites to determine the physical protection elements, technologies, and administrative controls NNSA should use to protect its assets, its workers, and the public. DOE Order 470.4 establishes the roles and responsibilities for the conduct of DOE's Safeguards and Security Program. DOE Order 470.3A establishes requirements designed to prevent unauthorized access, theft, diversion, or sabotage of nuclear weapons, components, and special nuclear material controlled by NNSA.

Among other things, DOE Order 470.3A: 1) Specifies those national security assets that require protection; 2) Outlines threat considerations for safeguards and security programs to provide a basis for planning, designing, and constructing new facilities; and 3) Requires the development of credible scenarios of threats that are used to design and test safeguards and security systems. NNSA must also protect against espionage, sabotage, and theft of materials, classified matter, and critical technologies.

NNSA's safeguards and security programs and systems employ state-of-the-art technologies to:

- Deny adversaries access to nuclear weapons, nuclear test devices, and completed nuclear assemblies;
- Deny adversaries the opportunity to steal special nuclear materials (SNM), sabotage weapons or facilities, or produce an unauthorized nuclear yield (criticality) of SNM;
- Protect the public and employees from harm resulting from an adversary's use of radiological, chemical, or biological materials; and
- Protect classified information, classified matter, and designated critical facilities or activities from sabotage, espionage, and theft.

NNSA's vulnerability assessments employ a rigorous methodology based on guidance from the DOE Vulnerability Assessment Process Guide (September 2004), and the Vulnerability Assessment Certification course. Typically, a vulnerability assessment involves analyses by subject matter experts to determine the effectiveness of a safeguard and security system used to protect against an adversary with certain capabilities. Vulnerability assessments generally include the following activities:

Characterizing the threat. Threat characterization provides a detailed description of a physical threat by a malevolent adversary to a site's physical protection systems. Usually the description includes information about the types of potential adversaries, their motivations, objectives, actions, capabilities, and site-specific tactical considerations. Much of the information required to develop a threat characterization is described in DOE Order 470.3A and the Adversary Capabilities List. The Department also issues site-specific guidance, to assist in this process.

Determining the target. Target determination involves identifying, describing, and prioritizing potential targets among NNSA's security interests. Results of target determinations are used to help characterize potential threats and objectives, as well as, protective force and neutralization requirements.

Defining the scope. The scope of a vulnerability assessment is determined by subject matter experts and depends on the site vulnerabilities. In addition to defining the threat and possible terrorist objectives, the scope establishes the key assumptions and interpretations that will guide the analyses, as well as the objectives, methods, and format for documenting the results of the vulnerability assessment.

Characterizing the facility or site. This activity requires defining and documenting every aspect of the facility or site to be assessed, particularly existing security programs (personnel security, information security, physical security, material control and accountability, etc.), to assist in identifying strengths and weaknesses. Results are used as inputs to the pathway analyses, which DOE uses to develop representative scenarios for evaluating the security system. Facility and site characterization modeling tools include Analytical System and Software for Evaluating Safeguards and Security (ASSESS), Adversary Time-Line Analysis System (ATLAS), VISA, tabletop analysis, and others.

Characterizing the protective force. To assess a facility or site's vulnerability, analysts must accurately characterize protective force's capabilities against a defined threat and objective, particularly its ability to detect, assess, interrupt, and neutralize an adversary. Specific data used for this activity include special nuclear materials categorization; configuration, flow, and movement of special nuclear materials within or from a facility or site; defined threats; detection and assessment times; and adversary delay and task time. The protective force's equipment, weapons, size, and posts also are considered in the characterization. The characterization information is validated and verified via observation, alarm response assessments, performance tests, force-on-force exercises, joint conflict and tactical simulation (JCATS), and tabletop analyses. The JCATS software tool is used for training, analysis, planning, and mission rehearsal, as well as characterization of the protective force. It employs detailed graphics and models of buildings, natural terrain features, and roads to simulate realistic operations in urban and rural environments.

Analyzing adversary pathways. This activity identifies and analyzes adversary pathways based on the results of threat, target, facility, and protective force characterization, as well as ancillary analyses such as explosives analysis. ASSESS and ATLAS are two primary tools that are used in this analysis. Analysts also conduct insider analysis as part of this activity.

Developing credible scenarios. Credible scenarios are developed for use in performance testing and to determine the effectiveness of the security system in place against a potential adversary's objectives. As part of this activity, data from the adversary pathways analyses are used to identify applicable threats, threat strategies, and objectives, and combined with protective force strategies and capabilities to develop scenarios that include specific adversary resources, capabilities, and projected task times to successfully achieve their objectives. Specialists also work with the vulnerability assessment team to develop realistic scenarios that provide a structured and informal analysis of the strengths and weaknesses of potential adversaries.

Determining the probability of neutralization. The probability of neutralization is the probability that a protective force can prevent an adversary from achieving its objectives. The probability is derived from more than one source, one of which must be based on Joint Tactical Simulation, JCATS analysis, or force-on-force exercises.

Determining system effectiveness. System effectiveness is determined by applying an equation that reflects the capabilities of a multi-layered protection system. Analysis data derived from the various vulnerability assessment activities are used to calculate this equation, which reflects the security system’s effectiveness against each of the scenarios developed for the vulnerability assessment. If system effectiveness is unacceptable for a scenario, the root cause of the weakness must be analyzed and security upgrades must be identified. The scenarios are reanalyzed with the upgrades, and effective upgrades are documented in the vulnerability analysis report.

Implementation. The culmination of the vulnerability assessment is development of a report documenting the analyses and results and a plan for implementing any necessary changes to security systems. NNSA verifies the results of the vulnerability assessment report and the conclusions of the implementation plan. NNSA also oversees the implementation of security system upgrades.

B.12.3.2 *Terrorist Impacts Analysis*

Substantive details of the credible scenarios for terrorist attacks NNSA’s countermeasures, and potential impacts of attacks are not released to the public because disclosure of this information could be exploited by terrorists and assist them in the planning of attacks. Depending on the intentionally destructive acts, impacts may be similar to or would exceed those of bounding accidents analyzed elsewhere in the SPEIS. A separate classified appendix to this SPEIS evaluates the impacts of an adversary achieving its objectives in one or more of the credible scenarios.

The classified appendix evaluates the potential impacts of the successful execution of credible scenarios for the alternatives at seven sites (LANL TA-16, LANL TA-55, LLNL, NTS, SRS, Pantex, and Y-12) and calculates consequences to a noninvolved worker, maximally exposed individual, and population in terms of direct effects, radiation dose, and LCFs. Risks are not calculated because the probability that an adversary could successfully execute the attack in a scenario cannot be quantified. The MACCS2 and RISKIND computer codes are used along with other manual methods to calculate human health effects of each credible scenario. The same site-specific meteorology and population distribution that is used in the accident analyses in SPEIS Appendix C are used in analyses of the impacts of an adversary achieving its objectives in the credible attack scenario.

B.12.3.3 *Mitigation of Impacts from Potential Terrorist Attacks*

The DOE strategy for the mitigation of environmental impacts resulting from a terrorist attack has three distinct components: 1) Prevent and deter terrorists form executing successful attacks; 2) Plan and provide timely and adequate response to emergency situations; and 3) Progressive recovery through long-term response in the form of monitoring, remediation, and support for affected communities and their environment.

B.12.3.3.1 Actions to Prevent or Reduce the Probability of Successful Attacks

NNSA employs a well-established system of engineered and administrative controls to prevent or reduce the probability of occurrence of extreme events and to limit their potential impacts on the environment. This system has evolved over time and will continue to evolve as new security requirements are identified, as new become available, and as new engineering standards or best practices are developed. The directing requirements and the framework for implementing this system of controls are embodied in the Code of Federal Regulations and in DOE Orders. These are imposed as contractual requirements for DOE management and operating (M&O) contractors. The NNSA system of safety requirements and quality assurance guidelines and controls covers all aspects of key nuclear and non-nuclear facilities including design requirements, construction practices, start-up and operational readiness reviews, and routine operations and maintenance. The contractor and federal staff at these facilities are evaluated for trustworthiness and reliability.

B.12.3.3.2 Plan for and Respond to Emergency Situations

While NNSA has comprehensive security measures to prevent terrorist attacks, it is also necessary to have the capability for timely and adequate response to emergency situations. Therefore, in addition to the systems of workplace hazard controls and safeguards and security measures, the NNSA emergency management system imposes additional protections over operations involving dispersible hazardous materials in quantities that could harm people outside the immediate workplace. NNSA’s comprehensive all-hazards approach to emergency management is established in DOE Order 151.1C, Comprehensive Emergency Management System. This Order provides a general structure and framework for responding to any emergency at an NNSA facility or for an NNSA activity and specific requirements to address protection of workers, the public, and the environment from the release of hazardous materials.

NNSA’s comprehensive emergency management system is based on a three-tiered structure consisting of facility, site, or activity management; the Cognizant Field Element; and Headquarters, with each tier having specific roles and responsibilities during an emergency. Each organizational tier provides management, direction, and support of emergency response activities. Management personnel of a facility, site, or activity manage the tactical response to the emergency by directing the mitigative actions necessary to resolve the problem, protect the workforce, the public, and the environment; and return the facility, site, or activity to a safe condition. The Cognizant Field Element oversees the facility/site response and provides local assistance, guidance, and operational direction to the facility/site management. The Cognizant Field Element also coordinates the tactical response to the event with tribal, state, and local governments. NNSA Headquarters provides strategic direction to the response, provides assistance and guidance to the Cognizant Field Element, and evaluates the broad impacts of the emergency on the NNSA complex. Headquarters also coordinates with other Federal agencies on a national level, provides information to representatives of the executive and legislative branches of the Federal government, and responds to inquiries from the national media.

Each NNSA facility, site, or activity is required by DOE Order 151.1C to have an Operational Emergency Base Program, which provides the framework for responding to serious events or conditions that involve the health and safety of the workforce and the public, the environment, and safeguards and security. The objective of the Operational Emergency Base Program is to achieve an effective integration of emergency planning and preparedness requirements into an emergency management program that provides capabilities for all emergency responses through communication, coordination, and an efficient and effective use of resources, that is commensurate with the hazards present at that facility, site, or activity.

DOE Order 151.C requires that a Hazards Survey be prepared, maintained, and used for emergency planning purposes. The Order requires that emergency management efforts begin with the identification and qualitative assessment of the facility- or site-specific hazards and the associated emergency conditions that may require response, and that the scope and extent of emergency planning and preparedness reflect these facility-specific hazards. Hazards Surveys are used to:

- identify the generic emergency conditions that apply to each facility;
- qualitatively describe the potential health, safety, or environmental impacts of the applicable emergencies;
- identify the applicable planning and preparedness requirements; and
- indicate the need for further evaluation of hazardous materials in an Emergency Planning Hazards Assessment (EPHA).

Some facilities have been analyzed as stand-alone facilities; however, several structures or component units with common or related purposes have been combined into a facility- or complex-wide hazards survey. Each facility- or complex-specific hazards survey clearly identifies the facility and describes the facility's mission, operations, and physical characteristics.

Using the knowledge and insights gained through the Hazards Survey and EPHA processes, the emergency management organization at each NNSA site or facility develops detailed plans and procedures and trains the staff to carry out response actions to reduce the severity of hazardous material release events and to minimize health impacts.

The Response Activities of the Emergency Management Program that would come into play should an operational emergency occur would include many of the following elements, depending on the specific circumstances:

Emergency Response Organization (ERO). The ERO is structured to enable it to assume overall responsibility for initial and ongoing site actions associated with the emergency response and mitigation. The ERO establishes effective control at the event/incident scene and integrates local agencies and organizations providing onsite response services.

Offsite response interfaces. DOE Order 151.1C requires coordination with tribal, state, and local agencies and organizations responsible for offsite emergency response. Interrelationships and interfaces for fire, HAZMET, medical, and law enforcement and mutual assistance and support are pre-arranged and documented in various formal plans, agreements, and memoranda of understanding.

Emergency facilities and equipment. The EPHA is used to assist in determining the types and amounts of personal protective equipment, radiation monitoring, communications, and other equipment and supplies required to be maintained and operable for immediate use in responding to an operational emergency. Facilities established for either dedicated permanent use or on an ad hoc basis depending on the specific type and location of the operational emergency can include Emergency Operations Centers (EOCs), Command Centers, and Joint Information Centers. Departmental assets that may be required in the event of an operational emergency involving nuclear weapons, weapons components, or the dispersal of special nuclear materials include the Accident Response Group, Nuclear Emergency Search Team, Federal Radiological Monitoring and Assessment Center, Aerial Measuring System, Atmospheric Advisory Capability, Radiological Emergency Assistance Center/Training Site, and the Radiological Assistance Program.

Emergency categorization and classification. DOE Order 151.1C and the associated Emergency Management Guide (DOE G 151.1-1A) require a DOE site or facility to declare an operational emergency when unplanned or abnormal events or conditions require time-urgent response from outside the immediate affected site, facility, or area of the incident. Events or conditions meeting the criteria for categorization as operational emergencies are those events or conditions that have the potential to cause: serious health or safety impacts to workers or the public; serious detrimental effects on the environment; direct harm to people or the environment as a result of degradation of security or safeguards conditions; direct harm to people or the environment as a result of a major degradation of safety systems, protocols, or practices involving hazardous biological agents or toxins; or loss of control over hazardous materials (for example, toxic chemicals or radioactive materials). NNSA sites or facilities are also required to classify an operational emergency that involves the loss of control over hazardous materials resulting in an actual or potential airborne release to the environment (outside a structure or enclosure on an NNSA facility or site) as either an Alert, Site Area Emergency, or General Emergency, in order of increasing severity.

Notifications and communications. The accurate, timely, and useful exchange of information during an emergency response is a key factor in understanding the scope of an emergency and providing proper response to limit its impacts. Emergency reporting includes initial notifications to onsite personnel, emergency response personnel, and offsite authorities including applicable NNSA elements; other Federal Agencies; and local, state, and tribal government organizations, and follow-on emergency status updates.

Consequent assessment. Consequence assessment includes all processes utilized to perform data collection and analysis necessary to support critical initial assessments and the continuing processes of refining the assessments as more information and additional resources become available. These can involve monitoring for specific indicators or field measurements and the integration of monitoring data with calculations and modeling capabilities. Consequence assessment is integrated with both event classification and protective action decision making and can include coordination with offsite entities including federal, state, local, and tribal organizations.

Protective actions and re-entry. Protective actions can be implemented either individually or in combination to reduce exposure of the workforce and the public to special nuclear materials or other hazardous materials. These can include:

- Controlling, monitoring, and maintaining records of personnel exposure to radiological and nonradiological hazardous materials;
- Sheltering or evaluation;
- Turning off heating, ventilation, and air conditioning systems during sheltering;
- Controlling access to contaminated areas and decontaminating personnel or equipment exiting the area;
- Controlling foodstuffs and water, or changing livestock and agricultural practices; and
- Developing and deploying for use in protective action decision making prepared Protective Action Guides and Emergency Response Planning Guidelines using DOE-approved guidance applicable to the actual or potential release of hazardous materials.

Planning and executing re-entry activities must include establishing adequate measures for the protection of response personnel from unnecessary exposure to hazardous materials or conditions either known or suspected to exist at the site of the accident or incident.

Emergency medical support. Emergency medical support includes providing various levels of treatment to those who may become injured or contaminated and arranging with offsite medical facilities to transport, accept, and treat contaminated, injured personnel. DOE Order 440.1A establishes requirements for facility and site medical programs required to meet the provisions of 10 CFR 851.210, *Occupational Medicine*, and addresses the medical organization, facilities and equipment, communications planning, and preparedness activities considered necessary for providing the medical treatment and access to medical services for mass casualty situations and medical response to an operational emergency involving contamination.

Emergency public information. The Emergency Public Information program plays a critical role in establishing and maintaining coordination with tribal, state, and local governments and the public. The program is expected to provide timely, candid, and accurate information to the workforce, the news media, and the public during an operational emergency. Providing accurate and factual health and safety information and security information helps to avoid and discourage speculation. The elements of an effective program can be pre-established by developing appropriate broadcast and print media interfaces, establishing a system for assembling and releasing emergency information that may include set-up of a Joint Information Center with representatives of offsite organizations, and conducting various drills and exercises that include exercising various Emergency Public Information program systems to educate the press and the public.

Termination and recovery. An operational emergency is terminated only after a predetermined set of criteria is met and in many scenarios, termination must be coordinated with various offsite agencies. The various pathways and timelines for recovery and resumption of normal operations must be developed to ensure the health and safety of the work force and the public. Actions may include the creation of a recovery organization to manage the conduct of recovery operations and to maintain communication and coordination with local, state, and tribal organizations, and other federal agencies providing support at the site. Specific recovery procedures may include dissemination of information to federal, state, tribal, and local organizations regarding the emergency and conditions required for the relaxation of public protection measures; planning and conducting decontamination actions; development and compliance with reporting requirements; and the creation of processes and procedures to guide the resumption of normal operations. Recovery also specifically includes the evaluation of the accident or incident and the response to identify lessons learned and develop potential means to mitigate the effects of future operational emergencies.

B.12.3.3.3 Progressive Recovery Through Long-Term Response

The recovery phase of an operational emergency in which radioactive materials are dispersed over a wide area could require years to complete and might require an extended response by NNSA. The specific requirements for an extended response would be dictated by the circumstances. Requirements may include a continuing coordination with local authorities and various government agencies to continue protective actions and controls; long-term monitoring of the affected environment, population, or both for effects attributable to the operational emergency; providing medical support for affected individuals; maintaining public information and various technical and other response interfaces; and performing periodic reassessments and evaluations of progress in the recovery and return to more normal conditions.

B.13 TRANSPORTATION

B.13.1 Description of Affected Resources and Region of Influence

Transportation routes in the vicinity of the proposed Complex Transformation location have been identified, in text and on a map, to indicate which highways would be impacted by Complex Transformation traffic, including commuters and shipments. Traffic data, such as annual average daily traffic, is presented as a baseline for a subsequent qualitative analysis of increased traffic congestion. Traffic data has been derived from recent DOE environmental documentation or from state agencies.

B.13.2 Description of Impact Assessment

The Complex Transformation SPEIS assesses the impacts associated with the transportation of radiological materials and workers as described below. The methodology for both the programmatic alternatives and project-specific alternatives was the same.

B.13.2.1 *Incident-Free Transportation Impacts*

The amount of radiological material requiring transportation was first determined based on information from the Complex Transformation alternative data report [NNSA 2007]. Next, using the RADTRAN 5 code, routes and routing characteristics were determined for the origin-destination pairs associated with the transportation of radiological material.

Radiological dose during normal, incident-free transportation of radioactive materials results from exposure to the external radiation field that surrounds the shipping containers. The dose is a function of the number of people exposed, their proximity to the containers, their length of time of exposure, and the intensity of the radiation field surrounding the containers. For the purpose of providing a conservative estimate of impacts, exposure rates assumed exposure rates of five millirem per hour. This assumption is much higher than assumptions utilized in the handling/loading analysis of pits and canned subassemblies (CSAs) provided in the *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*. In that FEIS, an external exposure rate of one millirem per hour was assumed (DOE 1996).

Loading operations typically represent the largest exposure impacts involved with the transportation of nuclear materials. NNSA assumed that loading operations would require one shift-day for each truck trailer loaded. A shift-day would represent a crew of five workers exposed to the load for eight hours. Estimation of loading operation impacts of other materials and waste products was based on the size and number of packages per load.

Radiological impacts were determined for crew workers and the general population during normal, incident-free transportation. For shipments, the crew was defined as the driver and passenger of the shipment vehicles. The general population was the individuals within 800 meters (2,625 feet) of the road, sharing the road, and at stops. Collective doses for the crew and general population were calculated using the RADTRAN 5.6/RadCat 2.3 computer codes (Weiner et al. 2006).

For the worker populations, DOE evaluated the following scenario:

- A truck driver and passenger, serving as an escort, that would be expected to drive radioactive shipments for 1,000 hours per year and unload shipments for 1,000 hour per year.

For shipments, the three scenarios for members of the public were:

- A person caught in traffic and located 1 meter (3 feet) away from the surface of the shipping container for 30 minutes;
- A service station worker working at a distance of 20 meters (66 feet) from the shipping container for 1 hour; and,
- A resident living 30 meters (98 feet) from the highway used to transport the shipping container.

The hypothetical maximum exposed individual doses were accumulated for all shipments over one year. For workers, it was assumed that they would be exposed to 23 percent of the shipments, based on working 2,000 hours per year. However, for the scenario involving an individual caught in traffic next to a truck, the radiological exposures were calculated for only one event because it was considered unlikely that the same individual would be caught in traffic next to all containers for all shipments. The maximum exposed transportation worker is the driver who was assumed to drive shipments for up to 1,000 hours per year. In the maximum exposed individual scenarios, the exposure rate for the shipments depended on the type of material being transported. Also, the maximum exposure rate for the truck driver was two millirem per hour (10 CFR 71.47[b] [4]).

Incident-free nonradiological fatalities were estimated using unit risk factors. These fatalities would result from exhaust and fugitive dust emissions from highway and rail traffic and are associated with 10-micrometer particles. The nonradiological unit risk factors were adopted from the transportation analysis conducted for the Final West Valley Demonstration Waste Management EIS (DOE 2003). The unit risk factors used in this analysis was 1.5×10^{-11} fatalities per kilometer per persons per square kilometer for diesel truck transport.

B.13.2.2 *Transportation Accidents*

The offsite transportation accident analysis considers the impacts of accidents during the transportation of radiological materials. Under accident conditions, impacts to human health and the environment may result from the release and dispersal of radioactive material. Accidents that could potentially breach the shipping container are represented by a spectrum of accident severities and radioactive release conditions. Historically, most transportation accidents involving radioactive materials have resulted in little or no release of radioactive material from the shipping container. Consequently, the analysis of accident risks takes into account a spectrum of accidents ranging from high-probability accidents of low severity to hypothetical high-severity accidents that have a correspondingly low probability of occurrence. This accident analysis calculates the probabilities and consequences from this spectrum of accidents.

To provide NNSA and the public with a reasonable assessment of radioactive waste transportation accident impacts, two types of analyses were performed. An accident risk assessment was performed that takes into account the probabilities and consequences of a spectrum of potential accident severities using a methodology developed by the NRC (NRC 1977; Fischer et al. 1987; Sprung et al. 2000). For the spectrum of accidents considered in the analysis, accident consequences in terms of collective dose to the population within 80 kilometers (50 miles) were multiplied by the accident probabilities to yield collective dose risk using the RADTRAN 5.6/RadCat 2.3 computer code (Weiner 2006).

The impacts for specific alternatives were calculated in units of dose (rem or person-rem). Impacts are further expressed as health risks in terms of estimated latent cancer fatalities in exposed populations. The health risk conversion factor of 0.0006 LCF/person-rem was derived from the Interagency Steering Committee on Radiation Standards report (ISCOR 2002), A Method for Estimating Radiation Risk from Total Effective Dose Equivalent (TEDE).

The risk analyses consider a spectrum of accidents of varying severity. Each first determines the conditional probability that the accident will be of a specified severity. Then, based on the accident environment associated with each severe accident, each models the behavior of the material being shipped and the response of the packaging. The models estimate the fraction of each species of radioactive material that might be released for each of the severe accidents being considered.

B.13.2.3 *Traffic Impacts*

Traffic flow has been analyzed to determine whether or not the flow would be adversely impacted by the addition of new commuters at each of the potential sites for both construction and operations phases. The number of new commuters has been determined based on construction and operations employment. The analysis determined the percent change in traffic as a result of the alternatives.

B.14 WASTE MANAGEMENT

B.14.1 Description of Affected Resources and Region of Influence

A key goal of Complex Transformation is to develop a safe, secure, environmentally compliant facilities based on modern manufacturing procedures. Waste minimization is a goal of Complex Transformation. The production of waste requiring offsite disposal will be reduced to as low as reasonably achievable (ALARA) consistent with cost-benefit analyses. Waste minimization and pollution prevention efforts and the management of Complex Transformation-related wastes have been analyzed for each alternative site. The impact assessment addresses the projected waste types and volumes from Complex Transformation facilities and operations at each site compared to the No Action Alternative. The methodology for both the programmatic alternatives and project-specific alternatives was the same.

Wastes generated during Complex Transformation operations would consist of five primary types: transuranic (TRU) waste, low-level waste (LLW), mixed LLW, hazardous waste, and nonhazardous waste. Waste management facilities supporting Complex Transformation operations would treat and package the waste into forms that would enable long-term storage or disposal. Other waste types generated by Complex Transformation facilities would be transferred to existing facilities and managed in accordance with current practices at the DOE site.

B.14.2 Description of Impact Assessment

To provide a framework for addressing the impacts of waste management for Complex Transformation facilities, descriptive information has been presented on each site’s waste management capabilities. The volumes of each waste type generated are estimated. These estimates, obtained from the Complex Transformation data call, include consideration of concepts for waste minimization. Impacts have been assessed in the context of existing site practices for treatment, storage, and disposal including the applicable regulatory requirements. Permits, compliance agreements, and other site-specific practices have been reviewed and analyzed to assess the ability to conduct the Complex Transformation-related waste management activities.

DOE generates both “routine” waste (e.g., job control, maintenance) and waste associated with Environmental Restoration (ER) and Decontamination and Decommissioning (D&D) activities. The ER/D&D waste volumes can vary greatly from year to year and often exceed the routine waste volumes. ER/D&D waste is fundamentally different (more volume, less contamination) from routine wastes and is frequently managed at separate facilities. The estimated waste volumes for Complex Transformation operations have been compared to the routine waste generation at each site to identify potential impacts to the site's waste management infrastructure.

For any alternatives that generate TRU waste, the number of additional shipments required to transport TRU waste to the Waste Isolation Pilot Plant (WIPP) was estimated and the impacts assessed as part of the transportation analysis. The SPEIS acknowledges that the total disposal capacity at WIPP is limited to 6,180,000 ft^3 under the *WIPP Land Management Act*. However, DOE continues to recognize that the amount of TRU waste to be disposed of could exceed these volumes. In the future, if inventory projects show a need for additional disposal capacity for TRU waste, DOE would initiate the development of strategies for expanding such capacity at an appropriate time. However, because DOE has made no plans to date regarding the location or design of a waste disposal facility for TRU waste beyond WIPP's current capacity, this SPEIS assumed WIPP as the disposal location for TRU waste generated under each alternative, for the purposes of transportation analysis only.

For sites under consideration for Complex Transformation that do not have existing or planned onsite LLW disposal, the number of additional shipments required to transport LLW from the site to a DOE LLW disposal facility has been estimated. For example, for purposes of this analysis, it is assumed that the Pantex Plant would ship its LLW to the Nevada Test Site (NTS) as per current practice. The risks associated with additional LLW shipments have been addressed as part of the transportation impacts assessment.

B.15 CUMULATIVE IMPACTS

The Council on Environmental Quality (CEQ) regulations implementing NEPA define cumulative effects as "the impact on the environment which results from the 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). The regulations further explain "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Other DOE programs and other Federal, State, and local development programs all have the potential to contribute to cumulative effects on DOE sites.

The methodology for the analysis of cumulative effects for the Complex Transformation SPEIS was developed from the guidelines and methodology in the CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act*. The major components of the CEQ methodology include:

- Scoping, including identifying the significant potential cumulative effects issues associated with the proposed action, and identifying other actions affecting the resources;
- Describing the affected environment; and
- Determining the environmental consequences, including the impacts from the proposed action and other activities in the ROI, and the magnitude and significance of the cumulative effects

The cumulative effects of the Complex Transformation SPEIS alternatives have been analyzed for each alternative site by reviewing and analyzing data from existing NEPA documents and other DOE documents. To update the data and to supplement this information, Internet searches, literature reviews of environmental documents for the regions surrounding the proposed sites, and personal contacts with local government planning departments have been undertaken, as needed, to obtain information on the potential cumulative effects for each resource area. For some resource areas, the analysis includes the cumulative regional impacts. For example, the air analysis must examine air quality in the region for each potential site in order to access the impacts of the proposed action.

Environmental impacts for other DOE programs and other Federal, State, and local development programs for each potential site have been reviewed and the cumulative impacts analyzed. The analysis includes impacts from previous actions at each of the sites and within the region of influence, current actions, and actions planned for reasonably foreseeable future actions. These impacts, combined with the impacts from the Complex Transformation SPEIS, form the basis of the analysis of cumulative effects. Where possible, quantifiable data is used. The level of analysis for each resource area is commensurate to the importance of the potential cumulative impacts on that resource. The data and analysis are then summarized and potential cumulative impacts for each site identified. For the project-specific analyses, because impacts were generally very small relative to existing operations at sites, the analysis of the additive project-specific impacts to the site baseline was tantamount to a cumulative assessment.

Appendix C
HUMAN HEALTH AND ACCIDENTS

Appendix C
HUMAN HEALTH, SAFETY, AND ACCIDENTS

This appendix to the Complex Transformation Supplemental Programmatic Environmental Impact Statement *(SPEIS) provides supplemental information pertaining to potential human health impacts associated with radiation exposures, chemical exposures, accidents, and worker safety issues due to operations of the major facilities (as identified in Chapter 3) associated with the programmatic alternatives analyzed. Located at the end of this appendix is a separate reference section.*

C.1 RADIOLOGICAL IMPACTS ON HUMAN HEALTH

C.1.1 Radiation and Radioactivity

Humans are constantly exposed to naturally occurring radiation through sources such as from the universe and from the Earth's rocks and soils. This type of radiation is referred to as *background radiation* and it is always around us. Background radiation remains relatively constant over time and is present in the environment today just as it was hundreds of years ago. In addition, humans are also exposed to manmade sources of radiation, including medical and dental x-rays, household smoke detectors, materials released from coal burning power plants, and nuclear facilities. The following sections describe some important principles concerning the nature, types, sources, and effects of radiation and radioactivity.

C.1.1.1 *What Is Radiation?*

Some atoms have large amounts of energy and are inherently unstable. They may reach a stable, less energetic state through the emission of subatomic particles or electromagnetic radiation, a process referred to as radioactivity. The main subatomic particles that comprise an atom are electrons, protons, and neutrons. *Electrons* are negatively charged particles that are principally responsible for chemical reactivity. *Protons* are positively charged particles, and *neutrons* are neutral. Protons and neutrons are located in the center of the atom, called the nucleus. Electrons reside in a designated space around the *nucleus*. The total number of protons in an atom is called its *atomic number*.

Atoms of different types are known as elements. There are more than 100 natural and manmade elements. Atoms of the same element always contain the same number of protons and electrons, but may differ by their number of constituent neutrons. Such atoms of elements having a different number of neutrons are called the *isotopes* of the element. The total number of protons and neutrons in the nucleus of an atom is called its *mass number,* which is used to identify the isotope. For example, the element uranium has 92 protons. Therefore, all isotopes of uranium have 92 protons. Each isotope of uranium is designated by its unique mass number: ^{238}U, the principal naturally occurring isotope of uranium, has 92 protons and 146 neutrons; ^{234}U has 92 protons and 142 neutrons; and ^{235}U has 92 protons and 143 neutrons. Atoms can lose or gain electrons in a process known as *ionization*.

Ionizing radiation has enough energy to free electrons from atoms, creating ions that can cause biological damage. Although it is potentially harmful to human health, ionizing radiation is used in a variety of ways, many of which are familiar to us in our everyday lives. An x-ray machine is one source of ionizing radiation. Likewise, most home smoke detectors use a small source of ionizing radiation to detect smoke particles in the room's air. The two most common mechanisms in which ionizing radiation is generated are the electrical acceleration of atomic particles such as electrons (as in x-ray machines) and the emission of energy from nuclear reactions in atoms. Examples of ionizing radiation include alpha, beta, and gamma radiation.

Alpha radiation occurs when a particle consisting of two protons and two neutrons is emitted from the nucleus of an unstable atom. Alpha particles, because of their relatively large size, do not travel very far and do not penetrate materials well. Alpha particles lose their energy almost as soon as they collide with anything, and therefore a sheet of notebook paper or the skin's surface can be used to block the penetration of most alpha particles. Alpha emitters only become a source of radiation dose after they are inhaled, ingested, or otherwise taken into the body.

Beta radiation occurs when an electron or positron is emitted from an atom. Beta particles are much lighter than alpha particles and therefore can travel faster and farther. Greater precautions must be taken to guard against beta radiation and some shielding is usually recommended to limit exposure to beta radiation. Beta particles can pass through a sheet of paper but can be stopped by a thin sheet of aluminum foil or glass. Most of the radiation dose from beta particles occurs in the first tissue they penetrate, such as the skin, or dose may occur as the result of internal deposition of beta emitters.

Gamma and *x-ray radiation* are known as electromagnetic radiation and are emitted as energy packets called *photons*, similar to light and radio waves, but from a different energy region of the electromagnetic spectrum. Gamma rays and x-rays are the most penetrating type of radiation. Gamma rays are emitted from the nucleus as waves of pure energy, whereas x-rays originate from the electron field surrounding the nucleus. Gamma rays travel at the speed of light, and because they are so penetrating, concrete, lead, or steel is required to shield them. The amount of shielding required, depends upon the energy and intensity of the gamma or x-radiation. For example, to absorb 95 percent of the gamma radiation from a ^{60}Co source, 6 centimeters of lead, 10 centimeters of iron, or 33 centimeters of concrete would be needed.

The neutron is another particle that contributes to radiation exposure, both directly and indirectly. Indirect exposure results from gamma rays and alpha particles that are emitted after neutrons are captured in matter. A neutron has about one quarter of the weight of an alpha particle and can travel 2.5 times faster than an alpha particle. Neutrons are less penetrating than gamma rays because they have mass, but neutrons are more penetrating than beta particles because they are uncharged. They can be shielded effectively by water, graphite, paraffin, or concrete.

Some elements, such as uranium, radium, plutonium, and thorium, share a common characteristic: they are unstable or radioactive. Such radioactive isotopes are called *radionuclides* or *radioisotopes*. As these elements attempt to change into more stable forms, they emit invisible rays of energy or particles at rates which decrease with time. This emission is known as radioactive decay. The time it takes a material to lose half of its original radioactivity is referred to as its half-life. Each radioactive isotope has a characteristic half-life. The half-life may vary from a millionth of a second to millions of years, depending upon the radionuclide. Eventually, the radioactivity will essentially disappear.

As a radioactive element emits radioactivity, it often changes into an entirely different element that may or may not be radioactive. Eventually, however, a stable element is formed. This transformation may require several steps, known as a decay chain. Radium, for example, is a naturally occurring radioactive element with a half-life of 1,622 years. It emits an alpha particle and becomes radon, a radioactive gas with a half-life of only 3.8 days. Radon decays to polonium and, through a series of steps, to bismuth, and ultimately to lead.

Nonionizing radiation bounces off or passes through matter without displacing electrons. Examples include visible light and radio waves. At this time, scientists are unclear as to the effects of nonionizing radiation on human health. In this SPEIS, the term radiation is used to describe ionizing radiation.

C.1.1.2 *How Is Radiation Measured?*

Scientists and engineers use a variety of units to quantify the measurement of radiation. These different units can be used to determine the amount, and intensity of radiation. Radiation is usually measured in *curies*, *rads*, or *rems*. The *curie* describes the activity of radioactive material. One curie is equal to 3.7×10^{10} disintegrations (decays) per second.

Absorbed radiation dose is the amount of energy deposited in a unit mass of material, such as a gram of tissue. Radiation dose is expressed in units of *rad*. One rad is 0.01 joule of energy deposited per kilogram of absorbing material. A joule is a very small amount of energy. For example, a 60-watt light bulb on for about 0.02 seconds would use one joule of energy.

A *rem* is a unit of equivalent dose, which is the absorbed dose modified by a weighting factor to account for the relative biological effectiveness of different types of radiation. The rem is used to measure the effects of radiation on the body. As such, one rem of one type of radiation is presumed to have the same biological effects as one rem of any other type of radiation. This standard allows comparison of the biological effects of different types of radiation. Note that the term millirem (mrem) is also often used. A millirem is one one-thousandth (0.001) of a rem.

C.1.1.3 *How Does Radiation Affect the Human Body?*

Ionizing radiation affects the body through two basic mechanisms. The ionization of atoms can generate chemical changes in body fluids and cellular material. Also, in some cases the amount of energy transferred can be sufficient to actually knock an atom out of its chemical bonds, again resulting in chemical changes. These chemical changes can lead to alteration or disruption of the normal function of the affected area. At low levels of exposure, such as the levels experienced in an occupational or environmental setting, these chemical changes are very small and ineffective. The body has a wide variety of mechanisms that repair the damage induced. However, occasionally, these changes can cause irreparable damage that could ultimately lead to initiation of a cancer, or change to genetic material that could be passed to the next generation. The probability for the occurrence of health effects of this nature depends upon the type and amount of radiation received, and the sensitivity of the part of the body receiving the dose.

At much higher levels of acute whole-body exposure, at least 10–20 times higher than the legal limits for occupational exposures (the limit for annual occupational exposures is 5 rem); damage is much more immediate, direct, and observable. Health effects range from reversible changes in the blood to vomiting, loss of hair, temporary or permanent sterility, and other changes leading ultimately to death at acute exposures (above about 100 times the regulatory limits). In these cases, the severity of the health effect is dependent upon the amount and type of radiation received. Exposures to radiation at these levels are quite rare.

For low levels of radiation exposure, the probabilities for induction of various cancers or genetic effects have been extensively studied by both national and international expert groups. The problem is that the potential for health effects at low levels is extremely difficult to determine without extremely large, well-characterized populations. For example, to get a statistically valid estimate of the number of cancers caused by an external dose equivalent of 1 rem, 10 million people would be required for the test group, with another 10 million for the control group. The risk factors for radiation-induced cancer at low levels of exposure are very small, and it is extremely important to account for the many nonradiation-related mechanisms for cancer induction, such as smoking, diet, lifestyle, chemical exposure, and genetic predisposition. Refer to the Glossary (Chapter 13) for the definition of risk. These multiple factors also make it difficult to establish cause-and-effect relationships that could attribute high or low cancer rates to specific initiators.

The most significant ill-health effects that result from environmental and occupational radiation exposure are cancer fatalities. These ill-health effects are referred to as “latent” cancer fatalities (LCFs) because the cancer may take many years to develop and for death to occur. Furthermore, when death does occur, these ill-health effects may not actually have been the cause of death.

Health impacts from radiation exposure, whether from sources external or internal to the body, generally are identified as somatic (affecting the individual exposed) or genetic (affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects rather than genetic effects. The somatic risks of most importance are the induction of cancers.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues. The thyroid and skin demonstrate a greater sensitivity than other organs; however, such cancers also produce relatively low mortality rates because they are relatively amenable to medical treatment.

C.1.1.4 *What Are Some Types of Radiation Dose Measurements?*

The amount of ionizing radiation that the individual receives during the exposure is referred to as *dose*. An external dose is delivered only during the actual time of exposure to the external radiation source. An internal dose, however, continues to be delivered as long as the radioactive material is in the body, although both radioactive decay and elimination of the radionuclide by ordinary metabolic processes decrease the dose rate with the passage of time. The measurement of radiation dose is called *radiation dosimetry* and is completed by a variety of methods depending upon the characteristics of the incident radiation. External radiation is measured as a value called deep dose equivalent. Internal radiation is measured in terms of the committed effective dose equivalent (CEDE). The sum of the two contributions (deep dose equivalent and CEDE) provides the total dose to the individual, called the total effective dose equivalent (TEDE). Often the radiation dose to a selected group or population is of interest and is referred to as the collective dose equivalent, with the measurement units of *person-rem*.

C.1.1.5 *What Are Some Sources of Radiation?*

Several different sources of radiation have been identified. Most sources are naturally occurring, or background sources, which can be categorized as cosmic, terrestrial, or internal radiation sources. Manmade radiation sources include consumer products, medical sources, and other miscellaneous sources. The average American receives a total of about 360 millirem per year from all sources of radiation, both natural and manmade (ATSDR/CDC 2006).

Cosmic radiation is ionizing radiation resulting from energetically charged particles from space that continuously hit the Earth’s atmosphere. These particles and the secondary particles and photons they create are referred to as cosmic radiation. Because the atmosphere provides some shielding against cosmic radiation, the intensity of this radiation increases with altitude above sea level. For example, a person in Denver, CO, is exposed to more cosmic radiation than a person in New Orleans, LA. The average annual dose from cosmic radiation to a person in the United States is about 27 millirem.

Terrestrial radiation is emitted from the radioactive materials in the Earth’s rocks, soils, and minerals. Radon, radon progeny, potassium, isotopes of thorium, and isotopes of uranium are the elements responsible for most terrestrial radiation. The average annual dose from terrestrial radiation is about 28 millirem, but the dose varies geographically across the country. Typically, reported values are about 16 millirem on the Atlantic and Gulf coastal plains and about 63 millirem on the eastern slopes of the Rocky Mountains.

Internal radiation arises from the human body metabolizing natural radioactive material that has entered the body by inhalation, ingestion, or through an open wound. Natural radionuclides in the body include isotopes of uranium, thorium, radium, radon, bismuth, polonium, potassium, rubidium, and carbon. The major contributors to the annual dose equivalent for internal radioactivity are the short-lived decay products of radon which contribute about 200 millirem per year. The average dose from other internal radionuclides is about 39 millirem per year, most of which results from potassium-40 and polonium-210. Internal exposure can also come from man-made radiation; not only “natural.” (Ingestion is primarily associated with natural radioactive materials [e.g., K-40]. Inhalation is associated with both natural and manmade radioactive materials with the dose delivered to the bronchii of the lungs—without the body metabolizing the material. Open wounds are primarily a concern for internal radiation exposure resulting from occupational settings.)

Consumer products also contain sources of ionizing radiation. In some products, like smoke detectors and airport x-ray machines, the radiation source is essential to the operation of the product. In other products, such as televisions and tobacco products, the radiation occurs incidentally to the product function. The average annual dose from consumer products is about 10 mrem.

Medical source radiation is an important diagnostic tool and is the main source of exposure to the public from manmade radiation. Exposure is deliberate and directly beneficial to the patient exposed. In general, medical exposures from diagnostic or therapeutic x-rays result from beams directed to specific areas of the body. Thus, all body organs generally are not irradiated uniformly. Nuclear medicine examinations and treatments involve the internal administration of radioactive compounds or radiopharmaceuticals by injection, inhalation, consumption, or insertion. Even then, radionuclides are not distributed uniformly throughout the body. Radiation and radioactive materials also are used in the preparation of medical instruments, including the sterilization of heat-sensitive products such as plastic heart valves. Diagnostic x-rays result in an average annual exposure of 39 millirem. Nuclear medical procedures result in an average annual exposure of 14 millirem. It is recognized that the averaging of medical doses over the entire population does not account for the potentially significant variations in annual dose among individuals, where greater doses are received by older or less healthy members of the population.

A few additional sources of radiation contribute minor doses to individuals in the United States. The doses from nuclear fuel cycle facilities, such as uranium mines, mills, and fuel processing plants, nuclear power plants, and transportation routes have been established to be less than 1 mrem per year. Radioactive fallout from atmospheric atomic bomb tests, emissions of radioactive material from U.S. Department of Energy (DOE) facilities, emissions from certain mineral extraction facilities, and transportation of radioactive materials contributes less than 1 mrem per year to the average individual dose. Air travel contributes approximately 1 mrem per year to the average dose.

C.1.2 Radioactive Materials in This SPEIS

The release of radiological contaminants into the environment at National Nuclear Security Administration (NNSA) sites occurs as a result of nuclear weapons production, research and development, maintenance, and waste management activities. This section describes the primary types of radioactive sources at NNSA sites, how DOE regulates radiation and radioactive materials, and the data sources and methodologies used to evaluate the potential health effects of radiation exposure to the worker and public.

C.1.2.1 *What Are Some Sources That May Lead to Radiation Exposure?*

Historically, NNSA has conducted many operations that involve the use of uranium, plutonium, tritium, and other radionulides. These have included nuclear material production; recovery and recycle operations; purification processes; and metal forming, machining, and material handling operations. The releases from these operations consisted primarily of particulates, liquids, fumes, and vapors.

Airborne emissions contribute to the potential for radiation dose at, and around, NNSA sites with operations involving radioactive materials. National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations specify that any source that potentially can contribute greater than 0.1 mrem per year TEDE to an offsite individual is to be considered a "major source" and emissions from that source must be continuously sampled. As such, there are a number of process exhaust stacks at NNSA sites that are considered major sources.

In addition to major sources, there are a number of minor sources that have the potential to emit radionuclides to the atmosphere. Minor sources are composed of any ventilation systems or components such as vents, laboratory hoods, room exhausts, and stacks that do not meet the criteria for a major source but are located in or vent from a radiological control area. Emissions from NNSA facility ventilation systems are estimated from radiation control data collected on airborne radioactivity concentrations in the work areas. Other emissions from unmonitored processes and laboratory exhausts are categorized as minor emission sources. Additionally, as explained in Section C.3, accidents can release radionuclides that can result in radiation exposure.

In addition, there are also areas of potential fugitive and diffuse sources at NNSA sites, such as contaminated soils and structures. Diffuse and fugitive sources include any source that is spatially distributed, diffuse in nature, or not emitted with forced air from a stack, vent, or other confined conduit. Radionuclides are transported entirely by diffusion or thermally driven air currents. Typical examples include emissions from building breathing; resuspension of contaminated soils, debris, or other materials; unventilated tanks; ponds, lakes, and streams; wastewater treatment systems; outdoor storage and processing areas; and leaks in piping, valves, or other process equipment.

Liquid discharges are another source of radiation release and exposure. Three types of liquid discharge sources at NNSA sites include treatment facilities, other point- and area-source discharges, and in-stream locations. A radiological monitoring plan is in place at NNSA sites required to address compliance with DOE orders and National Pollutant Discharge Elimination System (NPDES) Permits. Radiological monitoring of storm water is also usually required by the applicable NPDES permits.

C.1.2.2 *How Is Radiation Exposure Regulated?*

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by the DOE for its contractor facilities. Under conditions of the *Atomic Energy Act* (as amended by the *Price-Anderson Amendments Act* of 1988), DOE is authorized to establish Federal rules controlling radiological activities at the DOE sites. The act also authorizes DOE to impose civil and criminal penalties for violations of these requirements. Some NNSA activities are also regulated through a DOE Directives System that is contractually enforced.

Occupational radiation protection is regulated by 10 CFR Part 835, Occupational Radiation Protection. DOE has set occupational dose limits for an individual worker at 5,000 millirem per year. NNSA sites have set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material as low as reasonably achievable (ALARA).

Environmental radiation protection is currently regulated contractually with DOE Order 5400.5, Radiation Protection of the Public and the Environment. This Order is applicable to all DOE/NNSA contractor entities managing radioactive materials. This Order sets annual dose standards to members of the public, as a consequence of routine DOE operations, of 100 millirem through all exposure pathways. The Order requires that no member of the public receive an annual dose greater than 10 millirem from the airborne pathway and 4 millirem from ingestion of drinking water. In addition, the dose requirements in the Radionuclide National Emission Standards for Hazardous Air Pollutants (Rad-NESHAP) limit exposure of an individual member of the public to airborne releases of radionuclides to a maximum of 10 millirem per year.

Limits of exposure to members of the public and radiation workers are derived from International Commission on Radiological Protection (ICRP) recommendations. The U.S. Environmental Protection Agency (EPA) uses the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection recommendations and sets specific annual exposure limits (usually less than those specified by the Commission) in *Radiation Protection Guidance to Federal Agencies* documents.

Each regulatory organization then establishes its own set of radiation standards. The various exposure limits set by DOE and the EPA for radiation workers and members of the public are given in Table C.1-1.

Table C.1-1—Exposure Limits for Members of the Public and Radiation Workers

Guidance Criteria (organization)	Public Exposure Limit at the Site Boundary	Worker Exposure Limit
10 CFR Part 835 (DOE)	--	5,000 millirem per year [a]
10 CFR 835.1002 (DOE)	--	1,000 millirem per year [b]
DOE Order 5400.5 (DOE) [c]	10 millirem per year (all air pathways) 4 millirem per year (drinking water pathways) 100 millirem per year (all pathways)	--
40 CFR Part 61 (EPA)	10 millirem per year (all air pathways)	--
40 CFR Part 141 (EPA)	4 millirem per year (drinking water pathways)	--

[a] Although this is a limit (or level) that is enforced by DOE, worker doses must be managed in accordance with as low as is reasonably achievable principles. Refer to footnote b.

[b] This is a control level. It was established by DOE to assist in achieving its goal to maintain radiological doses as low as is reasonably achievable. DOE recommends that facilities adopt a more limiting 500 millirem per year Administrative Control.

[c] Derived from 40 CFR Part 61, 40 CFR Part 141, and 10 CFR Part 20.

C.1.2.3 *Data Sources Used To Evaluate Public Health Consequences From Routine Operations*

Because NNSA operations have the potential to release measurable quantities of radionuclides to the environment that result in exposure to the worker and the public, NNSA conducts environmental surveillance and monitoring activities at its sites. These activities provide data that are used to evaluate radiation exposures that contribute doses to the public. Each year, environmental data from the NNSA sites are collected and analyzed. The results of these environmental monitoring activities are summarized in an *Annual Site Environmental Report* (ASER). The environmental monitoring conducted at most NNSA sites consists of two major activities: effluent monitoring and environmental surveillance.

Effluent monitoring involves the collection and analysis of samples or measurements of liquid (waterborne) and gaseous (airborne) effluents prior to release into the environment. These analytical data provide the basis for the evaluation and official reporting of contaminants, assessment of radiation and chemical exposures to the public, and demonstration of compliance with applicable standards and permit requirements.

Environmental surveillance data provide a direct measurement of contaminants in air, water, groundwater, soil, food, biota, and other media subsequent to effluent release into the environment. These data verify the NNSA site's compliance status and, combined with data from effluent monitoring, allow the determination of chemical and radiation dose and exposure assessment of NNSA operations and effects, if any, on the local environment. The effluent and environmental surveillance data presented in the ASERs were used as the primary source of data for the analysis of radiation exposure to the public for the No Action Alternative.

C.1.3 Methodology for Estimating Radiological Impacts

The public health consequences of radionuclides released to the atmosphere from normal operations at NNSA sites are characterized and calculated in the applicable ASER. Radiation doses are calculated for the maximally exposed individual (MEI) and the entire population residing within 50 miles of the center of the site. In this SPEIS, dose calculations from normal operations were made using the CAP-88 package of computer codes, version 3 (EPA 2008), which was developed under EPA sponsorship to demonstrate compliance with 40 CFR Part 61, Subpart H, which governs the emissions of radionuclides other than radon from DOE facilities. This package implements a steady-state Gaussian plume atmospheric dispersion model to calculate concentrations of radionuclides in the air and on the ground and uses Regulatory Guide 1.109 (NRC 1977) food-chain models to calculate radionuclide concentrations in foodstuffs (vegetables, meat, and milk) and subsequent intakes by humans.

Meteorological data used in the calculations were in the form of joint frequency distributions of wind direction, wind speed class, and atmospheric stability category. For occupants of residences, the dose calculations assume that the occupant remained at home (actually, unprotected outside the house) during the entire year and obtained food according to the rural pattern defined in the NESHAP background documents (EPA 1989). This pattern specifies that 70 percent of the vegetables and produce, 44.2 percent of the meat, and 39.9 percent of the milk consumed are produced in the local area (e.g., a home garden). The remaining portion of each food is assumed to be produced within 50 miles of the site. The same assumptions are used for occupants of businesses, but the resulting doses are divided by two to compensate for the fact that businesses are occupied for less than one-half a year and that less than one-half of a worker’s food intake occurs at work. For collective effective dose equivalent (EDE) estimates, production of beef, milk, and crops within 50 miles of the site was calculated using production rates provided with CAP-88.

C.1.4 Risk Characterization and Interpretation of Radiological Data

The Interagency Steering Committee on Radiation Standards (Lawrence 2002) recommended a risk estimator of 6×10^{-4} excess (above those naturally occurring) fatal cancers per person-rem of dose in order to assess health effects to the public and to workers. The probability of an individual worker or member of the public contracting a fatal cancer is 6×10^{-7} per millirem. Radiation exposure can also cause nonfatal cancers and genetic disorders. The probability of incidence of these is one third that of a cancer fatality (Lawrence 2002). In this SPEIS, only estimates of potential fatal cancers are presented.

The radiation exposure risk estimators are denoted as excess because they result in fatal cancers above the naturally occurring annual rate, which is 171.4 per 100,000 population nationally (Ries et al. 2002). Thus, approximately 1,714 fatal cancer deaths per year would be expected to naturally occur in the approximately one million people surrounding an NNSA site. The doses to which they are applied is the EDE, which weights the impacts on particular organs so that the dose from radionuclides that affect different organs can be compared on a similar (effect on whole body) risk basis. All doses in this document are effective dose equivalent unless otherwise noted.

The number of latent cancer fatalities (LCFs) in the general population or in the workforce is determined by multiplying 600 LCFs per million person-rem with the calculated collective population dose (person-rem), or calculated collective workforce dose (person-rem). For example, in a population of 100,000 people exposed only to natural background radiation of 0.3 rem per year, 18 cancer fatalities per year would be inferred to be caused by the radiation (100,000 persons x 0.3 rem per year × 0.0006 cancer fatalities per person-rem = 18 cancer fatalities per year).

Sometimes, calculations of the number of excess cancer fatalities associated with radiation exposure do not yield whole numbers and, especially in environmental applications, may yield numbers less than 1.0. For example, if a population of 100,000 were exposed as above, but to a total dose of only 0.001 rem, the collective dose would be 100 person-rem, and the corresponding estimated number of cancer fatalities would be 0.06 (100,000 persons × 0.001 rem × 0.0006 cancer fatalities/person-rem = 0.06 fatal cancers).

A nonintegral number of cancer fatalities such as 0.06 should be interpreted as a statistical estimate. That is, 0.06 is interpreted as the average number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people. In most groups, no person (0 people) would incur a cancer fatality from the 0.001 rem dose each member would have received. In a small fraction of the groups, one fatal cancer would result; in exceptionally few groups, two or more fatal cancers would occur. The average number of deaths over all the groups would be 0.06 fatal cancers (just as the average of 0, 0, 0, and 1 is 1/4, or 0.25). The most likely outcome is zero cancer fatalities.

These same concepts apply to estimating the effects of radiation exposure on a single individual. Consider the effects, for example, of exposure to background radiation over a lifetime. The "number of cancer fatalities" corresponding to a single individual's exposure over a (presumed) 70-year lifetime to 0.3 rem per year is the following:

1 person × 0.3 rem/year × 70 years × 0.0006 cancer fatalities/person-rem = 0.013 cancer fatalities

This could be interpreted that the estimated effect of background radiation exposure on the exposed individual would produce a 1.3 percent chance that the individual might incur a fatal cancer caused by the exposure.

Health effects resulting from exposure to both airborne and waterborne radionuclides may also be evaluated by comparing estimated concentrations to established radionuclide-specific, risk-based concentration values. For example, DOE Order 5400.5 establishes Derived Concentration Guidelines (DCGs) for the inhalation of air and the ingestion of water. The DCG is the concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation) would result in an effective dose equivalent of 100 mrem per year. To ensure that exposure via the drinking water pathway does not exceed four millirem per year, as required by DOE Order 5400.5, four percent of the DCG values are used as comparison values.

Members of the public are assumed to ingest 730 liters per year (2 liters per day) of water or to inhale 8,400 cubic meters per year (23 cubic meters per day) of air. The DCG values are used as reference concentrations for conducting environmental protection programs at DOE sites, as screening values for considering best available technology for treatment of liquid effluents, and for making dose comparisons.

Because fatal cancer is the most probable serious effect of environmental and occupational radiation exposures, this SPEIS presents estimates of LCFs rather than cancer incidence. The numbers of LCFs can be used to compare the risks among the various alternatives. Nonfatal cancers can be estimated by comparing them with the LCF estimates (see Table C.1.4-1).

Table C.1.4-1—Nominal Health Risk Estimators Associated With Exposure to 1 Rem of Ionizing Radiation

Exposed Individual	Fatal Cancer	Nonfatal Cancer
Worker	0.0006	0.0008
Public	0.0006	0.0008

Source: DOE 2002d.

C.1.5 Risk Estimates and Health Effects for Potential Radiation Exposures to Workers

For the purpose of evaluating radiation exposure on an ongoing basis, NNSA workers may be designated as radiation workers, nonradiation workers, or visitors, based upon the potential level of exposure they are expected to encounter in performing their work assignments. For purposes of estimating radiation doses to workers resulting from potential accidents, NNSA looks at involved workers (those workers actually working with radioactive materials) and noninvolved workers (those workers performing other tasks near the involved workers).

Radiation workers have job assignments that place them in proximity to radiation-producing equipment and/or radioactive materials. These workers are trained for unescorted access to radiological areas, and may also be trained radiation workers from another DOE site. These workers are assigned to areas that could potentially contribute to an annual TEDE of more than 100 millirem per year. All trained radiation workers wear dosimeters.

Nonradiation workers are those not currently trained as radiation workers but whose job assignment may require their occasional presence within a radiologically controlled area with an escort. They may be exposed to transient radiation fields as they pass by or through a particular area, but their job assignments are such that annual dose equivalents in excess of 100 millirem are unlikely. Based upon the locations where such personnel work on a daily basis, they may be issued a Personal Nuclear Accident Dosimeter.

Visitors are individuals who are not trained radiation workers and are not expected to receive 100 millirem in a year. Their presence in radiological areas is limited, in terms of time and access. These individuals generally enter specified radiological areas on a limited basis for walk-through or tours with a trained escort. As appropriate, visitors participate in dosimetry monitoring when requested by the hosting division.

C.1.5.1 *NNSA's Radiation Protection Program*

A primary goal of the NNSA Radiation Protection Program is to keep worker exposures to radiation and radioactive material ALARA. Such a program must evaluate both external and internal exposures with the goal to minimize worker radiation dose. The worker radiation dose presented in this SWEIS is the total TEDE incurred by workers as a result of normal operations. This dose is the sum of the external whole body dose, including dose from both photons and neutrons, and internal dose, as required by 10 CFR Part 835. The internal dose is the 50-year CEDE. These values are determined through the NNSA External and Internal Dosimetry Programs.

The External Dosimetry Program at NNSA provides personnel monitoring information necessary to determine the dose equivalent received following external exposure of a person to ionizing radiation. The program is based on the concepts of effective dose equivalent, as described in publications of the ICRP and the International Commission on Radiation Quantities and Units.

Internal dose monitoring programs are conducted at NNSA sites to estimate the quantity and distribution of radionuclides to which a worker may have been exposed. The internal dose monitoring program consists of urinalysis, fecal analysis, lung counting, continuous air monitoring, and retrospective air sampling. Dose assessments are generally based on bioassay data. Bioassay monitoring methods and participation frequencies are required to be established for individuals who are likely to receive intakes that could result in a CEDE that is greater than 100 millirem.

C.2 HAZARDOUS CHEMICAL IMPACTS TO HUMAN HEALTH

C.2.1 Chemicals and Human Health

We use chemicals in our everyday tasks—as pesticides in our gardens, cleaning products in our homes, insulating materials in buildings, and as ingredients in medications. Potentially hazardous chemicals can be found in all of these products, but usually the quantities are not large enough to cause adverse health effects. In contrast to home use, chemicals used in industrial settings are often found in concentrations that may affect the health of individuals in the workplace and in the surrounding community.

For the programmatic alternatives considered in this SPEIS, the chemicals of with the highest hazards were determined to be nitric acid, hydrofluoric acid, formic acid, and chlorine. This determination was based on considerations of vapor pressure, acceptable concentration, and quantity available for release. The following sections describe both the carcinogenic and noncarcinogenic effects of chemicals on the body and how these effects are assessed.

C.2.1.1 *How Do Chemicals Affect the Body?*

Industrial pollutants may be released either intentionally or accidentally to the environment in quantities that could result in health effects to those who come in contact with them. Chemicals that are airborne, or released from stacks and vents, can migrate in the prevailing wind direction for many miles. The public may then be exposed by inhaling chemical vapors or particles of dust contaminated by the pollutants. Additionally, the pollutants may be deposited on the surface soil and biota (plants and animals) and subsequent human exposure could occur. Chemicals may also be released from industries as liquid or solid waste (effluent) and can migrate or be transported from the point of release to a location where exposure could occur.

Exposure is defined as the contact of a person with a chemical or physical agent. For exposure to occur, a chemical source or contaminated media such as soil, water, or air must exist. This source may serve as a point of exposure, or contaminants may be transported away from the source to a point where exposure could occur. In addition, an individual (receptor) must come into either direct or indirect contact with the contaminant. Contact with a chemical can occur through ingestion, inhalation, dermal contact, or external exposure. The exposure may occur over a short (acute or subchronic) or long (chronic) period of time. These methods of contact are typically referred to as exposure routes. The process of assessing all of the methods by which an individual might be exposed to a chemical is referred to as an exposure assessment.

Once an individual is exposed to a hazardous chemical, the body's metabolic processes typically alter the chemical structure of the compound in its efforts to expel the chemical from the system. For example, when compounds are inhaled into the lungs they may be absorbed depending on their size (for particulates) or solubility (for gases and vapors) through the lining of the lungs directly into the blood stream. After absorption, chemicals are distributed in the body and may be metabolized, usually by the liver, into metabolites that may be more toxic than the parent compound. The compound may reach its target tissue, organ, or portion of the body where it will exert an effect, before it is excreted via the kidneys, liver, or lungs. The relative toxicity of a compound is affected by the physical and chemical characteristics of the contaminant, the physical and chemical processes ongoing in the human body and the overall health of an individual. For example, infants, the elderly, and pregnant women are considered more susceptible to certain chemicals.

C.2.2 How Does DOE Regulate Chemical Exposures?

C.2.2.1 *Environmental Protection Standards*

DOE Order 450.1 requires implementation of sound stewardship practices that are protective of the air, water, land, and other natural and cultural resources impacted by the DOE operations and by which DOE cost-effectively meets or exceeds compliance with applicable environmental; public health; and resource protection laws, regulations, executive orders, and DOE requirements. The objective is accomplished by implementing Environmental Management Systems (EMSs) at DOE sites. An EMS is a continuing cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental goals. Applicable Federal and State environmental acts/agreements include:

- *Resource Conservation and Recovery Act* (RCRA)
- *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) as amended by the *Superfund Amendments and Reauthorization Act* (SARA)
- Federal Facility Compliance Agreement
- *Endangered Species Act*
- *Safe Drinking Water Act*
- *Clean Water Act* (CWA)(which resulted in the establishment of the NPDES and pretreatment regulations for Publicly-Owned Treatment Works [POTW])
- *Clean Air Act* (CAA) (Title III, Hazardous Air pollutants Rad-NESHAP, Asbestos NESHAP)
- *Toxic Substances Control Act* (TSCA)
- *Federal Insecticide, Fungicide, and Rodenticide Act*

Many of these acts/agreements include environmental standards that must be met to ensure the protection of the public and the environment. Most of the acts/agreements require completed permit applications in order to treat, store, dispose of, or release contaminants to the environment. The applicable environmental standards and reporting requirements are set forth in the issued permits and must be met to ensure compliance.

The *Emergency Planning and Community Right-To-Know Act*, also referred to as SARA Title III, requires reporting of emergency planning information, hazardous chemical inventories, and environmental releases to Federal, State, and local authorities. The annual Toxics Release Inventory report addresses releases of toxic chemicals into the environment, waste management activities, and pollution prevention activities associated with those chemicals.

C.2.2.2 *Regulated Occupational Exposure Limits*

Occupational limits for hazardous chemicals are regulated by the Occupational Safety and Health Administration (OSHA). The permissible exposure limits (PELs) represent the legal concentration levels set by OSHA that are safe for 8-hour exposures without causing noncancer health effects. Other agencies, including the National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) provide guidelines. The NIOSH guidelines are Recommended Exposure Limits, and the ACGIH guides are threshold limit values (TLVs). Occupational limits are further defined as time-weighted averages (TWAs), or concentrations for a conventional 8-hour workday and a 40-hour workweek, to which it is believed nearly all workers may be exposed, day after day, without adverse effects. Often ceiling limits, or airborne concentrations that should not be exceeded during any part of the workday, are also specified. In addition to the TWA and ceiling limit, short-term exposure limits may be set. Short-term exposure limits are 15-minute TWA exposures that should not be exceeded at any time during a workday, even if the 8-hour TWA is within limits. OSHA also uses action levels to trigger certain provisions of a standard (e.g., appropriate workplace precautions, training, and medical surveillance) for workers whose exposures could approach the PEL.

C.2.2.3 *Department of Energy Regulation of Worker Safety*

DOE Order 440.1A, Worker Protection Management for DOE Federal and Contractor Employees, regulates the health and safety of workers at all DOE sites. This comprehensive standard directs the contractor facilities to establish the framework for an effective worker protection program that will reduce or prevent injuries, illnesses, and accidental losses by providing DOE Federal and contractor workers with a safe and healthful workplace. Baseline exposure assessments are outlined in this requirement, along with day-by-day health and safety responsibilities.

Industrial hygiene limits for occupational chemical exposures at Federal sites are regulated by 29 CFR Part 1910 and 29 CFR Part 1926, Occupational Safety and Health Standards, including the PELs set by OSHA. DOE requires that all sites comply with the PELs unless a lower limit (more protective) exists in the ACGIH TLVs.

C.3 ACCIDENTS

C.3.1 Introduction

An accident is a sequence of one or more unplanned events with potential unmitigated outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators*** normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators*** are independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators*** are natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, wild fires, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, the dispersion of released hazardous materials and their effects are predicted. However, prediction of latent potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be precisely defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident itself.

The potential for facility accidents and the magnitudes of their consequences are important factors in evaluating the alternatives addressed in this SPEIS. The health risk issues are twofold:

- Whether accidents at any of the individual facilities (or reasonable combinations thereof) pose unacceptable health risks to workers or the general public; and
- Whether alternative locations for facilities (or reasonable combinations thereof) can provide lesser public or worker health risks. These lesser risks may arise either from a greater isolation of the site from the public or from a reduced frequency of such external accident initiators as seismic events.

Guidance for implementing Council on Environmental Quality (CEQ) regulation, 40 Code of Federal Regulations 1502.22, as amended (51 FR 15618), requires the evaluation of impacts which have low probability of occurrence but high consequences if they do occur; thus, facility accidents must be addressed to the extent feasible in this SPEIS. Further, public comments received during the scoping process clearly indicated the public's concern with facility safety and consequent health risks and the need to address these concerns in the decision-making process.

For the No Action Alternative, potential accidents are defined in existing facility documentation, such as safety analysis reports, hazards assessment documents, NEPA documents, and probabilistic risk assessments. The accidents include radiological and chemical accidents that produce high consequences but have a low likelihood of occurrence, and a spectrum of other accidents that have a higher likelihood of occurrence and lesser consequences. The data in these documents include accident scenarios, probabilities, materials at risk, source terms (quantities of hazardous materials released to the environment), and consequences.

For new, modified, or upgraded NNSA facilities, the identification of accident scenarios and associated data would normally be a product of safety analysis reports performed on completed facility designs. However, facility designs have not been completed for the facility alternatives analyzed in the programmatic portion of this SPEIS. Accordingly, the accident information developed for this SPEIS was developed based upon existing information for similar facilities. The first step in the process was to review all of the potential types of facilities and processes that could be associated with the Consolidated Plutonium Center (CPC), Consolidated Uranium Center (CUC), and Assembly/Disassembly/High Explosives (A/D/HE) Center, with emphasis on building hazard classification and radionuclide inventories (including type, quantity, and physical form) and storage and use conditions. First, administrative buildings without radioactive materials were excluded. Then, buildings ranked as low hazard and those without radioactive materials were eliminated from consideration. The potential offsite consequences of facilities screened out would be well bounded by a nuclear facility’s bounding accident scenarios.

The next step in the selection process was to identify the most current documentation describing/quantifying the hazards associated with each facility’s operation. Current safety documentation, which is either classified or contains Unclassified Controlled Nuclear Information that is not releasable to the general public, was obtained for these facilities, and reviewed to determine a reasonable range of bounding accidents for the CPC, CUC, and A/D/HE Center. Documents such as those shown in Table C.3-1 were reviewed for applicable accident scenarios and data.

The process sought to identify a bounding accident in each of several classes of events (e.g., fire, explosion, spill, mechanical, criticality, natural phenomena initiators, and external initiators) applicable to the alternative. The process also sought to identify bounding accidents over the spectrum of high to low probability of occurrence in order to include high-consequence/low-probability and low-consequence/high-probability accidents. These accidents are generally referred to as beyond evaluation basis accidents and evaluation basis accidents, respectively.

Beyond evaluation basis accidents are generally in the probability of occurrence range of 1 x 10^{-7} to 10^{-6} per year, and evaluation basis accidents generally have a probability of occurrence greater than 1 x 10^{-6} per year. These two designations are used only if formal SARs have not been prepared. In cases where Safety Analyses Reports (SARs) have been prepared, they are the source documents for two equivalent designations "beyond design basis accidents" and "design basis accidents."

Table C.3-1—Source Documents Reviewed for Applicable Accident Scenarios

Title	Date
"The Continued Operation of the Pantex Plant & Associated Storage of Weapons Components" **Unclassified Controlled Nuclear Information**	Sept. 1995
"CMR Facility (SM-29) Final Safety Analysis Report" **Unclassified Controlled Nuclear Information**	Feb. 1994
Executive Summary—"Hazards Analysis of the Los Alamos National Laboratory Plutonium Facility (TA-55)" **Unclassified Controlled Nuclear Information**	July 13, 1995
Stockpile Stewardship and Management/PEIS "Alternative Report for Pit Manufacturing at SRS" **Unclassified Controlled Nuclear Information**	Sept. 1, 1995
Draft Safety Analysis Report for "The Device Assembly Facility at the Nevada Test Site" **Unclassified Controlled Nuclear Information**	Mar. 1995
"U.S. Department of Energy Defense Programs Safety Survey Report" Volume III: Appendix B—Uranium Facilities **Unclassified Controlled Nuclear Information**	Nov. 1993
"U.S. Department of Energy Defense Programs Safety Survey Report" Volume I: Main Report **Unclassified Controlled Nuclear Information**	Nov. 1993
"U.S. Department of Energy Defense Programs Safety Survey Report" Volume II: Appendix A—Plutonium Facilities **Unclassified Controlled Nuclear Information**	Nov. 1993
"U.S. Department Of Energy Defense Programs Safety Survey Report" Volume VI: Appendix E—Spent-fuel Handling Facilities **Unclassified Controlled Nuclear Information**	Nov. 1993
"TA-55 Final Safety Analysis Report" Volume I **Unclassified Controlled Nuclear Information**	July 13, 1995
"TA-55 Final Safety Analysis Report" Volume II **Unclassified Controlled Nuclear Information**	July 13, 1995
"TA-55 Hazard Analysis" **Unclassified Controlled Nuclear Information**	July 13, 1995
"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Cells Module" (Buildings 12-44 Cells 1-6, 12-85, 12-96, and 12-98) **Unclassified Controlled Nuclear Information**	July 1995
"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Cells Module" (Buildings 12-44 Cells 1-6, 12-85, 12-96, and 12-98) **Unclassified Controlled Nuclear Information**	July 1995
"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Bays Module" (Buildings 12-64, 12-84, 12-99, and 12-104) **Unclassified Controlled Nuclear Information**	Dec. 1994
"Nuclear Explosive Facilities Final Safety Analysis Report Nuclear Explosive Bays Module" (Buildings 12-64, 12-84, 12-99, and 12-104) **Unclassified Controlled Nuclear Information**	Dec. 1994
"Preliminary Safety Analysis Report Special Nuclear Materials Component Staging Facility" **Unclassified Controlled Nuclear Information**	Apr. 1989
"Safety Analysis Report - On-Site Transportation" **Unclassified Controlled Nuclear Information**	Sept. 1995
Appendix 11-K—Release Fraction Data, Appendix 11-J - Consequence Equations Used in the Accident Analysis, Appendix 11-F - Seismic Accident Analysis, Appendix 11-E - Derivation of Data Values Used in the Accident Analysis **Unclassified Controlled Nuclear Information**	Feb. 1994
Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE 1996d)	Sept. 1996
Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL 1999)	Jan. 1999

Table C.3-1—Source Documents Reviewed for Applicable Accident Scenarios (continued)

Title	Date
Final Supplement Analysis for Pit Manufacturing Facilities at Los Alamos National Laboratory, Stockpile Stewardship and Management Programmatic Environmental Impact Statement (LANL 1999b	Sept. 1999
Topical Report—Supporting Documentation for the Accident Impacts Presented in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement (Maltese et al., 1996)	June 1996
Modern Pit Facility Pre-Conceptual Design Radiological Hazards Evaluation	Jan. 2002
Safety Analysis Report for the 9215 Complex, Y/MA-7886, Rev. 4, Effective 12/08/2005 **Unclassified Controlled Nuclear Information**	Dec. 2005
Safety Analysis Report for the 9204-2E Facility, Y/SAR-003, Rev. 4, Effective 12/01/2005 **Unclassified Controlled Nuclear Information**	Dec. 2005
Safety Analysis Report for the 9204-2 Facility, Y/SM-SAR-005, Rev. 4, Effective 12/20/2005 **Unclassified Controlled Nuclear Information**	Dec. 2005
Safety Analysis Report for the 9204-4 Facility, Y/SAR-004, Rev. 4, Effective 02/24/2005 **Unclassified Controlled Nuclear Information**	Feb. 2005
Safety Analysis Report for the Nuclear Material Safeguarded Shipping and Storage Facility, Y/SAR-10, Rev. 5, Effective 12/21/2005 **Unclassified Controlled Nuclear Information**	Dec. 2005
Preliminary Documented Safety Analysis for the Highly Enriched Uranium Materials Facility, Y/HEU-0091 Rev. 0, 08/17/04 **Unclassified Controlled Nuclear Information**	Aug. 2004
Basis for Interim Operation for the Enriched Uranium Operations Complex, Y/MA-7254, Rev. 18, Effective 09/23/2004 **Unclassified Controlled Nuclear Information**	Sept. 2004
Safety Analysis Report for 9212 Complex, Y/MA-7926, Rev. 1, 11/18/05 (Approved not yet effective) **Unclassified Controlled Nuclear Information**	Nov. 2005
Safety Analysis Report for Building 9995, Y/ENG/SAR-79, Rev. 4, 05/20/2005, Effective 06/22/2005 **Unclassified Controlled Nuclear Information**	May 2005
Safety Analysis Report for Building 9201-5/5E, Y/NA-1836, Rev. 3, 05/16/2005, Effective 06/30/2005 **Unclassified Controlled Nuclear Information**	May 2005
Safety Analysis Report for Buildings 9201-5N/5W, Y/NA-1839, Rev. 3, 05/16/2005, Effective 06/30/2005 **Unclassified Controlled Nuclear Information**	May 2005
Basis for Interim Operations for the Pantex Plant, Amarillo, Texas, Pantex Plant, June 1995 (Pantex 1995j). **Unclassified Controlled Nuclear Information**	June 1995
Basis for Interim Operations for the Non-Nuclear Facilities Amarillo, Texas, Pantex Plant, September 1995 (Pantex 1995). **Unclassified Controlled Nuclear Information**	Sept. 1995
Chemical High Explosives Hazards Assessment for the Pantex Plant, Jacobs Engineering, October 1993 (Jacobs 1993a). **Unclassified Controlled Nuclear Information**	Oct. 1993
Natural Phenomena Hazards Assessment for the Pantex Plant Amarillo, Texas, Jacobs Engineering, October 1993 (Jacobs 1993). **Unclassified Controlled Nuclear Information**	Oct. 1993
Recalculation of Potential Deposition Levels and Dose Exposure Levels for the Pantex Radiological Hazards Assessment, Jacobs Engineering, October 1993 Jacobs 1993b). **Unclassified Controlled Nuclear Information**	Oct. 1993
Pantex Plant, *Safety Information Document*, prepared for the U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM, September 1996 (Pantex 1996a). **Unclassified Controlled Nuclear Information**	Sept. 1996

For each facility, applicable accidents were analyzed to estimate risk (i.e., mathematical product of an accident's probability of occurrence and the accident's consequences) and consequences (e.g., LCF) to a noninvolved worker, an MEI (a hypothetical member of the public located at the closest site boundary), and the surrounding population within 50 miles of the site. This analysis considers the potential differences in likelihood of accident initiators at specific sites (e.g., beyond design basis seismic events, and so forth). The likelihood and consequences of accidents (which are site dependent) are analyzed at each of the sites where a particular facility may be located. This calculation reflects the effects of such site parameters as population size and distribution, meteorology, and distance to the site boundary. Based on this process, the following reference report was prepared: *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008).

The accidents described in Sections C.4 through C.6 were selected from a wide spectrum of potential accident scenarios. The selection process, screening criteria used, and conservative estimates of material at risk and source term ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur under an alternative. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated. All accidents are assumed to result in ground-level, one-hour duration releases unless indicated otherwise. All releases are assumed neutrally buoyant except the uranium operations aircraft crash, for which the added heat was taken as 4.6 megawatts, the value used in the Lawrence Livermore Continued Operations SWEIS (DOE 2005a).

Of particular interest are the uncertainties in the estimates of cancer fatalities from exposure to radioactive materials. The numerical values of the health risk estimators used in this SPEIS were obtained by linear extrapolation from the nominal risk estimate for lifetime total cancer mortality resulting from exposures of 10 rad. There is uncertainty about cancer risk in the low-dose region and the possibility of no risk cannot be excluded. Because the health risk estimators are multiplied by conservatively calculated radiological doses to predict fatal cancer risks, the fatal cancer values presented in this EIS are expected to be overestimates.

For the purposes of this EIS, the impacts calculated from the linear model are treated as an upper-bound case, consistent with the widely used methodologies for quantifying radiogenic health impacts. This does not imply that health effects are expected. Moreover, in cases where the upper-bound estimators predict a number of LCFs greater than one, this does not imply that the LCF risk can be determined for a specific individual.

C.3.1.1 *Assessment of Vulnerability to Terrorist Threats*

The methodology for the assessment of vulnerability to terrorist threats is discussed in Appendix B, Section B.12.3.

C.3.2 Safety Design Process

Subsequent to this SPEIS, evaluation of the specific benefits achieved would be presented for each new facility in a Hazards Analysis Document. This document would identify and estimate the effects of all major hazards that have the potential to impact the environment, workers, and the public, and would be issued in conjunction with the Conceptual Design Package. Additional accident analyses for identified major hazards would be provided in a Preliminary SAR to be issued during the period of Definitive Design (Title II) Review. A Final SAR would be prepared during the construction period and issued before testing begins as final documented evidence that the new facility can be operated in a manner that does not present any undue risk to the health and safety of workers and the public.

One of the major design goals for any Complex Transformation facility is to achieve a reduced risk to workers and the public relative to that associated with similar facilities in the existing Nuclear Weapons Complex. Any new NNSA facilities would be designed to comply with current Federal, State, and local laws; DOE orders; and industrial codes and standards. As a result, a facility will be provided that is highly resistant to the effects of natural phenomena, including earthquake, flood, tornado, high wind, as well as credible events appropriate to the site, such as fire, explosions, and manmade threats. The facilities would be designed to maintain their continuing structural integrity in the event of any credible accident or event, including an aircraft crash, if credible at these sites.

The design process for new and modified facilities would comply with the requirements for safety analysis and evaluation in DOE Order 430.1B, Real Property Asset Management, assessment is required to be an integral part of the design process to ensure compliance with all DOE safety criteria by the time that the facilities are constructed and in operation.

For new facilities, the safety analysis process begins early in conceptual design by identifying hazards with the potential to produce unacceptable safety consequences to workers or the public. As the design develops, failure mode and effects analyses are performed to identify events that have the potential to release hazardous material. The kinds of events considered include equipment failure, spills, human error, fire and explosions, criticality, earthquake, electrical storms, tornado, flood, and aircraft crash. These postulated events become focal points for design changes or improvements to prevent unacceptable accidents. These analyses continue as the design progresses to assess the need for safety equipment and to assess the performance of this equipment in accident mitigation. Eventually, the safety analyses are formally documented in an SAR and/or in a probabilistic risk assessment. The probabilistic risk assessment documents the estimated frequency and consequence for an entire spectrum of accidents and helps to identify design improvements that could make meaningful safety improvements.

The first SAR is completed at the conclusion of conceptual design and includes identification of hazards and some limited assessment of a few enveloping design basis accidents. This analysis includes deterministic safety analysis and failure modes and effects analysis of major systems. A detailed, comprehensive Preliminary SAR is completed during preliminary design and provides a broad assessment of the range of design basis accident scenarios and the performance of equipment provided in the facility specifically for accident consequence mitigation. A limited probability risk assessment may be included in that analysis.

The SAR continues to be developed during detailed design. The safety review of this report and any supporting probabilistic risk assessment is completed and safety issues resolved before the facility construction is initiated. The Final SAR documents safety-related design changes during construction and the impact of those changes on the safety assessment. It also includes the results of any safety-related research and development that has been performed to support the safety assessment of the facility.

C.3.3 Consequence Analysis Methodology

The MELCOR Accident Consequence Code System (MACCS) was used to estimate the radiological consequences of all stockpile stewardship and management facilities for all accidents. MACCS2 is a DOE/Nuclear Regulatory Commission (DOE/NRC)-sponsored computer code that has been widely used in support of probabilistic risk assessments for the nuclear power industry and in support of safety and NEPA documentation for facilities throughout the DOE Complex. A brief description of MAACS follows. A detailed description of the MACCS model is available in a three-volume report: *MELCOR Accident Consequence Code System* (MACCS) (NUREG 1990).

MACCS models the offsite consequences of an accident that releases a plume of radioactive materials to the atmosphere. Should such an accidental release occur, the radioactive gases and aerosols in the plume would be transported by the prevailing wind while dispersing in the atmosphere. The environment would be contaminated by radioactive materials deposited from the plume, and the population would be exposed to radiation. The objectives of a MACCS calculation are to estimate the range and probability of the health induced by the radiation exposures not avoided by protective actions.

The MACCS2 code uses three distinct modules for consequence calculations: The ATMOS module performs atmospheric transport calculations, including dispersion, deposition, and decay. The EARLY module performs exposure calculations corresponding to the period immediately following the release; this module also includes the capability to simulate evacuation from areas surrounding the release. The EARLY module exposure pathways include inhalation, cloudshine, and groundshine. The CHRONC module considers the time period following the early phase (i.e., after the plume has passed). CHRONC exposure pathways include groundshine, resuspension inhalation, and ingestion of contaminated food and water. Land use interdiction (e.g., decontamination) can be simulated in this module. Other supporting input files include a meteorological data file and a site data file containing distributions of the population and agriculture surrounding the release site.

In order to understand MACCS, one must understand its two essential elements: the time scale after an accident is divided into various "phases"; and the region surrounding the facility is divided into a polar-coordinate grid. The time scale after the accident is divided into three phases: emergency phase, intermediate phase, and long-term phase. The emergency phase begins immediately after the accident and could last up to seven days. In this period, the exposure of the population to both radioactive clouds and contaminated ground is modeled. Various protective measures can be specified for this phase, including evacuation, sheltering, and dose-dependent relocation.

The intermediate phase can be used to represent a period in which evaluations are performed and decisions are made regarding the type of protective measure actions that need to be taken. In this period, the radioactive clouds are assumed to be gone, and the only exposure pathways are those from the contaminated ground. The only protective measure that can be taken during this period is temporary relocation.

The long-term phase represents all time subsequent to the intermediate phase. The only exposure pathways considered here are those resulting from the contaminated ground. A variety of protective measures can be taken in the long-term phase in order to reduce doses to acceptable levels: decontamination, interdiction, and condemnation of property.

As implemented, the MACCS2 model evaluates doses due to inhalation of airborne material, as well as external exposure to the passing plume. This represents the major portion of the dose that an individual would receive because of a facility accident. The longer-term effects of radioactive material deposited on the ground after a postulated accident, including the resuspension and subsequent inhalation of radioactive material and the ingestion of contaminated crops, were not modeled for this SPEIS because these pathways have been studied and found to contribute less significantly to the dosage than the inhalation of radioactive material in the passing plume; they are also controllable through interdiction. Instead, the deposition velocity of the radioactive material was set to zero, so that material that might otherwise be deposited on surfaces remained airborne and available for inhalation. Thus, the method used in this SPEIS is conservative compared with dose results that would be obtained if deposition and resuspension were taken into account.

The source terms were handled by the code by considering the materials at risk (MAR) as the inventory. The release fraction of each scenario was then the product of the various factors (damage ratio [DR], airborne release fraction [ARF], respirable fraction [RF], and leak path factor [LPF]) that describe the material available to actually impact a receptor. The meteorological data consisted of sequential hourly wind speed, wind direction, stability class, and precipitation for one year.

Each four-hour period of the annual meteorological site specific data set for each site was randomly sampled, assuring a good representation of the entire meteorological data set. The results from each of these samples were then ranked and combined (according to their frequency of occurrence) and a distribution of results is presented by the code. This distribution includes statistics such as 95th percentile, 50th percentile, and mean dose. The latter is presented in this SPEIS.

Because of assumptions used in this SPEIS analysis, not all of the code’s capabilities were used. For example, it was conservatively assumed that no special actions would be taken to avoid or mitigate exposure to the general population following an accidental release of radionuclides.

Population and individual doses were statistically sampled by assuming an equally likely accident start time during any hour of the year. MEI and noninvolved worker doses were calculated using conservative assumptions, such as the wind blowing toward the MEI and locating the receptor along the plume centerline. The doses (50-year committed EDE) were converted into LCFs using the factor of 6×10^{-4} LCFs per person-rem for both members of the public and workers (DOE 2002d); calculated LCFs were doubled for individual doses greater than 20 rem (NCRP 1993). The MEI and noninvolved worker are assumed to be exposed for the duration of the release; they or DOE would take protective or mitigative actions thereafter if required by the size of the release. Exposure to the general population continues after the release as a result of resuspension and inhalation, external exposure and ingestion of deposited radionuclides.

C.3.3.1 *Analysis Conservatism and Uncertainty*

The analysis of accidents is based on calculations relevant to hypothetical sequences of events and models of their potential impacts. The models provide estimates of the frequencies, source terms, pathways for dispersion, exposures, and the effects on human health and the environment as realistic as possible within the scope of the analysis. In many cases, the scarcity of experience with the postulated accidents leads to uncertainty in the calculation of the consequences and frequencies. This fact has promoted the use of models or input values that yield conservative estimates of consequences and frequency. Additionally, since no credit is taken for safety systems that may function during an event, these events do not represent expected conditions within the facility at any point in its lifetime.

Due to the layers of conservatism built into the accident analysis for the spectrum of postulated accidents, the estimated consequences and risks to the public represent the upper limit for the individual classes of accidents. A conservative approach is appropriate and standard practice for analyses of this type, which involve high degrees of uncertainty associated with analytical factors such as accident frequency, MAR, and LPF.

C.3.3.2 *Mitigation Measures*

Mitigations to exposure and therefore mitigations to dose that would affect the postulated results of the accident scenarios are discussed below. In general, no mitigation was assumed for emergency response in the consequence analysis.

C.3.3.2.1 Emergency Response and Protective Actions

NNSA sites have detailed plans for responding to accidents of the type described in this SPEIS, and the response activities would be closely coordinated with those of local communities. NNSA personnel are trained and drilled in the protective actions to be taken if a release of radioactive or otherwise toxic material occurs. The underlying principle for the protective action guides (PAGs) is that under emergency conditions all reasonable measures should be taken to minimize the radiation exposure of the general public and emergency workers. In the absence of significant constraints, protective actions could be implemented when projected doses are lower than the ranges given in the PAGs. No credit was taken for emergency response and protective actions in the consequence analysis.

C.3.3.2.2 High Efficiency Particulate Air Filtration

In all areas where unconfined plutonium or other radioactive materials can be handled and can exist in a dispersible form, high-efficiency particulate air (HEPA) filters provide a final barrier against the inadvertent release of radioactive aerosols into the outside environment. However, these filters would not trap volatile fission products such as the noble gases and iodine; such gases would be released into the outside environment.

HEPA filter efficiencies are 99.99 percent or greater with the minimum efficiency of 99.97 percent for 0.3-micron particles, the size most easily passed by the filter. To maximize containment of particles and provide redundancy, two HEPA filters in series would be used, as is the normal operational procedure at such NNSA facilities. Additional HEPA filtration would be used, as required, to ensure compliance with regulatory requirements. These HEPA filters are protected by building design features against the consequences of an earthquake or fire. Credit was taken for filtration in the consequence analysis when ventilation and building containment were shown by analysis to survive during the accident.

C.3.3.3 *Chemical Releases*

Consequences of accidental chemical releases were determined using the Aerial Location of Hazardous Atmospheres (ALOHA) computer code (EPA 1999b). ALOHA is an EPA/National Oceanic and Atmospheric Administration (NOAA)-sponsored computer code that has been widely used in support of chemical accident responses and also in support of safety and NEPA documentation for DOE facilities.

The ALOHA code is a deterministic representation of atmospheric releases of toxic and hazardous chemicals. The code can predict the rate at which chemical vapors escape (e.g., from puddles or leaking tanks) into the atmosphere; a specified direct release rate is also an option. Either of two dispersion algorithms is applied by the code, depending on whether the release is neutrally buoyant or heavier than air. The former is modeled similarly to radioactive releases in that the plume is assumed to advect with the wind velocity. The latter considers the initial slumping and spreading of the release because of its density. As a heavier-than-air release becomes more dilute, its behavior tends towards that of a neutrally buoyant release.

The ALOHA code uses a constant set of meteorological conditions (e.g., wind speed, stability class) to determine the downwind atmospheric concentrations. The sequential meteorological data sets used for the radiological accident analyses were re-ordered from high to low dispersion by applying a Gaussian dispersion model (such as that used by ALOHA) to the closest site boundary at each site. The median set of hourly conditions for each site (i.e., mean wind speed and mean stability) was used for the analysis; this is roughly equivalent to the conditions corresponding to the mean radiological dose estimates of MACCS2.

In addition to the source term and downwind concentration calculations, ALOHA allows for the specification of concentration limits for the purpose of consequence assessment (e.g., assessment of human health risks from contaminant plume exposure). ALOHA refers to these concentration limits as level-of-concern (LOC) concentrations. Safety analysis work uses the Emergency Response Planning Guidelines (ERPGs) and Temporary Emergency Exposure Limits (TEELs) for assessing human health effects for both facility workers and the general public. While ERPGs and TEELs are not explicitly a part of the ALOHA chemical database, ALOHA allows the user to input any value, including an ERPG or TEEL value, as the LOC concentration. The LOC value is superimposed on the ALOHA-generated plot of downwind concentration as a function of time to facilitate comparison. In addition, ALOHA will generate a footprint that shows the area (in terms of longitudinal and lateral boundaries) where the ground-level concentration reached or exceeded the LOC during puff or plume passage (the footprint is most useful for emergency response applications).

ERPG Definitions

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.*

ALOHA contains physical and toxicological properties for the chemical spills included in the EIS and for approximately 1,000 additional chemicals. The physical properties were used to determine which of the dispersion models and accompanying parameters were applied. The toxicological properties were used to determine the levels of concern. Atmospheric concentrations at which health effects are of concern (e.g., ERPG-2) are used to define the footprint of concern because the meteorological conditions specified do not account for wind direction (i.e., it is not known a priori in which direction the wind would be blowing in the event of an accident) the areas of concern are defined by a circle of radius equivalent to the downwind distance at which the concentration decreases to levels less than the level of concern. The fraction of the area of concern actually exposed to the concentration of concern (footprint area/circle area) was noted. In addition, the concentration at 1,000 meters (3,281 feet) (potential exposure to a noninvolved worker) and at the nearest site boundary distance (exposure to maximum exposed offsite individual) are calculated and presented.

C.4 RADIOLOGICAL ACCIDENT SCENARIOS—CPC

CPC-related facility radiological and chemical accidents are described in Tables C.4-1 and C.4-2. These tables also identify the estimated maximum MAR and source term and accident frequency. Section C.5 provides additional data on release fractions such as damage ratio, leak path factor, and estimated respirable release fraction (RRF) for each postulated accident. The RRF is the mathematical product of the ARF and the RF calculated by the equation RRF = ARF × RF (Tetra Tech 2008).

C.4.1 Postulated Accidents

The accident scenarios shown in Tables C.4-1 and C.4-2 cover the types of hazardous situations appropriate for the Complex Transformation SPEIS. The list includes fires, spills, criticality and explosions events, site-specific externally initiated events, and natural phenomena events. For radiological accidents, the material at risk is plutonium and the predominant form of exposure is through inhalation. For radiological accidents, the material at risk is plutonium and the predominant form of exposure is through inhalation. The list also includes the potential release of toxic chemicals used in CPC processes. The accidents listed in this section were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008).

The results of the accident analysis indicate potential consequences that exceed the DOE exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases for NEPA purposes are based on unmitigated releases of radioactive material to select a site for the CPC. Following the Record of Decision (ROD) and selection of a site, additional NEPA action would be taken that would identify specific mitigating features that would be incorporated in the CPC design to ensure compliance with DOE exposure guidelines. These could include procedural and equipment safety features, additional HEPA filtration systems, and other design features that would protect radioactive materials from accident conditions and contain any material that might be released. DOE would prepare safety analysis documentation such as a safety analysis report to further ensure that DOE exposure guidelines would not be exceeded. The results of the safety analysis report are reflected in facility and equipment design and defines an operating envelope and procedures to ensure public and worker safety. Specific mitigation measures would be incorporated into a CPC design and operating procedures to ensure that consequences would not exceed the DOE exposure guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident source terms shown in Tables C.4–1 and C.4-2 indicate the quantity of radioactive and chemical material released to the environment with a potential for harm to the public and onsite workers. The radiological source terms are calculated by the equation:

Source Term = MAR × ARF × RF × DR × LPF, where:

MAR. The amount and form of radioactive material at risk of being released to the environment under accident conditions.

ARF. The airborne release fraction reflecting the fraction of damaged MAR that becomes airborne as a result of the accident.

RF. The respirable fraction reflecting the fraction of airborne radioactive material that is small enough to be inhaled by a human.

DR. The damage ratio reflecting the fraction of MAR that is damaged in the accident and available for release to the environment.

LPF. The leak path factor reflecting the fraction of respirable radioactive material that has a pathway out of the facility for dispersal in the environment.

The accident source terms for chemical accidents are shown in Table C.4-2. The impacts of chemical accidents are measured in terms of ERPG-2 and ERPG-3 concentration limits established by the American Industrial Hygiene Association. ERPG-2 is defined as the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their ability to take protective actions. ERPG-3 is defined as the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

Beyond evaluation basis earthquake with fire. The earthquake accident scenario postulates a seismic event and seismically induced failure of interior nonstructural walls. The collapsed walls cause a loss of confinement and a potential release of materials in multiple areas in the facility. Combustible materials in the area are ignited, and the resulting fire propagates to multiple areas of the facility, including storage vaults in three buildings containing the largest quantity of plutonium metal. The MAR for the 125 pits per year (ppy) production case includes 16,929 kilograms (37,322 pounds) metal, 36 kilograms (79 pounds) powder, and 24 kilograms (53 pounds) solution. The bounding seismic accident with fire conservatively assumes a damage ratio (DR) = 1.0 resulting in all of the MAR to be affected by the fire. The collapsed walls cause a loss of confinement resulting in an assumed leak path factor (LPF) = 1.0. The airborne respirable release fraction is estimated to be ARF × RF = 2.5×10^{-4} (metal), 6×10^{-5} (oxide), and 2×10^{-3} (solution). No credit is taken for the mitigating effects of safety systems, fire suppression efforts and equipment, plutonium cladding, the shipping containers, or the final building state (building collapse and rubble bed). The resulting source term for the 125 ppy case is 4.23 kilograms (9.3 pounds) of plutonium metal, 0.0021 kilograms (0.0046 pounds) of plutonium oxide, and 0.048 kilograms (0.11 pounds) of plutonium solution. The accident frequency is estimated to be in the range of from 1×10^{-6} to 1×10^{-5} per year. For the purpose of risk calculations, a conservative frequency of 1×10^{-5} per year is assumed (Tetra Tech 2008).

Fire in a single building. A fire is postulated to start within a glovebox, processing room, or storage vault. Possible causes of the fire include an electrical short, equipment failure, welding equipment, or human error. The fire propagates to multiple areas of the facility involving the largest quantities of plutonium metal. The material at risk is a maximum 7,685 kilograms (16,943 pounds) of plutonium metal for the 125 ppy. The bounding fire accident conservatively assumes a DR = 1.0 resulting in all of the MAR to be affected by the fire. No credit is taken for safety systems, building confinement, or filtration resulting in an assumed LPF = 1.0. The airborne respirable release fraction is estimated to be ARF × RF = 2.5×10^{-4}. No credit is taken for the mitigating effects of fire suppression efforts and equipment, plutonium cladding, or the shipping containers. The resulting source term is a ground level, thermal release of 1.92 kilograms (4.23 pounds) of plutonium. The accident frequency is estimated to be in the range of from 1×10^{-6} to 1×10^{-4} per year. For the purpose of risk calculations, a conservative frequency of 1×10^{-4} per year is assumed (Tetra Tech 2008).

Table C.4-1—Postulated CPC-Related Facility Radiological Accidents

Accident	Accident Description	Material at Risk	Source Term	Event Frequency
Natural Phenomena Events				
1. Beyond Evaluation Basis Earthquake With Fire	A seismic event is postulated causing failure of interior nonstructural walls. The collapsed walls cause a loss of confinement and a potential release of materials in multiple areas of the facility. Combustible materials in the area are ignited and the fire propagates to multiple areas and storage vaults containing the largest quantity of plutonium metal.	16,988 kg plutonium-239 equivalent: 99.65% metal 0.21% powder 0.14% solution	4.23 kg metal 0.0021 kg oxide 0.048 kg solution	1.0×10^{-6} to 1.0×10^{-5}/yr
Externally Initiated Events				
Addressed in Classified Appendix	Addressed in Classified Appendix	Addressed in Classified Appendix	Addressed in Classified Appendix	Addressed in Classified Appendix
Internal Process Events				
1. Fire in a Single Building	A fire is postulated to start within a glovebox, processing room or storage vault. The fire propagates to multiple areas involving the largest quantities of plutonium metal.	7,685 kg plutonium metal	1.92 kg plutonium	1.0×10^{-6} to 1.0×10^{-4}/yr
2. Explosion in a Feed Casting Furnace	A steam explosion/over-pressurization is postulated to occur in a feed casting furnace in the foundry. The steam explosion occurs due to a cooling water leak or an over-pressurization event. The explosion/over-pressurization impacts molten plutonium metal in seven furnaces. Negligible impacts from the shock/blast are postulated for the solid plutonium metal in the glovebox.	4.5 kg molten plutonium metal	2.25 kg molten plutonium metal	1.0×10^{-4} to 1.0×10^{-2}/yr
3. Nuclear Criticality	An inadvertent criticality is postulated based on several potential events involving handling errors. Accumulation of fissile material in excess of criticality safety limits, addition of a moderator causing a critical configuration, or a seismic event causing collapse of storage vault racks are potential scenarios.	See Table 3–1[a]	5×10^{17} fissions	1.0×10^{-2}/yr

Table C.4-1—Postulated CPC-Related Facility Radiological Accidents (continued)

Accident	Accident Description	Material at Risk	Source Term	Event Frequency
Internal Process Events *(continued)*				
4. Fire-induced Release in the CRT Storage Room	A fire is postulated to occur in the cargo restraint transporter storage room.	600 kg plutonium metal	0.15 kg plutonium	1.0×10^{-4} to 1.0×10^{-2}/yr
5. Radioactive Material Spill	A loss of confinement and spill of molten plutonium into the metal reduction glovebox is postulated. The spill occurs due to a failure or rupture of the feed casting furnace.	4.5 kg molten plutonium metal	0.045 kg plutonium	1.0×10^{-4} to 1.0×10^{-2}/yr

[a] Tetra Tech 2008.
Source: Tetra Tech 2008.

Table C.4-2—Postulated CPC-Related Facility Chemical Accidents

Chemical Release Events				
1. Nitric Acid Release From Bulk Storage	Nitric acid is inadvertently released from bulk storage due to natural phenomena, equipment failure, mechanical impact, or human error during storage, handling, or process operations.	*10,500 kg*	*10,500 kg*	1.0×10^{-5} to 1.0×10^{-4}/yr
2. Hydrofluoric Acid Release From Bulk Storage	Hydrofluoric acid is inadvertently released from bulk storage due to natural phenomena, equipment failure, mechanical impact, or human error during storage, handling, or process operations.	*550 kg*	*550 kg*	1.0×10^{-5} to 1.0×10^{-4}/yr
3. Formic Acid Release From Bulk Storage	Formic acid is inadvertently released from bulk storage due to natural phenomena, equipment failure, mechanical impact, or human error during storage, handling, or process operations.	*1,500 kg*	*1,500 kg*	1.0×10^{-5} to 1.0×10^{-4}/yr

Source: Tetra Tech 2008.

Explosion in a feed casting furnace. A steam explosion/over-pressurization is postulated to occur in a feed casting furnace in the foundry. The steam explosion occurs due to a cooling water leak or an over-pressurization event. The explosion/over-pressurization impacts molten plutonium metal in seven furnaces. The furnace is assumed to contain 4.5 kilogram (9.9 pounds) of plutonium in the form of molten metal. The airborne respirable release fraction was estimated to be ARF × RF = 0.5 for the 4.5 kilogram (9.9 pounds) of plutonium. Negligible impacts from the shock/blast are postulated for 9 kilogram (19.8 pound) of solid plutonium metal in the glovebox. The bounding scenario assumes a DR = 1.0 and an LPF = 1.0. The resulting source is 2.25 kilogram (5.0 pounds) of plutonium. The frequency of the accident is estimated to be in the range of from 1×10^{-4} to 1×10^{-2} per year. For the purpose of risk calculations, a conservative frequency of 1×10^{-2} was used (Tetra Tech 2008).

Nuclear criticality. An inadvertent criticality is postulated based on any one of several potential events involving handling errors. Accumulation of fissile material in excess of criticality safety limits, addition of a moderator causing a critical configuration, or a seismic event causing collapse of storage vault racks are potential scenarios. The estimated frequency of a criticality is 1×10^{-2} per year (Tetra Tech 2008).

Fire-induced release in the cargo restraint transporter storage room. A fire is postulated to start in cargo restraint transporter storage room. The fire is confined to the room. The MAR in the room is 600 kilogram (1,322.8 pounds) plutonium metal. The bounding scenario assumes a DR = 1.0 resulting in all of the MAR to be affected by the fire. No credit is taken for building confinement or filtration resulting in an assumed LPF = 1.0. The airborne respirable fraction is estimated to be ARF × RF = 2.5×10^{-4}. No credit is taken for the mitigating effects of fire suppression efforts and equipment, plutonium cladding, or shipping containers. The resulting source term is a ground-level thermal release of 0.15 kilogram (0.33 pound) of plutonium. The accident frequency is estimated to be in the range of from 1×10^{-4} to 1×10^{-2} per year. For the purpose of risk calculations, a conservative frequency of 1×10^{-2} per year is assumed (Tetra Tech 2008).

Radioactive material spill. A spill of radioactive material occurs in the metal reduction glovebox. A loss of confinement and spill of molten plutonium into the metal reduction glovebox is postulated. The spill occurs due to a failure or rupture of the feed casting furnace. The event does not impact any other material that may be in the glovebox. The spill is assumed to involve 4.5 kilogram (9.9 pounds) molten plutonium metal. An airborne release from disturbed metal surfaces is assumed the release mechanism. The airborne respirable release fraction is estimated to be ARF × RF = 1×10^{-2}. A DR = 1.0 was conservatively assumed. For a bounding scenario, no credit is taken for safety systems, building confinement, or ventilation/filtration corresponding to LPF = 1.0. The resulting source term is a ground level release of 0.045 kilogram (0.099 pounds) of plutonium. The accident frequency is estimated to be in the range of from 1×10^{-4} to 1×10^{-2} per year. For the purpose of risk calculations, a conservative frequency of 1×10^{-2} per year is assumed (Tetra Tech 2008).

Nitric acid release. An accidental release of nitric acid from bulk storage is postulated due to equipment failure, mechanical impact, or human error. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Nitric acid is corrosive and can cause severe burns to all parts of the body. Its vapors may burn the respiratory tract and may cause pulmonary edema, which could prove fatal. The nitric acid is assumed to be stored in bulk quantity in an outdoor facility at a modern pit facility (MPF). The maximum amount of nitric acid that could be released is 10,500 kilogram (23,149 lb). The nitric acid is released by evaporation to the environment and is transported as an airborne plume with potential impacts in excess of ERPG-2 and ERPG-3 concentration limits to onsite workers and the offsite public. The ERPG-2 and ERPG-3 concentration limits for the chemical are 6 and 78 parts per million (ppm), respectively. The estimated frequency of this accident is in the range of from 1.0×10^{-5} to 1.0×10^{-4} per year. For the purpose of risk calculations, a conservative frequency of 1.0×10^{-4} is assumed (Tetra Tech 2008).

Hydrofluoric acid release. An accidental release of hydrofluoric acid from bulk storage is postulated due to equipment failure, mechanical impact, or human error. Hydrofluoric acid is extremely toxic and may be fatal if inhaled or ingested. It is readily absorbed through the skin, and skin contact may be fatal. It acts as a systemic poison, causes severe burns, and is a possible mutagen. The hydrofluoric acid is assumed to be stored in bulk quantity in an outdoor facility at MPF. The maximum amount of hydrofluoric acid that could be released is 550 kilogram (1,212.5 pounds). The hydrofluoric acid is released by evaporation to the environment and is transported as an airborne plume with potential impacts in excess of ERPG-2 and ERPG-3 concentration limits to onsite workers and the offsite public. The ERPG-2 and ERPG-3 concentration limits for the chemical are 20 and 50 ppm, respectively. The estimated frequency of this accident is in the range of from 1.0×10^{-5} to 1.0×10^{-4} per year. For the purpose of risk calculations, a conservative frequency of 1.0×10^{-4} per year is assumed (Tetra Tech 2008).

Formic acid release. An accidental release of formic acid from bulk storage is postulated due to equipment failure, mechanical impact, or human error. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Formic acid is corrosive and will cause severe burns. It is harmful by inhalation, ingestion, and readily absorbed through skin. It is very destructive to mucous membranes and the upper respiratory tract, eyes, and skin. Inhalation may be fatal. The formic acid is assumed to be stored in bulk quantity in an outdoor facility at MPF. The maximum amount of formic acid that could be released is 1,500 kilogram (3,307 pounds). The formic acid is released by evaporation to the environment and is transported as an airborne plume with potential impacts in excess of ERPG-2- and ERPG-3-concentration limits to onsite workers and the offsite public. The ERPG-2- and ERPG-3-concentration limits for the chemical are 10 and 30 ppm, respectively. The estimated frequency of this accident is in the range of from 1.0×10^{-5} to 1.0×10^{-4} per year. For the purpose of risk calculations, a conservative frequency of 1.0×10^{-4} per year is assumed (Tetra Tech 2008).

Results. Tables C.4-3 through C.4-12 show the consequences and risks of the postulated set of accidents for a noninvolved worker and the public (MEI and the general population living within 50 miles of the site), for the site alternatives for the CPC. Chemical accidents are shown in Tables C.4-13 through C.4-18.

C.4.2 LANL Alternative

C.4.2.1 *Greenfield CPC and Upgrade Alternative*

Table C.4-3—CPC Radiological Accident Frequency and Consequences at LANL

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	87.5	0.105	44,200	26.5	1,420	1.0
Fire in a Single Building	1.0×10^{-4}	62.4	0.0749	27,600	16.6	2,200	1.0
Explosion in a Feed Casting Furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1.0
Nuclear Criticality	1.0×10^{-2}	0.00014	$8.40x10^{-8}$	0.0372	$2.23x10^{-5}$	0.00278	$1.67x10^{-6}$
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	4.88	0.00293	2,160	1.3	172	0.206
Radioactive Material Spill	1×10^{-2}	0.146	$8.76x10^{-5}$	64.8	0.0389	5.16	0.0031

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

Table C.4-4—Annual Cancer Risks for CPC at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	$1.05x10^{-6}$	$2.65x10^{-4}$	$1x10^{-5}$
Fire in a Single Building	$7.49x10^{-6}$	$1.66x10^{-3}$	$1x10^{-4}$
Explosion in a Feed Casting Furnace	$8.78x10^{-4}$	0.19	$1x10^{-2}$
Nuclear Criticality	$8.40x10^{-10}$	$2.23x10^{-7}$	$1.67x10^{8}$
Fire-induced Release in the CRT Storage Room	$2.93x10^{-5}$	$1.3x10^{-2}$	$2.06x10^{-3}$
Radioactive Material Spill	$8.76x10^{-7}$	$3.89x10^{-4}$	$3.1x10^{-5}$

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

C.4.2.2 *50/80 Alternative*

Under the 50/80 Alternatives at Los Alamos, the Plutonium Facility, Building 4 (PF-4) at TA-55 would be upgraded to provide a capability to produce up to 80 pits/year to the stockpile. The changes to PF-4 to achieve this capability are assumed to be equivalent to the operations, processes, and technology and safety systems planned for a Greenfield CPC. As such, the potential hazards and accidents postulated for a Greenfield CPC would be applicable to the upgraded PF-4. However, for three of the accidents (Beyond Evaluation Basis Earthquake and Fire, Fire in a single building, and the Fire-induced release in the CRT Storage Room), the material-at-risk for the 50/80 Alternative would be approximately two-thirds as large as for the Greenfield CPC. The potential consequences and risks from accidents for the 50/80 Alternative are presented in Tables C.4-3a and C.4-4a.

Table C.4-3a—CPC Radiological Accident Frequency and Consequences at LANL for the 50/80 Alternative

		Maximally Exposed Individual[a]		**Offsite Population[b]**		**Noninvolved Worker[c]**	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	58.6	0.07	29,614	17.8	951	1.0
Fire in a Single Building	1.0×10^{-4}	41.8	0.05	18,492	11.1	1,474	1.0
Explosion in a Feed Casting furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1.0
Nuclear Criticality	1.0×10^{-2}	0.00014	8.40×10^{-8}	0.0372	2.23×10^{-5}	0.00278	1.67×10^{-6}
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	3.3	0.002	1,447	0.9	115	0.13
Radioactive Material Spill	1×10^{-2}	0.146	8.76×10^{-5}	64.8	0.0389	5.16	0.003

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.
Source: Tetra Tech 2008

Table C.4-4a—Annual Cancer Risks for CPC at LANL for the 50/80 Alternative

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake With Fire	7.0x10^{-7}	1.78x10^{-4}	1x10^{-5}
Fire in a Single Building	5.0x10^{-6}	1.1x10^{-3}	1x10^{-4}
Explosion in a Feed Casting Furnace	8.78x10^{-4}	0.19	1x10^{-2}
Nuclear Criticality	8.40x10^{-10}	2.23x10^{-7}	1.67x10^{8}
Fire-induced Release in the CRT Storage Room	2.0x10^{-5}	9.0x10^{-3}	1.3x10^{-3}
Radioactive Material Spill	8.76x10^{-7}	3.89x10^{-4}	3.1x10^{-5}

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

C.4.3 Nevada Test Site Alternative

Table C.4-5—CPC Radiological Accident Frequency and Consequence–NTS

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	1.99	0.00119	788	0.473	1,770	1.0
Fire in a Single Building	1.0×10^{-4}	0.918	0.000551	354	0.212	984	1.0
Explosion in a Feed Casting Furnace	1.0×10^{-2}	1.08	0.000648	414	0.248	1,150	1.0
Nuclear Criticality	1.0×10^{-2}	1.89x10^{-6}	1.13x10^{-9}	0.000309	1.85x10^{-7}	0.00124	7.44x10^{-7}
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	0.0717	0.000043	27.6	0.0166	76.8	0.0922
Radioactive Material Spill	1×10^{-2}	0.00215	1.29x10^{-6}	0.829	0.000497	2.31	0.00139

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

Table C.4-6—Annual Cancer Risks for CPC–NTS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake With Fire	1.19 x10^{-8}	4.73x10^{-6}	1x10^{-5}
Fire in a Single Building	5.51 x10^{-8}	2.12x10^{-5}	1x10^{-4}
Explosion in a Feed Casting Furnace	6.48 x10^{-6}	2.48x10^{-3}	1x10^{-2}
Nuclear Criticality	1.13x10^{-11}	1.85x10^{-9}	7.44x10^{-9}
Fire-Induced Release in the CRT Storage Room	4.3 x10^{-7}	1.66x10^{-4}	9.22x10^{-4}
Radioactive Material Spill	1.29x10^{-8}	4.97x10^{-6}	1.39x10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

C.4.4 Pantex Site Alternative

Table C.4-7—CPC Radiological Accident Frequency and Consequences—Pantex

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	23.1	0.0277	9,840	5.9	1,550	1.0
Fire in a Single Building	1.0×10^{-4}	11.4	0.00684	4,610	2.77	988	1.0
Explosion in a Feed Casting Furnace	1.0×10^{-2}	13.3	0.00798	5,400	3.24	1,160	1.0
Nuclear Criticality	1.0×10^{-2}	3.17x10^{-5}	1.90x10^{-8}	0.00446	2.68x10^{-6}	0.00126	7.56x10^{-7}
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	0.888	0.000533	360	0.216	77.2	0.0926
Radioactive Material Spill	1×10^{-2}	0.0266	0.000016	10.8	0.00648	2.32	0.00139

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table C.4-8—Annual Cancer Risks for CPC—Pantex

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake With Fire	2.77x10^{-7}	5.9x10^{-5}	1x10^{-5}
Fire in a Single Building	6.84x10^{-7}	2.77x10^{-4}	1x10^{-4}
Explosion in a Feed Casting Furnace	7.98x10^{-5}	3.24x10^{-2}	1x10^{-2}
Nuclear Criticality	1.90x10^{-10}	2.68x10^{-8}	7.56x10^{-9}
Fire-Induced Release in the CRT Storage Room	5.33x10^{-6}	2.16x10^{-3}	9.26x10^{-4}
Radioactive Material Spill	1.6x10^{-7}	6.48x10^{-5}	1.39x10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

C.4.5 Savannah River Site Alternative

Table C.4-9—CPC Radiological Accident Frequency and Consequences—SRS

		Maximally Exposed Individuala		Offsite Populationb		Noninvolved Workerc	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	3.39	0.00203	17,500	10.5	1,580	1.0
Fire in a Single Building	1.0×10^{-4}	1.57	0.000942	7,890	4.73	1,070	1.0
Explosion in a Feed casting furnace	1.0×10^{-2}	1.83	0.0011	9,250	5.55	1,260	1.0
Nuclear Criticality	1.0×10^{-2}	$3.42\text{x}10^{-6}$	$2.05\text{x}10^{-9}$	0.00728	$4.37\text{x}10^{-6}$	0.00146	$8.76\text{x}10^{-7}$
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	0.122	$7.32\text{x}10^{-5}$	617	0.37	83.7	0.1
Radioactive Material Spill	1×10^{-2}	0.00367	$2.20\text{x}10^{-6}$	18.5	0.0111	2.51	0.00151

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table C.4-10—Annual Cancer Risks for CPC—SRS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Non-involved Worker[c]
Beyond Evaluation Basis Earthquake With Fire	$2.03\text{x}10^{-8}$	$1.05\text{x}10^{-4}$	$1\text{x}10^{-5}$
Fire in a Single Building	$9.42\text{x}10^{-8}$	$4.73\text{x}10^{-4}$	$1\text{x}10^{-4}$
Explosion in a Feed Casting Furnace	$1.1\text{x}10^{-5}$	$5.55\text{x}10^{-2}$	$1\text{x}10^{-2}$
Nuclear Criticality	$2.05\text{x}10^{-11}$	$4.37\text{x}10^{-8}$	$8.76\text{x}10^{-9}$
Fire-Induced Release in the CRT Storage Room	$7.32\text{x}10^{-7}$	$0.37\ \text{x}10^{-7}$	$1\text{x}10^{-3}$
Radioactive Material Spill	$2.20\text{x}10^{-8}$	$1.11\text{x}10^{-4}$	$1.51\text{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

C.4.6 Y-12 Alternative

Table C.4-11—CPC Radiological Accident Frequency and Consequences—Y-12

		Maximally Exposed Individual[a]		**Offsite Population**[b]		**Noninvolved Worker**[c]	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	219	0.263	295,000	177	857	1.0
Fire in a Single Building	1.0×10^{-4}	173	0.208	152,000	91.2	4,760	1.0
Explosion in a Feed Casting Furnace	1.0×10^{-2}	203	0.244	178,000	107	5,580	1.0
Nuclear Criticality	1.0×10^{-2}	0.000301	1.81×10^{-7}	0.117	7.02×10^{-5}	0.00544	3.26×10^{-6}
Fire-Induced Release in the CRT Storage Room	1.0×10^{-2}	13.5	0.0081	11,900	7.14	372	0.446
Radioactive Material Spill	1×10^{-2}	0.406	0.000244	357	0.214	11.2	0.00672

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table C.4-12—Annual Cancer Risks for CPC–Y-12

Accident	**Maximally Exposed Individual**[a]	**Offsite Population**[b]	**Noninvolved Worker**[c]
Beyond Evaluation Basis Earthquake With Fire	2.63×10^{-6}	1.77×10^{-3}	1×10^{-5}
Fire in a Single Building	2.08×10^{-5}	9.12×10^{-3}	1×10^{-4}
Explosion in a Feed Casting Furnace	2.44×10^{-3}	1.07	1×10^{-2}
Nuclear Criticality	1.81×10^{-9}	7.02×10^{-7}	3.26×10^{-8}
Fire-Induced Release in the CRT Storage Room	8.1×10^{-5}	7.14×10^{-2}	4.46×10^{-3}
Radioactive Material Spill	2.44×10^{-6}	2.14×10^{-3}	6.72×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

C.4.7 Chemical Accident Frequency and Consequences—CPC

The chemicals selected for evaluation are based on the aqueous feed preparation process, as noted in each table, and are considered the most hazardous of all the chemicals used in this process. Determination of a chemical's hazardous ranking takes into account quantities available for release, protective concentration limits (ERPG-2), and evaporation rate. The most hazardous chemical used in an alternative method, the pyrochemical processing method is also analyzed as noted in the tables.

This section presents the impacts of potential chemical accidents at each of the five CPC site alternatives. The tables show the name of the chemical and the quantity released during a severe accident. The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite.

Table C.4-13—Chemical Accident Frequency and Consequences at Los Alamos

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm) [b]	At Site Boundary(ppm)	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	10.4	10^{-4}
Formic acid	1,500	10	0.215	0.54	1.06	10^{-4}

[a] At site boundary, approximately 0.7 miles from release.

Table C.4-14—Upgrade 80 Chemical Accident Frequency and Consequences

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	3,420	6	0.5	1.46	2.85	10^{-4}
Hydrofluoric acid	340	20	0.4	3.1	6.42	10^{-4}
Hydrochloric acid	384	20	2.1	118	264	10^{-4}

[a] At site boundary, approximately 0.7 miles from release.

Table C.4-15—Chemical Accident Frequency and Consequences at NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	<0.1	10^{-4}
Formic acid	1,500	10	0.215	0.54	<0.1	10^{-4}

[a] Site boundary is at a distance of 13.7.

Table C.4-16—Chemical Accident Frequency and Consequences at Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}
Hydrofluoric acid	550	20	0.5	5.1	0.55	10^{-4}
Formic acid	1,500	10	0.22	0.56	<0.1	10^{-4}

[a] Site boundary is at a distance of 2.2 miles.

Table C.4-17—Chemical Accident Frequency and Consequences at SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}
Hydrofluoric acid	550	20	0.12	0.21	<0.01	10^{-4}
Formic acid	1,500	10	0.1	0.02	0	10^{-4}

[a] Site boundary is at a distance of 6.7 miles.

Table C.4-18—CPC Chemical Accident Frequency and Consequences at Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary(ppm)	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}
Hydrofluoric acid	550	20	0.35	2.0	0.016	10^{-4}
Formic acid	1,500	10	0.08	0.07	0	10^{-4}

[a] At site boundary, approximately 1.3 miles from release.

C.5 RADIOLOGICAL ACCIDENT SCENARIOS—CUC

This section presents the estimated impacts of accidents that could occur at a CUC. The scenarios described here define the bounding envelope of accidents—that is, any other reasonably foreseeable accident at the CUC would be expected to have similar or smaller consequences. These accident analyses are conservative, with little or no credit taken for existing preventative and mitigating features in each building or operation analyzed or the safety procedures that are mandatory at NNSA sites.

C.5.1 Accident Scenarios

From the safety documents obtained through the process described in Section C.3.1, Table C.5-1 identifies the accident scenarios and source terms (release rates and frequencies) that were developed for the CUC (Tetra Tech 2008).

Table C.5-1—Potential CUC Accident Scenarios

Accident	Frequency	Source Term or Hazard	Notes/Assumptions
EU Metal Fabrication Complex			
Local fire	$10^{-2} - 10^{-4}$	N/A, No radiological consequences	
Uranium Metal Criticality	$10^{-2} - 10^{-4}$	See Tables C.5-2 through C.5-4	1.0×10^{18} fissions
Major fire	$10^{-4} - 10^{-6}$	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hr
Aircraft Crash—Initiator for major fire	$1.5 \times 10^{-5} - 2.2 \times 10^{-5}$	See major fire	
Tanker Truck Accident—Initiator for major fire	$10^{-4} - 10^{-6}$	See major fire	
Earthquake	$10^{-2} - 10^{-4}$	Same as criticality	
High Winds	$10^{-2} - 10^{-4}$	Same as earthquake	
Rain/Snow	$10^{-2} - 10^{-4}$	Same as earthquake	
Assembly			
Uranium Metal Criticality	$10^{-2} - 10^{-4}$	See Tables C.5-2 through C.5-4	1.0×10^{18} fissions
Explosion	$10^{-4} - 10^{-6}$	2 kg EU (sum of metal and chips) 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hr
Fire	$10^{-4} - 10^{-6}$	Same as explosion	Release height = 7.6 m Release duration = 2 hr
Earthquake	$10^{-2} - 10^{-4}$	Bounded by fire	
Wind	$10^{-1} - 10^{-2}$	None	
Flood	$10^{-2} - 10^{-4}$	None	
Aircraft crash	$\sim 2 \times 10^{-5}$	Bounded by fire	
Manufacturing QE			
Uranium Metal Criticality	$10^{-2} - 10^{-4}$	See Tables C.5-2 through C.5-4	1.0×10^{18} fissions
Local fires	$10^{-2} - 10^{-4}$	No radiological releases	
Large Building Fire	$10^{-4} - 10^{-6}$	2.6 kg EU 54 kg DU 172 kg Th	Release height =<10 m Release duration = 1 hr
Aircraft Crash—Initiator for large building fire	$4.5 \times 10^{-5} - 5.0 \times 10^{-5}$	See large building fire	
Tanker Truck explosion—Initiator for large building fire	$10^{-4} - 10^{-6}$	See large building fire	
Earthquake	$10^{-2} - 10^{-4}$	Bounded by criticality	
Wind	$10^{-2} - 10^{-4}$	Bounded by criticality	
Rain/Snow	$10^{-2} - 10^{-4}$	Bounded by criticality	

Table C.5-1—Potential CUC Accident Scenarios (continued)

Accident	Frequency	Source Term or Hazard	Notes/Assumptions
EU Warehouse			
Uranium Metal Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$1.0×10^{18}$ fissions
Fire	$10^{-4} – 10^{-6}$	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (represents sum of metals, oxides, and combustibles) Pu = $1.0×10^{-6}$ kg Np-237 = $1.6×10^{-5}$ kg	Release height = 4 m Release duration = 1 hr
Aircraft crash—Initiator of fire	$1.2×10^{-5}$	Same as fire	
Earthquake-induced loss of confinement	$10^{-2} – 10^{-4}$	EU = 1.3 kg DU = 0.06 kg Th = 0.03 kg (the above all represent the sum of metals, oxides, and combustibles)	Release height = ground level Release duration = 15 min
Wind	$10^{-2} – 10^{-4}$	Bounded by criticality, fire	
Flood	$10^{-2} – 10^{-4}$	Bounded by criticality	
Lightning	$10^{-4} – 10^{-6}$	Bounded by fire	
HEUMF			
Design-basis fires[1]	$10^{-2} – 10^{-4}$	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hr
Uranium Metal Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$1.0×10^{18}$ fissions
Earthquake	$10^{-2} – 10^{-4}$	None	
Wind	$10^{-2} – 10^{-4}$	None	
Rain/Snow	$10^{-2} – 10^{-4}$	None	
Flood	$10^{-2} – 10^{-4}$	Bounded by criticality	
EU Operations			
Uranium Metal Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$1.0×10^{18}$ fissions
Uranium Solution Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$3.25×10^{18}$ fissions
Local fires	$10^{-2} – 10^{-4}$	8 kg EU (includes aqueous and organic solutions	Release height = ground level Release duration = 15 min
Large fire	$10^{-4} – 10^{-6}$	14.8 kg EU (includes metals, oxides, aqueous and organic solutions)	Release height = "roof level" Release duration = 1 hr
Explosions	$10^{-2} – 10^{-4}$	None—localized effects	
Aircraft crash	$10^{-4} – 10^{-6}$	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

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[1] The source term for a design-basis fire at the HEUMF has been identified as the bounding (largest possible) source term, and reasonably bounds the source term that might result from any aircraft crash.

Table C.5-1—Potential CUC Accident Scenarios (continued)

Accident	Frequency	Source Term or Hazard	Notes/Assumptions
EU Operations *(continued)*			
Earthquake-induced fire	$10^{-2} – 10^{-4}$	Same as large fire	
Wind	$10^{-2} – 10^{-4}$	Bounded by earthquake	
Rain/Snow	$10^{-2} – 10^{-4}$	Bounded by earthquake	
Lightning	$10^{-2} – 10^{-4}$	Same as local fire	
Analytical Laboratory			
Uranium Metal Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$1.0×10^{18}$ fissions
Large fire	$10^{-2} – 10^{-4}$	0.06 kg EA (includes solutions, metals, oxides, etc.)	
Aircraft crash	$1.4×10^{-5}$	Same as large fire	
Machine Shop Special Materials			
Large fire	$10^{-4} – 10^{-6}$	96.6 kg DU (includes metals, fines, and oxides)	Release height = ground level Release duration = 1 hr
Inadvertent water leak into furnace	$10^{-2} – 10^{-4}$	32 kg DU	Release height = ground level Release duration = “short” (assume 15 min)
Machine Shop DU/Binary			
Large fire	$10^{-4} – 10^{-6}$	31.3 kg DU (includes bulk metal, chips, and fines)	Release height = “elevated” Release duration = 1 hr
Uranium Metal Criticality	$10^{-2} – 10^{-4}$	See Tables C.5-2 through C.5-4	$1.0×10^{18}$ fissions
Earthquake	$10^{-2} – 10^{-4}$	Bounded by large fire	
High wind/tornado	$10^{-2} – 10^{-4}$	Bounded by large fire	
Rain/Snow	$10^{-2} – 10^{-4}$	Bounded by large fire	

Source: Tetra Tech 2008.

Table C.5-2—Source Term (Ci) Released to the Environment Following a Uranium Metal Criticality ($1.0×10^{18}$ fissions)

Radionuclide	Half Life	Curies released
Kr-83m	1.8 hr	8.00E+00
Kr-85m	4.5 yr	7.50E+00
Kr-84	1.7 yr	8.00E-05
Kr-87	76.3 min	4.95E+01
Kr-88	2.8 hr	3.25E+01
Kr-89	3.2 min	2.10E+03
Xe-131m	11.9 day	4.10E-03
Xe-133m	2.0 day	9.00E-02
Xe-133	5.2 day	1.35E+00
Xe-135m	15.6 min	1.10E+02
Xe-135	9.1 hr	1.80E+01
Xe-137	3.8 min	2.45E+03
Xe-138	14.2 min	6.50E+02
I-131	8.1 day	4.35E-02
I-132	2.3 hr	5.50E+00
I-133	0.8 hr	8.00E-01
I-134	52.6 min	2.25E+01
I-135	6.6 hr	2.35E+00

Source: Tetra Tech 2008.

Table C.5-3—Source Term (Ci)–Uranium Solution Criticality (3.28×10^{18} fissions)

Radionuclide	Half Life	Curies released
Kr-83m	1.8 hr	5.25E+01
Kr-85m	4.5 yr	4.92E+01
Kr-84	1.7 yr	5.25E-04
Kr-87	76.3 min	3.25E+02
Kr-88	2.8 hr	2.13E+02
Kr-89	3.2 min	1.38E+04
Xe-131m	11.9 day	2.69E-02
Xe-133m	2.0 day	5.90E-01
Xe-133	5.2 day	8.86E+00
Xe-135m	15.6 min	7.22E+02
Xe-135	9.1 hr	1.18E+02
Xe-137	3.8 min	1.61E+04
Xe-138	14.2 min	4.26E+03
I-131	8.1 day	7.13E-01
I-132	2.3 hr	9.02E+01
I-133	0.8 hr	1.31E+01
I-134	52.6 min	3.69E+02
I-135	6.6 hr	3.85E+01

Source: Tetra Tech 2008.

Table C.5-4—Estimated Direct Radiation Dose From an Unshielded Criticality Accident

Downwind Distance (m)	Direct Radiation Dose (rem)	
	Uranium metal criticality	Uranium solution criticality
100	5.7	18.6
200	0.88	2.9
300	0.25	0.81
350	0.14	0.47
400	0.088	0.29
450	0.056	0.18
500	0.036	0.12
550	0.024	0.079
600	0.016	0.053
650	0.011	0.036
700	0.0077	0.025
750	0.0054	0.018
800	0.0039	0.013
850	0.0028	0.0091
900	0.0020	0.0066
950	0.0015	0.0048
1000	0.0011	0.0036

Source: Tetra Tech 2008.

C.5.2 Estimated Health Effects

Table C.5-5 identifies the accidents that are analyzed in this SPEIS for the CUC. Tables C.5-6 through C.6-17 show the consequences and risks of the postulated set of accidents for a noninvolved worker and the public (MEI and the general population living within 50 miles of the site), for the site alternatives for the CUC.

Table C.5-5—Uranium Operations Accidents

Operation	Accident	Frequency	Source Term	Notes/Assumptions
EU Metal Fabrication	Major fire	$10^{-4} – 10^{-6}$	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hour
Assembly	Explosion	$10^{-4} – 10^{-6}$	2 kg EU (sum of metal and chips) 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hour
EU Warehouse	Fire	$10^{-4} – 10^{-6}$	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (the above all represent the sum of metals, oxides, and combustibles) Pu = $1.0×10^{-6}$ kg Np-237 = $1.6×10^{-5}$ kg	Release height = 4 m Release duration = 1 hour
HEUMF	Design-basis fires	$10^{-2} – 10^{-4}$	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hour
EU Operations	Aircraft crash	$10^{-4} – 10^{-6}$	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

Source: Tetra Tech 2008.

Table C.5-6—CUC Radiological Accident Frequency and Consequences at Los Alamos, TA-55 [a]

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	Frequency (per year)	Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.213	1.28×10^{-4}	94.5	5.67×10^{-2}	7.53	4.52×10^{-3}
Explosion	$10^{-4} – 10^{-6}$	0.0209	1.25×10^{-5}	9.3	5.58×10^{-3}	0.612	3.67×10^{-4}
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.249	1.49×10^{-4}	110	6.6×10^{-2}	8.33	5.0×10^{-3}
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0267	1.6×10^{-5}	12	7.2×10^{-3}	0.637	3.82×10^{-4}
Aircraft crash	$10^{-4} – 10^{-6}$	0.132	7.92×10^{-5}	75.5	4.53×10^{-2}	0.8	4.8×10^{-4}

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

Table C.5-7—Annual Cancer Risks for CUC at Los Alamos, TA-55

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.28×10^{-8}	5.67×10^{-6}	4.52×10^{-7}
Explosion	1.25×10^{-9}	5.58×10^{-7}	3.67×10^{-8}
Fire in EU Warehouse	1.49×10^{-8}	6.6×10^{-6}	5.0×10^{-7}
Design-basis fires for HEU Storage	1.6×10^{-7}	7.2×10^{-5}	3.82×10^{-6}
Aircraft crash	7.92×10^{-9}	4.53×10^{-6}	4.8×10^{-8}

Source: Tetra Tech 2008.

[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.

[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.

[c] At a distance of 1,000 meters.

Table C.5-8—Potential Accident Consequences—CUC at Los Alamos, TA-16[a]

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
EU Metal Fabrication	0.798	4.79×10^{-4}	60.3	3.62×10^{-2}	7.53	4.52×10^{-7}
Assembly	0.0768	4.61×10^{-5}	5.95	3.57×10^{-3}	0.612	3.67×10^{-8}
EU Warehouse	0.926	5.56×10^{-4}	70.6	4.24×10^{-2}	8.33	5.0×10^{-7}
HEUMF	0.0961	5.77×10^{-5}	7.7	4.62×10^{-3}	0.637	3.82×10^{-6}
EU Operations	0.158	9.48×10^{-5}	68.2	4.09×10^{-2}	0.8	4.8×10^{-8}

Source: Tetra Tech 2008.

[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.

[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.

[c] At a distance of 1,000 meters.

Table C.5-9—Annual Cancer Risks for CUC at Los Alamos, TA-16

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	4.79 x 10^{-8}	3.62 x 10^{-6}	0.00452
Explosion	4.61 x 10^{-9}	3.57 x 10^{-7}	0.000367
Fire in EU Warehouse	5.56 x 10^{-8}	4.24 x 10^{-6}	0.005
Design-basis fires for HEU Storage	5.77 x 10^{-7}	4.62 x 10^{-5}	0.000382
Aircraft crash	9.48 x 10^{-9}	4.09 x 10^{-6}	0.00048

Source: Tetra Tech 2008.
[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

Table C.5-10—CUC Radiological Accident Frequency, Consequences, and Risks at NTS

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	10^{-4} – 10^{-6}	0.00314	1.88 x 10^{-6}	1.21	0.000726	3.36	0.00202
Explosion	10^{-4} – 10^{-6}	0.000309	1.85x10^{-7}	0.119	0.0000714	0.252	0.000151
Fire in EU Warehouse	10^{-4} – 10^{-6}	0.00366	2.20x10^{-6}	1.41	0.000846	3.63	0.00218
Design-basis fires for HEU Storage	10^{-2} – 10^{-4}	0.000398	2.39x10^{-7}	0.155	0.000093	0.243	0.000146
Aircraft crash[d]	10^{-4} – 10^{-6}	0.0071	4.26x10^{-6}	2.28	0.00137	2.13	0.00128

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.
[e] NTS has controlled airspace over approximately 8000 square miles. Aircraft accidents are extremely unlikely and, therefore, are usually excluded from further analysis at the NTS. This accident is included as a comparison to other CUC sites.

Table C.5-11—Annual Cancer Risks for CUC at NTS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.88 x 10^{-10}	7.26 x 10^{-8}	2.02 x 10^{-7}
Explosion	1.85 x 10^{-11}	7.14 x 10^{-9}	1.51 x 10^{-8}
Fire in EU Warehouse	2.20 x 10^{-10}	8.46 x 10^{-8}	2.18 x 10^{-7}
Design-basis fires for HEU Storage	2.39 x 10^{-9}	9.3 x 10^{-7}	1.46 x 10^{-6}
Aircraft crash	4.26 x 10^{-10}	1.37 x 10^{-7}	1.28 x 10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

Table C.5-12—CUC Radiological Accident Frequency and Consequences at Pantex

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	10^{-4} – 10^{-6}	0.0388	0.0000233	15.8	0.00948	3.38	0.00203
Explosion	10^{-4} – 10^{-6}	0.00383	2.30×10^{-6}	1.56	0.000936	0.283	0.00017
Fire in EU Warehouse	10^{-4} – 10^{-6}	0.0454	0.0000272	18.4	0.011	3.77	0.00226
Design-basis fires for HEU Storage	10^{-2} – 10^{-4}	0.00494	2.96×10^{-6}	2.01	0.00121	0.303	0.000182
Aircraft crash	10^{-4} – 10^{-6}	0.0719	0.0000431	26.4	0.0158	2.68	0.00161

[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.
Source: Tetra Tech 2008.

Table C.5-13—Annual Cancer Risks for CUC at Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Major fire	2.33×10^{-9}	9.48×10^{-7}	2.03×10^{-7}
Explosion	2.30×10^{-10}	9.36×10^{-8}	1.7×10^{-8}
Fire in EU Warehouse	2.72×10^{-9}	1.1×10^{-6}	2.26×10^{-7}
Design-basis fires for HEU Storage	2.96×10^{-8}	1.21×10^{-5}	1.82×10^{-6}
Aircraft crash	4.31×10^{-9}	1.58×10^{-6}	1.61×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table C.5-14—Potential Accident Consequences—CUC at SRS

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	10^{-4} – 10^{-6}	0.00535	3.21×10^{-6}	27	0.0162	3.66	0.0022
Explosion	10^{-4} – 10^{-6}	0.000528	3.17×10^{-7}	2.67	0.0016	0.313	0.000188
Fire in EU Warehouse	10^{-4} – 10^{-6}	0.00625	3.75×10^{-6}	31.5	0.0189	4.11	0.00247
Design-basis fires for HEU Storage	10^{-2} – 10^{-4}	0.000682	4.09×10^{-7}	3.45	0.00207	0.344	0.000206
Aircraft crash	10^{-4} – 10^{-6}	0.011	6.60×10^{-6}	47.3	0.0284	1.28	0.000768

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

Table C.5-15—Annual Cancer Risks for CUC at SRS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	3.21×10^{-10}	1.62×10^{-6}	2.2×10^{-7}
Explosion	3.17×10^{-11}	1.6×10^{-7}	1.88×10^{-8}
Fire in EU Warehouse	3.75×10^{-10}	1.89×10^{-6}	2.47×10^{-6}
Design-basis fires for HEU Storage	4.09×10^{-9}	2.07×10^{-5}	2.06×10^{-6}
Aircraft crash	6.60×10^{-10}	2.84×10^{-6}	7.68×10^{-8}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table C.5-16—UPF or Upgraded Facilities, Radiological Accident Frequency and Consequences at Y-12

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	Frequency (per year)	Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.592	0.000355	520	0.312	16.3	0.00978
Explosion	$10^{-4} – 10^{-6}$	0.0577	0.0000346	51.2	0.0307	1.18	0.000708
Fire in UPF Warehouse	$10^{-4} – 10^{-6}$	0.689	0.000413	608	0.365	17.4	0.0104
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0734	0.000044	66.1	0.0397	1.08	0.000648
Aircraft crash	$10^{-4} – 10^{-6}$	0.259	0.000155	665	0.399	0.388	0.000233

[a] At site boundary, approximately 1.3 miles from release.

[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.

[c] At 1000 meters from release.

Source: Tetra Tech 2008.

Table C.5-17—Annual Cancer Risks for CUC at Y-12

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	3.55×10^{-8}	3.12×10^{-5}	9.78×10^{-7}
Explosion	3.46×10^{-9}	3.07×10^{-6}	7.08×10^{-8}
Fire in UPF Warehouse	4.13×10^{-8}	3.65×10^{-5}	1.04×10^{-6}
Design-basis fires for HEU Storage	4.4×10^{-7}	3.97×10^{-4}	6.48×10^{-6}
Aircraft crash	1.55×10^{-8}	3.99×10^{-5}	2.33×10^{-8}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 1.3 miles from release.

[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.

[c] At 1000 meters from release.

C.5.3 Involved Worker Impacts

Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. However, prediction of latent potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be precisely defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident itself.

C.5.4 CUC Chemical Accident Frequency and Consequences

The chemicals selected for evaluation are based on the aqueous feed preparation process, as noted in each table, and are considered the most hazardous of all the chemicals used in this process. Determination of a chemical's hazardous ranking takes into account quantities available for release, protective concentration limits (ERPG-2) and evaporation rate. This section presents the impacts of potential chemical accidents at each of the five CUC site alternatives. The tables show the name of the chemical and the quantity released during a severe accident. The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in parts per million. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of one hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations (Tetra Tech 2008).

Table C.5-18—Chemical Accident Frequency and Consequences at Los Alamos

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)[b]	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}

[a] Site boundary is at a distance of 1.2 miles.

Table C.5-19—Chemical Accident Frequency and Consequences at NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}

[a] Site boundary is at a distance of 13.7 miles.

Table C.5-20—Chemical Accident Frequency and Consequences at Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}

[a] Site boundary is at a distance of 2.2 miles.

Table C.5-21—Chemical Accident Frequency and Consequences at SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}

[a] Site boundary is at a distance of 6.7 miles.

Table C.5-22—Chemical Accident Frequency and Consequences at Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration[a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}

[a] Site boundary is at a distance of approximately 1.3 miles.

C.6 ACCIDENT SCENARIOS—A/D/HE CENTER

This section presents the estimated impacts of accidents that could occur at an A/D/HE Center. The scenarios described here define the bounding envelope of accidents—that is, any other reasonably foreseeable accident at the A/D/HE Center would be expected to have similar or smaller consequences. These accident analyses are conservative, with little or no credit taken for existing preventative and mitigating features in each building or operation analyzed or the safety procedures that are mandatory at NNSA sites.

C.6.1 Radiological Accident Scenarios

Facilities and operations at Pantex were analyzed to identify all hazards and potential accidents associated with the facilities and process systems, components, equipment, or structures and to establish design and operational means to mitigate these hazards to prevent potential accidents. The results of these analyses are contained in SARs and other safety basis documentation (see Section C.3.1).

For each facility and operation at Pantex, DOE has developed a safety analysis report. In addition, other facility-specific safety analyses have been performed and documented (e.g., process hazards reviews, hazards analysis documents, and justifications for continued operations). These documents were also utilized for the identification of potential accidents at Pantex. The next step of the screening process involved the identification of representative accidents that contribute to the risk to public and worker health from A/D/HE Center operations that would be similar to the operations currently performed at Pantex. Ideally, a complete evaluation of A/D/HE Center risks would include all potential accident scenarios. However, this type of an approach is impractical. Therefore, the purpose of this step in the screening process was to identify a subset of accident scenarios that contribute a large fraction of the total risk from A/D/HE Center operations. This step of the screening process involved the grouping of potential accidents based on both the magnitude of the frequency of occurrence and the magnitude of the expected consequence. Once the accidents were grouped, the accidents corresponding to the highest risk in each group were chosen for further analysis. For the accidents described below, which were identified as risk significant, consequence assessments were performed for the A/D/HE Center at the five site alternatives. Table C.6-1 presents the source terms for these accidents.

Scenario 1. Explosive-driven plutonium and tritium dispersal from an internal event. Nuclear weapons may be made with either conventional or insensitive HE, depending upon weapon design. Scenario 1 represents the accidental detonation of conventional HE in the presence of plutonium due to an internally initiated event. HE is present with radioactive materials in facilities where nuclear explosives work occurs. Initiators for this scenario include accidental actuation of an electro-explosive device during disassembly and handling accidents. Insensitive HE is a negligible risk contributor because it is not susceptible to ignition under the conditions existing during assembly or disassembly (A/D) operations. Insensitive HE is, thus, not a credible explosive source for this scenario.

Scenario 1 is comprised of three individual cases in which an accidental HE detonation is postulated to be initiated by an internal event. These cases differ in where the accidental detonation occurs; i.e., in a nuclear weapons A/D cell, a bay, or a special purpose building. An HE detonation during A/D would lead to the dispersal of radioactive material. Weapons are designed so that, in the event of an accidental detonation, there will be no significant nuclear reactions. Positive measures are engineered into nuclear explosives to preclude a nuclear yield from an accidental HE detonation.

The frequency of Scenario 1 is estimated to be 1.1 x 10^{-5} per year. It is, thus, *extremely unlikely* (frequency of occurrence is less than 10^{-4} per year but greater or equal to 10^{-6} per year). The derivation of this frequency involves summing of probabilities of different initiating events in different facilities. Explosive-driven plutonium dispersal from an internal event can result from operations conducted in bays, cells, or special purpose facilities. The probability per operation that an operational error could cause an explosive-driven plutonium and tritium release was estimated for each facility using data from available safety analyses (Tetra Tech 2008).

Scenario 2. Tritium reservoir failure from an internal event. This scenario represents the release of tritium due to a reservoir failure during normal operations. Initiators for this scenario include an inadvertent squib valve actuation during weapon operations.

This type of event has occurred at Pantex, and the frequency of this event is strongly dependent on the number of weapon operations being performed. For the 2,000 weapons activity level, this scenario is *anticipated* (frequency greater than or equal to 10^{-2} per year). For the 500 weapons activity level, this event is *unlikely* (frequency of occurrence is less than 10^{-2} per year but greater than or equal to 10^{-4} per year). This scenario is dominated by handling accidents during weapon operations (Tetra Tech 2008).

Scenario 3. Pit breach from an internal event. This scenario represents a pit breach, with resultant plutonium release, during normal operations. Initiators that contribute to this scenario include a pit drop due to a handling accident and a pit breach due to a forklift accident (Pantex 1996a, DOE 1994w). This scenario is dominated by handling accidents in bays and special purpose facilities. The overall likelihood of this scenario occurring is *unlikely* (frequency of occurrence is less than 10^{-2} per year but greater than or equal to 10^{-4} per year) (Tetra Tech 2008).

Scenario 4. Multiple tritium reservoir failure from an external event or natural phenomena. This scenario represents the release of tritium from reservoir failures caused by a fire in the tritium storage vault. The fire could be initiated by a seismic event or aircraft crash.
The dominant event in this scenario is a seismic event initiated fire in the warehouse surrounding the tritium storage vault. For a release to occur, the protective vault fire door would have to be open and the fire protection system disabled by the seismic initiator. The overall likelihood of this scenario occurring is *not reasonably foreseeable* (frequency of occurrence is less than 10^{-6} per year) (Tetra Tech 2008).

Scenario 5. Fire-driven dispersal involving stored pits from an external event or natural phenomena. This scenario represents a pit breach, resulting in a plutonium release, initiated by a seismic event or aircraft accident. The overall likelihood of this scenario occurring is *extremely unlikely* (frequency of occurrence is less than 10^{-4} per year but greater or equal to 10^{-6} per year) (Tetra Tech 2008).

Scenario 6. Plutonium and tritium dispersal from an external event or natural phenomena. This scenario represents a tritium or plutonium release, without an explosion, caused by a seismic event or aircraft crash. Initiators include an aircraft impact-initiated fire in a nuclear explosive facility and a seismic collapse of a special purpose facility (Pantex 1993a). This scenario is dominated by seismic events resulting in structural failure of special purpose buildings containing nuclear explosives. Many stockpile support activities (e.g., testing and maintenance) are performed in older facilities without the structural strength of the storage magazines. Thus, these facilities are more vulnerable to external events and natural phenomena. The overall likelihood of this scenario occurring is *unlikely* (frequency of occurrence is less than 10^{-2} per year but greater than or equal to 10^{-4} per year) (Tetra Tech 2008).

Table C.6-1—Representative A/D/HE Accident Source Terms

Scenario	Pu Release (Ci)	Tritium Release (Ci)
Scenario 1	400	3.0×10^5
Scenario 2	0	2.0×10^5
Scenario 3	1.8×10^{-5}	0
Scenario 4	0	4.0×10^7
Scenario 5	50	0
Scenario 6	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Table C.6-2—Potential Consequences of A/D/HE Accidents at LANL

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	73.8	0.0886	5,580	3.35	696	0.835
Scenario 2	0.0529	3.17x10^{-5}	4	2.4x10^{-3}	0.499	2.99x10^{-4}
Scenario 3	4.42x10^{-6}	2.65x10^{-9}	3.34x10^{-4}	2.00x10^{-7}	4.17x10^{-5}	2.50x10^{-8}
Scenario 4	1.31	7.86x10^{-4}	545	0.327	7.94	4.76x10^{-3}
Scenario 5	1.37	8.22x10^{-4}	570	0.342	8.3	4.98x10^{-3}
Scenario 6	0.0102	6.12x10^{-6}	4.23	2.5x10^{-3}	0.0615	3.69x10^{-5}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 0.5 miles from release.

[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.

[c] At a distance of 1,000 meters.

Table C.6-3—Annual Cancer Risks for A/D/HE Accidents at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Individual Noninvolved Worker[c]
Scenario 1	8.86x10^{-6}	3.35x10^{-4}	8.35x10^{-5}
Scenario 2	3.17x10^{-7}	2.4x10^{-4}	2.99x10^{-6}
Scenario 3	2.65x10^{-11}	2.00x10^{-9}	2.50x10^{-10}
Scenario 4	7.86x10^{-10}	3.27x10^{-7}	4.76x10^{-9}
Scenario 5	8.22x10^{-8}	3.42x10^{-5}	4.98x10^{-7}
Scenario 6	6.12x10^{-8}	2.54x10^{-5}	3.69x10^{-7}

Source: Tetra Tech 2008.

[a] At site boundary, approximately 0.5 miles from release.

[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.

[c] At a distance of 1,000 meters.

Table C.6-4—Potential Consequences of A/D/HE Accidents at NTS

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	0.29	0.000174	112	0.0672	311	0.373
Scenario 2	0.000208	1.25x10^{-7}	0.08	0.000048	0.223	0.000134
Scenario 3	1.74x10^{-8}	1.04x10^{-11}	6.70x10^{-6}	4.02x10^{-9}	1.86x10^{-5}	1.12x10^{-8}
Scenario 4	0.043	2.58E-05	17.7	0.0106	26.3	0.0316
Scenario 5	0.045	0.000027	18.5	0.0111	27.5	0.033
Scenario 6	0.000333	2.00x10^{-7}	0.137	8.22x10^{-5}	0.204	0.000122

Source: Tetra Tech 2008.

[a] At site boundary, 13.7 miles from release.

[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

Table C.6-5—Annual Cancer Risks for A/D/HE Accidents at NTS

	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Accident	Latent Cancer Fatalities	Latent Cancer Fatalities	Latent Cancer Fatalities
Scenario 1	$1.74x10^{-8}$	$6.72x10^{-6}$	$3.73x10^{-5}$
Scenario 2	$1.25x10^{-9}$	$4.8x10^{-7}$	$1.34x10^{-6}$
Scenario 3	$1.04x10^{-13}$	$4.02x10^{-11}$	$1.12x10^{-10}$
Scenario 4	$2.58x10^{-11}$	$1.06x10^{-8}$	$3.16x10^{-8}$
Scenario 5	$2.7x10^{-9}$	$1.11x10^{-6}$	$3.3x10^{-6}$
Scenario 6	$2.00x10^{-9}$	$8.22x10^{-7}$	$1.22x10^{-6}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 13.7 miles from release.

[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.

[c] At 1000 meters from release.

Table C.6-6—Potential Consequences of A/D/HE Accidents at Pantex

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Scenario 1	3.59	0.00215	1,460	0.876	312	0.374
Scenario 2	0.00257	$1.54x10^{-6}$	1.04	0.000624	0.224	0.000134
Scenario 3	$2.15x10^{-7}$	$1.29x10^{-10}$	$8.73x10^{-5}$	$5.24x10^{-8}$	$1.87x10^{-5}$	$1.12x10^{-8}$
Scenario 4	0.453	0.000272	208	0.125	25.2	0.0302
Scenario 5	0.474	0.000284	218	0.131	26.3	0.0316
Scenario 6	0.00352	$2.11x10^{-6}$	1.61	0.000966	0.195	0.000117

Source: Tetra Tech 2008.

[a] At site boundary, approximately 2.2 miles from release.

[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.

[c] At 1000 meters from release.

Table C.6-7—Annual Cancer Risks for A/D/HE Accidents at Pantex

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	$2.15x10^{-7}$	$8.76x10^{-5}$	$3.74x10^{-5}$
Scenario 2	$1.54x10^{-8}$	$6.24x10^{-6}$	$1.34x10^{-6}$
Scenario 3	$1.29x10^{-12}$	$5.24x10^{-10}$	$1.12x10^{-10}$
Scenario 4	$2.72x10^{-10}$	$1.25x10^{-7}$	$3.02x10^{-8}$
Scenario 5	$2.84x10^{-8}$	$1.31x10^{-5}$	$3.16x10^{-6}$
Scenario 6	$2.11x10^{-8}$	$9.66x10^{-6}$	$1.17x10^{-6}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 2.2 miles from release.

[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.

[c] At 1000 meters from release.

Table C.6-8—Potential Consequences of A/D/HE Accidents at SRS

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	0.495	0.000297	2,490	1.49	339	0.407
Scenario 2	0.000354	$2.12\text{x}10^{-7}$	1.79	0.00107	0.243	0.000146
Scenario 3	$2.96\text{x}10^{-8}$	$1.78\text{x}10^{-11}$	0.000149	$8.94\text{x}10^{-8}$	$2.03\text{x}10^{-5}$	$1.22\text{x}10^{-8}$
Scenario 4	0.065	0.000039	368	0.221	12.1	0.00726
Scenario 5	0.068	$4.08\text{x}10^{-5}$	385	0.231	12.6	0.00756
Scenario 6	0.000504	$3.02\text{x}10^{-7}$	2.85	0.00171	0.0936	$5.62\text{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table C.6-9—Annual Cancer Risks for A/D/HE Accidents at SRS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	$2.97\text{x}10^{-8}$	$1.49\ \text{x}10^{-4}$	$4.07\text{x}10^{-5}$
Scenario 2	$2.12\text{x}10^{-9}$	$1.07\text{x}10^{-5}$	$1.46\text{x}10^{-6}$
Scenario 3	$1.78\text{x}10^{-13}$	$8.94\text{x}10^{-10}$	$1.22\text{x}10^{-10}$
Scenario 4	$3.9\text{x}10^{-11}$	$2.21\text{x}10^{-7}$	$7.26\text{x}10^{-9}$
Scenario 5	$4.08\text{x}10^{-9}$	$2.31\text{x}10^{-5}$	$7.56\text{x}10^{-7}$
Scenario 6	$3.02\text{x}10^{-9}$	$1.71\text{x}10^{-5}$	$5.62\text{x}10^{-7}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 6.7 miles from release.

[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.

[c] At a distance of 1,000 meters.

Table C.6-10—Potential Consequences of A/D/HE Accidents at Y-12

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	54.7	0.0656	48,100	28.9	1,500	1
Scenario 2	0.0392	$2.35\text{x}10^{-5}$	34.4	0.0206	1.08	0.000648
Scenario 3	$3.28\text{x}10^{-6}$	$1.97\text{x}10^{-9}$	0.00288	$1.73\text{x}10^{-6}$	$9.02\text{x}10^{-5}$	$5.41\text{x}10^{-8}$
Scenario 4	2.3	0.00138	5,390	3.23	4.11	0.00247
Scenario 5	2.41	0.00145	5,630	3.38	4.3	0.00258
Scenario 6	0.0179	$1.07\text{x}10^{-5}$	41.8	0.0251	0.0319	$1.91\text{x}10^{-5}$

Source: Tetra Tech 2008.

[a] At site boundary, approximately 1.3 miles from release.

[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.

[c] At 1000 meters from release.

Table C.6-11—Annual Cancer Risks for A/D/HE Accidents at Y-12

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	6.56×10^{-6}	2.89×10^{-3}	1×10^{-4}
Scenario 2	2.35×10^{-7}	2.06×10^{-4}	6.48×10^{-6}
Scenario 3	1.97×10^{-11}	1.73×10^{-8}	5.41×10^{-10}
Scenario 4	1.38×10^{-9}	3.23×10^{-6}	2.47×10^{-9}
Scenario 5	1.45×10^{-7}	3.38×10^{-4}	2.58×10^{-7}
Scenario 6	1.07×10^{-7}	2.51×10^{-4}	1.91×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

C.6.2 Chemical Accident Scenarios

Chlorine has been identified as the hazardous chemical dominating the risk from nonradiological releases for an A/D/HE Center (DOE 1996c). Chlorine is the only chemical with the potential for significant adverse offsite consequences. Since chlorine is not carcinogenic, the consequences of exposure to chlorine (primarily acute effects) differ from the consequences of exposure to radionuclides (potential latent cancers). This difference precludes a direct comparison between the risk and consequences associated with hazardous chemical releases and radionuclide releases. A useful measure of potential human health effects resulting from exposure to non-carcinogenic chemicals is the hazard index. In its most general form, a hazard index is a ratio of the actual exposure of a human receptor to an established exposure limit. If this ratio is appreciably less than unity, no adverse human health effects are expected. If the hazard index is close to unity, some adverse human health effects may occur; and if the hazard index is substantially greater than unity, severe health effects can result.

Numerous exposure limits are available to form a hazard index. Since exposure to an accidental chlorine release is an unlikely, short-duration event, chronic exposure limits are inapplicable. Instead, ERPG values will serve to develop hazard indices for chlorine exposure.

Scenario 7. Chlorine release. The rooms in which chlorine gas would be used would be equipped with a chlorine sensor alarm system that consists of an alarm siren and flashing light located outside the building. The sensor system would be set to activate this alarm at a chlorine concentration of 1.0 part per million in the air. The rooms would also be ventilated with a floor-level exhaust fan and contain an elevated fresh air inlet.

A release of chlorine to the environment due to an earthquake is an unlikely event. Should an earthquake occur with sufficient magnitude to damage a facility that uses chlorine, could release the contents from a maximum of four chlorine cylinders in use. Other chlorine cylinders are not ordinarily expected to contribute to a release initiated by an earthquake. However, in the unlikely event that a chlorine cylinder is stored without its valve cap in place or is substandard structurally when delivered, it is conservatively postulated that Scenario 7 could involve a release from up to six chlorine cylinders. The magnitude of this chlorine release could be as high as 408 kilograms (900 pounds) (Tetra Tech 2008).

Workers in the vicinity of a chlorine release could be exposed to chlorine concentrations in excess of EPRG-3 and threshold levels. No long-term adverse health effects are expected for workers who promptly evacuate the area. For any persons incapable of evacuating the area of the chlorine plume, no serious or irreversible health impacts are expected from EPRG-1 or EPRG-2 exposures since the exposure duration is less than 1 hour. Persons incapable of evacuating an area with EPRG-3 concentrations may experience adverse health impacts depending upon the actual chlorine concentrations encountered and the exposure duration. However, chronic lung disease, electrocardiographic changes, and death have occurred in humans exposed to high concentrations of chlorine as a consequence of industrial accidents (Calabrese 1991).

Tables C.6-12 through C.6-16 depict the potential impacts of conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations.

Table C.6-12—Chlorine Accident Frequency and Consequences at LANL

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Chlorine	408.23	3	2.8	17.4	32.5	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 1.2 miles.

Table C.6-13—Chlorine Accident Frequency and Consequences at NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Chlorine	408.23	3	2.7	17	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 13.7 miles.

Table C.6-14—Chlorine Accident Frequency and Consequences at Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Chlorine	408.23	3	2.8	17.5	1.8	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 2.2 miles.

Table C.6-15—Chlorine Accident Frequency and Consequences at SRS

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Chlorine	408.23	3	1.8	15	<0.2	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

Table C.6-16—Chlorine Accident Frequency and Consequences at Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm)	
Chlorine	408.23	3	2.3	16	4.5	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of approximately 1.3 miles.

C.7 TRANSPORTATION RADIOLOGICAL ACCIDENTS

The offsite transportation accident analysis considers the impacts of accidents during the transportation of radiological materials. Under accident conditions, impacts to human health and the environment may result from the release and dispersal of radioactive material. Accidents that could potentially breach the shipping container are represented by a spectrum of accident severities and radioactive release conditions. Historically, most transportation accidents involving radioactive materials have resulted in little or no release of radioactive material from the shipping container. Consequently, the analysis of accident risks takes into account a spectrum of accidents ranging from high-probability accidents of low severity to hypothetical high-severity accidents that have a correspondingly low probability of occurrence. This accident analysis calculates the probabilities and consequences from this spectrum of accidents.

To provide NNSA and the public with a reasonable assessment of radioactive waste transportation accident impacts, two types of analyses were performed. An accident risk assessment was performed that takes into account the probabilities and consequences of a spectrum of potential accident severities using a methodology developed by the NRC (NRC 1977). For the spectrum of accidents considered in the analysis, accident consequences in terms of collective dose to the population within 80 kilometers (50 miles) were multiplied by the accident probabilities to yield collective dose risk using the RADTRAN 5.6/RadCat 2.3 computer code (Weiner 2006).

The impacts for specific alternatives were calculated in units of dose (rem or person-rem). Impacts are further expressed as health risks in terms of estimated latent cancer fatalities in exposed populations. The health risk conversion factor of 0.0006 LCF/person-rem was derived from the Interagency Steering Committee on Radiation Standards report (ISCOR 2002), A Method for Estimating Radiation Risk from Total Effective Dose Equivalent (TEDE).

The risk analyses consider a spectrum of accidents of varying severity. Each first determines the conditional probability that the accident will be of a specified severity. Then, based on the accident environment associated with each severe accident, each models the behavior of the material being shipped and the response of the packaging. The models estimate the fraction of each species of radioactive material that might be released for each of the severe accidents being considered. Results of the RADTRAN runs are provided in Table C.7-1.

Table C.7-1—Results of RADTRAN Accident Runs for a Single Shipment

RADTRAN Run No.	Dose Risk (person-rem)	RADTRAN Run No.	Dose Risk (person-rem)
1	-	9b	4.8×10^{-6}
2a	3.5×10^{-8}	10	2.9×10^{-11}
2b	-	11a	-
3	9.3×10^{-12}	11b	1.5×10^{-4}
4a	6.2×10^{-9}	12a	-
4b	-	12b	2.3×10^{-6}
5	1.8×10^{-11}	13a	4.4×10^{-9}
6	2.2×10^{-11}	13b	6.3×10^{-6}
7	-	14	2.3×10^{-11}
8	-	15a	1.2×10^{-5}
9a	1.6×10^{-8}	15b	3.2×10^{-6}

"-" = no RADTRAN run needed.
Source: DOE 2003b.

References Specific to Appendix C

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DOE 1996d	DOE, *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, DOE/EIS-0236, U.S. Department of Energy, Washington, D.C., 1996.
DOE 2002d	DOE, *Radiation Risk Estimation from Total Effective Dose Equivalents (TEDEs)*, Office of Environmental Policy and Guidance, Washington, D.C., August 9.
DOE 2003b	DOE, *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility*, DOE/EIS-236-S2, May 2003.
DOE 2005a	DOE, *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement*, DOE/EIS-0348 and DOE/EIS-0236-S3, U.S. Department of Energy, National Nuclear Security Administration, Washington, D.C., March 2005.
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EPA 2008	EPA, *Radiation Risk Assessment Software: CAP88 and CAP88 PC*, Available at: http://www.epa.gov/radiation/assessment/CAP88/index.html, Accessed: June-July 2008.
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Jacobs 1993a	Jacobs Engineering Group, *Chemical High Explosives Hazards Assessment for the Pantex Plant*, Jacobs Engineering Group, Amarillo, Texas, October 1993.
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LANL 1999b	LANL, *Final Supplement Analysis for Pit Manufacturing Facilities at Los Alamos National Laboratory, Stockpile Stewardship and Management Programmatic Environmental Impact Statement*, DOE/EIS-0236/SA-6, U.S. Department of Energy, Washington, D.C., 1999.
Lawrence 2002	Lawrence, Andy, Memorandum on the *Radiation Risk Estimation From Total Effective Dose Equivalents (TEDEs)*, Office of Environmental Policy and Guidance, Washington, D.C., August 9, 2002.
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NUREG 1990	Nuclear Regulatory Commission Regulation, *MELCOR Accident Consequence Code System (MACCS)*, NUREG/CR-4691-Vol. 3; SAND-86-1562-Vol. 3, Nuclear Regulatory Commission, Washington, D.C., February 1990.

Pantex 1995j	Pantex, *Basis for Interim Operations for the Pantex Plant*, Amarillo, Texas, Pantex Plant, June 1995, Unclassified Controlled Nuclear Information.
Ries et al. 2002	National Council on Radiation Protection and Measurement (NCRP), *Risk Estimates for Radiation Protection*, NCRP Report No. 115, 1993, First Edition, First Printing. (ISBN: 0929600347), National Council on Radiation Protection, Bethesda, MD, December 31, 1993.
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Appendix D
SUMMARY OF PUBLIC SCOPING DOCUMENTS

Appendix D
SUMMARY OF PUBLIC SCOPING COMMENTS

D.1 PUBLIC SCOPING PROCESS

As a preliminary step in the development of an environmental impact statement (EIS), regulations established by the Council on Environmental Quality (CEQ) (40 CFR 1501.7) and the U.S. Department of Energy (DOE) require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." The purpose of this scoping process is: (1) to inform the public about a proposed action and the alternatives being considered, and (2) to identify and/or clarify issues that are relevant to the EIS by soliciting public comments.

On October 19, 2006, the National Nuclear Security Administration (NNSA), a semi-autonomous agency within DOE, published a Notice of Intent (NOI) in the *Federal Register* announcing its intent to prepare a *Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (71 FR 61731). During the *National Environmental Policy Act* (NEPA) process, there are opportunities for public involvement (see Figure D.1-1). The NOI listed the issues initially identified by DOE for evaluation in the Complex Transformation[1] Supplemental Programmatic Environmental Impact Statement (SPEIS). Public citizens, civic leaders, and other interested parties were invited to comment on these issues and to suggest additional issues that should be considered in this SPEIS. NNSA accepted comments during the 90-day public scoping period via U.S. mail, e-mail, facsimile, and in person at public scoping meetings.

NNSA held public scoping meetings near each of the nine sites potentially affected by the alternatives and in Washington, DC. Meetings were held as shown on Figure D.1-2:

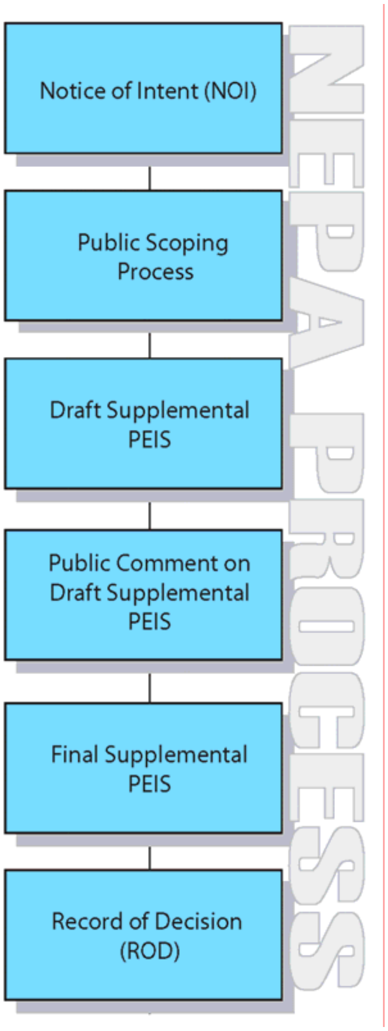

Figure D.1-1

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[1] In the NOI, this supplement was referred to as the "Complex 2030" SPEIS.

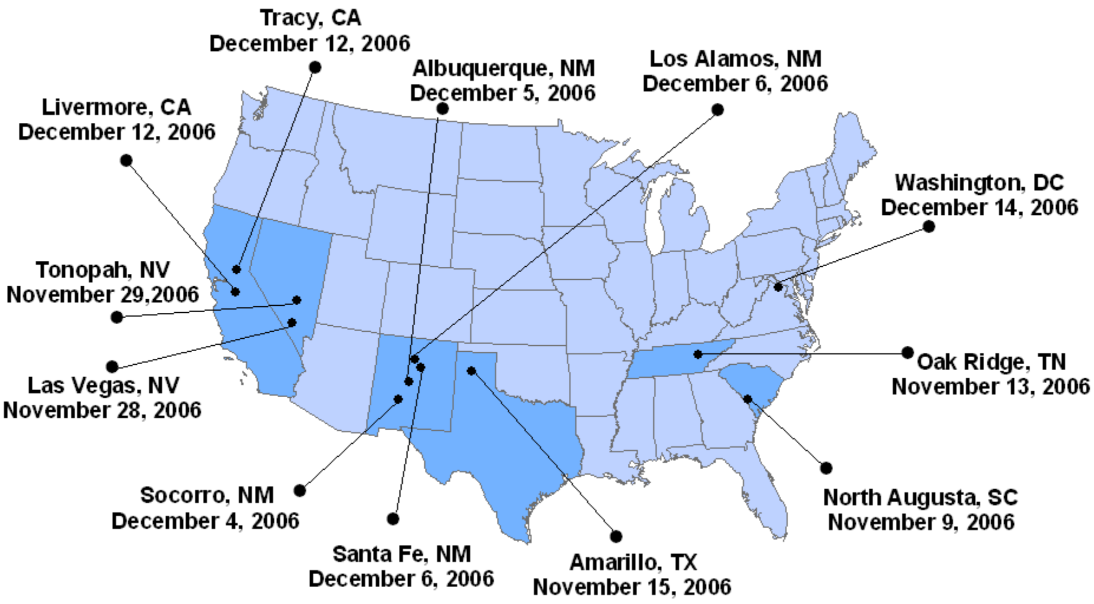

Figure D.1-2—Public Scoping Meeting Locations and Dates

DOE chose an interactive format for the scoping meetings. Each meeting began with an open house session where the public could speak to DOE representatives followed by a presentation by a DOE representative who explained the background, purpose and need for agency action, the alternatives, and the NEPA process. Following the presentation, members of the public were given the opportunity to provide oral comments. These oral comments were recorded, and a transcript for each meeting was produced.

D.2 ISSUE IDENTIFICATION AND COMMENT DISPOSITION

Comments received during the scoping period were systematically reviewed by DOE. Where possible, comments on similar or related topics were grouped under comment issue categories as a means of summarizing the comments. Table D.2-1 lists topics ("bins") used to categorize comments. More than 33,000 comment documents were received from individuals, interested groups, and Federal, state, and local officials during the public scoping period.

Table D.2-1—Comment Bin List

Topics and Subtopics
1. Policy
A. Existing Treaties—general
B. Presidential Directives, Public law, and current policies
C. Nuclear Posture Review
D. Comprehensive Test Ban Treaty
E. Treaty on the Non-Proliferation of Nuclear Weapons
F. Moscow Treaty
G. International Policies
H. Nuclear Waste Policy Act
2. NEPA Process
A. General NEPA process
B. Whether to prepare a new PEIS versus a supplemental PEIS
C. Stakeholder involvement
D. Scoping process—notification
E. Length of scoping period, number and location of scoping meetings
F. Scoping meeting format and scoping meeting fact sheets
G. Scoping comments
H. Availability of information
I. NEPA compliance
J. NEPA conflict-of-interest
3. Programmatic Purpose and Need
A. Purpose and need—general
B. Relationship to Stockpile Stewardship and Management
C. Question the need for Complex Transformation
4. Programmatic No Action Alternative
A. No Action Alternative—general
B. No Action Alternative needs to be a true no action
C. Viability of the No Action Alternative
D. Justification of the No Action Alternative
5. Programmatic Alternatives
A. Programmatic Alternatives—general
B. Development of Programmatic Alternatives
C. Programmatic Proposed Action: Distributed Centers of Excellence
D. Programmatic Alternative 2: Consolidated Nuclear Production Center
E. Programmatic Alternative 3: Capability-Based
6. Project-Specific Alternatives
A. High Explosives R&D
B. Tritium R&D
C. NNSA Flight Test Operations
D. Major Hydrodynamic Test Facilities
E. Major Environmental Test Facilities
7. Other Alternatives
A. Other Alternatives—general
B. Transportation of nuclear materials
C. Disarmament, Dismantlement, Decommissioning alternatives
D. Reduce stockpile alternatives
E. Downsizing-in-place alternatives
F. Responsible curatorship alternatives
G. Alternatives that comply with NPT
H. Comprehensive Test Ban Treaty alternatives

Table D.2-1—Comment Bin List (continued)

Topics and Subtopics
I. Security alternatives
J. Safety alternatives
K. Alternatives involving policy
L. Test readiness alternatives
M. Site alternatives
N. Nonproliferation alternatives
O. Cleanup alternatives
P. New Triad
Q. Alternatives promoting peace
R. Future of the nuclear weapons complex
8. Reliable Replacement Warhead
A. RRW – general
B. Opposition to RRW
C. RRW and pit production
D. RRW – analysis
E. Relationship between RRW and Complex Transformation
F. Question the need for RRW
9. Cost and Schedule
A. Cost-effectiveness of existing nuclear weapons complex
B. Better use of resources
C. Factors that could increase proposed costs
D. Cost of cleanup
E. Cost of each of the alternatives
F. Cost-Benefit Study
G. Timeline
10. Candidate Sites
A. Candidate sites – general
B. LANL
C. LLNL
D. NTS
E. TTR
F. Pantex
G. SNL/NM
H. SRS
I. Y-12
11. Additional Analysis
A. Additional analysis—general
B. Nuclear weapons activities
C. Special nuclear material
D. Environmental analysis
12. Kansas City Plant
A. KCP – general
B. Objection to the exclusion of KCP
C. NEPA analysis for KCP
13. Waste Isolation Pilot Plant
A. WIPP – general
B. WIPP as a candidate site
C. Future of WIPP
D. Support for WIPP as a candidate site
E. Opposition to WIPP
14. Sabotage and terrorism

Table D.2-1—Comment Bin List (continued)

Topics and Subtopics
A. Sabotage and terrorism-general
B. Evaluation of sabotage and terrorism
C. Suggested actions to protect against sabotage and terrorism
D. LANL
E. Pantex
F. LLNL
15. Resources
A. Land Use
B. Visual Resources
C. Site Infrastructure
D. Air Quality and Noise
E. Water Resources
F. Geology and Soils
G. Biological Resources
H. Cultural and Archaeological Resources
I. Socioeconomics
J. Environmental Justice
K. Health and Safety
L. Transportation
M. Waste Management
N. Facility Accidents
16. General/Miscellaneous
A. General support for Complex Transformation
B. Support for the No Action Alternative
C. Support for CNPC
D. Support for the Capability-Based and Reduced Operations Alternative
E. Support for siting at LANL
F. Support for siting at LLNL
G. Support for siting at NTS
H. Support for siting at Pantex
I. Support for siting at SRS
J. Support for siting at Y-12
K. Opposition to Complex Transformation
L. Opposition to siting at LANL
M. Opposition to siting at LLNL
N. Opposition to siting at NTS
O. Opposition to siting at SRS
P. Opposition to siting at Pantex
Q. Opposition to siting at SNL
R. Opposition to siting at Y-12
S. Divine Strake Environmental Assessment
T. Other projects and sites
U. Moral and ethical issues
V. Proliferation and nonproliferation
W. Criticism of the current administration and policy
X. International relations/policy
Y. Nuclear weapons
Z. Nuclear power
AA. War on Terror
BB. IAEA Inspections in the U.S.[Consider renaming as IAEA Inspections in the U.S.]

Each comment document was read carefully. Scoping comments were identified and summarized. Each comment document was assigned a document number and was assigned to an appropriate issue category. Table D.2-2, provided at the end of this appendix, summarizes the comments received that fall within the scope of this SPEIS and also directs the reader to sections of this SPEIS that address these issues. In addition Table D.2-2 lists the comment documents which were assigned to that issue category.

Many comments were outside the scope of this SPEIS. These comments fell into the following general categories: 1) concerns about cost and schedule overruns; 2) moral/ethical issues; 3) the use of nuclear weapons; and 4) alternate uses of Federal funds. These comments are addressed, only to the extent they relate to the background discussion in Chapter 1: Introduction, and Chapter 2: Purpose and Need. Detailed design safety questions that are not covered in the Complex Transformation SPEIS would be covered in site-specific, tiered EISs.

D.3 SCOPING PROCESS RESULTS

More than 33,000 comment documents were received from individuals, interested groups, and Federal, state, and local officials during the public scoping period. In addition, approximately 350 individuals made oral comments during public meetings. Some commentors who spoke at the public meetings also prepared written statements. When the oral comments and written comments were identical, comments submitted by an individual commentor were counted once. Table D.3-1 provides a summary of the number of scoping comments received.

Table D.3-1—Scoping Documents Received

Document Type	Number Received
Individual Scoping Documents	1,207
Campaign 1	1,160
Campaign 2	6
Campaign 3	99
Campaign 4	115
Campaign 5	9
Campaign 6	38
Campaign 7	11,676
Campaign 8	381
Campaign 9	6
Campaign 10	138
Campaign 11	33
Campaign 12	17
Campaign 13	7
Campaign 14	21
Campaign 15	18,830
Campaign 16	3
Campaign 17	10
Campaign 18	6
Campaign 19	115
Campaign 20	15
Total Scoping Comment Documents Received	**33,892**

A comment is a distinct statement or question about a particular topic or a specific issue. Most of the oral and written public statements submitted during the EIS scoping period contained multiple comments on various issues.

A majority of the comment documents received were form letters or e-mail campaigns. A form letter is defined as a standard letter submitted by numerous individuals. An e-mail campaign has the same concept as a form letter, but is submitted via electronic mail. Twenty different form letters/e-mail campaigns were submitted during the scoping period. All contained comments similar to those summarized in Table D.2-2 except campaign letters 11 and 13, which addressed the regional socioeconomic benefits of the Y-12 National Security Complex in Tennessee and support for that site's mission. A majority of the form letters/e-mail campaigns received were from Campaigns 1, 7, and 15. Table D.3-2 provides a summary of these documents.

Table D.3-2—Summary of Campaigns 1, 7, and 15

Document	Summary
Campaign 1 (Postcard)	Commentors stated the proposed action to build more nuclear weapons is dangerous and unnecessary. Commentors also stated that the U.S. cannot produce nuclear weapons while insisting other countries not pursue nuclear capabilities; the U.S. should meet its obligations under the Non-Proliferation Treaty to pursue disarmament; and resources should be spent on cleaning pollution from past production.
Campaign 7 (E-mail campaign)	Commentors wrote to express opposition to the proposed Complex Transformation plan. Commentors stated that the nuclear weapons complex is unnecessary and expensive and that new studies conclude that nuclear warheads will last at least 100 years. Commentors endorsed the proposal's stated aim of downsizing the nuclear weapons infrastructure.
Campaign 15 (E-mail campaign)	Commentors stated that the EIS is too limited and should include an assessment of an alternative that would abandon plans to build nuclear weapons and make reductions in the nuclear stockpile. Commentors suggested that DOE prepare a nonproliferation impact assessment to determine how the proposals would affect the goal of stopping the spread of nuclear weapons.

In addition to the form letters/e-mail campaigns, NNSA received approximately 1,200 individual scoping documents. Scoping meeting transcripts from 17 meetings were also included in the comment analysis.

A summary of the major comments received during the scoping period and responses to these comments follows:

Comment: The majority of the comments expressed opposition to the nuclear weapons program and U.S. national security policies. Many of the comments stated that the U.S. is violating the Nuclear Non-proliferation Treaty (NPT). Many of the comments stated that NNSA should assess an additional alternative—disarmament in compliance with the NPT - and not design or build new nuclear weapons.

Response: The security policies of the U.S. require the maintenance of a safe, secure, and reliable nuclear weapons stockpile, and the maintenance of core competencies to design, manufacture, and maintain nuclear weapons. Article VI of the NPT obligates the parties "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." Actions by the U.S., including its moratorium on nuclear testing accompanied by significant reductions in its strategic force structure, nuclear weapons stockpile, and production infrastructure, constitute significant progress toward these goals. However, unless and until there are significant changes in national security policy, NNSA is required to design, produce, and maintain the nuclear weapons stockpile pursuant to requirements established by the President and funded by Congress. In conjunction with the 2001 NPR, President Bush set an objective of "…achieving a credible nuclear deterrent with the lowest-possible number of nuclear warheads consistent with our national security needs…." In recognition of this objective and the reduction in the U.S. stockpile since the end of the Cold War, this SPEIS qualitatively evaluates changes in the alternatives that would be appropriate if the stockpile is reduced below the level called for by the Moscow Treaty. Accordingly, this SPEIS analyzes alternatives that satisfy requirements of the existing national security policy framework, as well as a capability-based alternative that, while not capable of meeting current requirements, could meet those requirements if the stockpile were reduced below the level called for by the Moscow Treaty.

Comment: Commentors stated that the reliable replacement warhead (RRW) was not needed and should not be pursued.

Response: RRW refers to possible future warhead designs that could replace existing "legacy" warheads. The RRW would not affect the proposed action of this SPEIS related to restructuring SNM facilities, or the proposed action to restructure R&D facilities. The proposed actions are independent of whether an RRW is developed. Because the environmental impacts analyzed are based on the maintenance of the legacy weapons that are currently in the stockpile, a conservative estimate of the environmental impacts is provided in this SPEIS. If RRW is approved as part of the national strategy for providing a nuclear deterrent, it would enable a shift to fewer hazardous operations. However, a production capacity for plutonium and highly-enriched uranium components, as well as for weapons assembly and disassembly, will be required for the foreseeable future with or without implementation of RRW. Chapter 2 provides a discussion of the RRW's possible impact on the nuclear weapons stockpile and decisions about the Complex facilities.

Comment: Commentors stated that NNSA should develop a fair and objective statement for the purpose and need that takes into account the broader missions of NNSA that include preventing proliferation, ensuring the effectiveness of the NPT, and developing strategies to ensure the peaceful denuclearization of existing and threshold nuclear states, and the underlying legal obligations and treaty commitments.

Response: The fundamental principle underlying NNSA's evaluation of alternatives is that the Stockpile Stewardship Program (SSP) must continue to support existing and reasonably foreseeable national security requirements. This is NNSA's obligation and responsibility under the *Atomic Energy Act*[2] and the *National Nuclear Security*

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[2] 42 U.S.C. 2011 *et seq.*

Administration Act.[3] This SPEIS does not analyze alternatives to U.S. national security policy. Rather, it examines the environmental effects of proposed actions and reasonable alternatives for executing the SSP, which is based on requirements established by national security policy including the maintenance of a safe, secure, and reliable nuclear weapons stockpile, and the maintenance of core competencies to design, manufacture, and maintain nuclear weapons. NNSA continues work in other areas, including those identified in comments. Nuclear weapons knowledge has and will continue to enable nonproliferation; however, they are not dealt with in this SPEIS.

Comment: Commentors asked why NNSA was not assessing a consolidated nuclear production center (one site for plutonium, enriched uranium, and weapons assembly/disassembly) as a reasonable alternative for transforming the Complex.

Response: A consolidated nuclear production center (CNPC) alternative was added as a reasonable alternative and is discussed in Section 3.5 of this SPEIS. NNSA decided to analyze this alternative in order to assess the potential impacts of consolidating major nuclear weapons and SNM production missions at one site.

Comment: Commentors stated that pits will last up to 100 years and potentially longer; therefore, there is no need for new pit production capacity.

Response: This SPEIS addresses the environmental effects of both possessing and utilizing a pit production capacity in the event decisions are made to produce pits. While the current state of knowledge is that there may not be a need to produce pits in the near future because of the plutonium's longevity, NNSA cannot be certain that other issues associated with pits, other than the aging of plutonium materials, would never arise. Accordingly, prudent management requires that NNSA maintain a capacity to produce pits as long as this nation maintains its nuclear stockpile. A small pit fabrication capability is currently being maintained at LANL and is part of the No Action Alternative evaluated in this SPEIS.

Comment: Commentors asked why KCP was not being considered in this SPEIS, and stated that NNSA was not representing the full cost of Complex Transformation by excluding alternatives involving activities currently performed by KCP.

Response: Following the Non-nuclear Consolidation Environmental Assessment (DOE 1993), NNSA decided to consolidate most non-nuclear operations to improve efficiency. In the SSM PEIS (DOE 1996d), NNSA further considered alternatives with respect to non-nuclear operations, including relocating those capabilities to the NNSA national laboratories. The decision was made (61 FR 68014; December 26, 1996) to retain the existing facilities at the KCP. This was the environmentally preferable alternative, posed the least technical risk, and was the lowest cost alternative.

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[3] Title 32, *National Defense Authorization Act for Fiscal Year 2000*, Public Law 106-65

Because the non-nuclear operations at KCP are essential and do not duplicate the work at other sites, no proposal for combination or elimination of these missions was formulated. A recent analysis has concluded that transferring these KCP non-nuclear operations to a site other than one within the immediate Kansas City area would not be cost effective (SAIC 2008). Consequently, the non-nuclear operations would remain at either the current KCP or a new facility in the Kansas City area, and would neither affect nor be affected by the decisions regarding the alternatives in this SPEIS.

Comment: Commentors requested an analysis of the risks and impacts of terrorist attacks on NNSA facilities.

Response: With respect to intentional destructive acts, substantive details of attack scenarios and security countermeasures are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. Depending on the malevolent, terrorist, or intentional destructive acts, impacts may be similar to or would exceed accident impact analyses prepared for the SPEIS. A separate classified appendix to this Draft SPEIS has been prepared that evaluates the underlying facility threat assumptions with regard to malevolent, terrorist, or intentional destructive acts. The methodology for the analysis in this classified appendix is discussed in Appendix B. These data provide NNSA with information upon which to base, in part, decisions supported by this SPEIS.

Comment: Support for the continuation of the NNSA flight test mission at the Tonopah Test Range was received from the Tonopah community. Commentors demanded evidence of a compelling reason to move this mission from Tonopah.

Response: A detailed impact analysis was prepared for the NNSA flight testing alternatives and is presented in Section 5.15.4.2 of the SPEIS. The analysis discusses the potential socioeconomic impacts to the Tonopah community of NNSA flight testing alternatives.

Comment: Commentors expressed opposition to any new nuclear facilities. There was specific opposition to expanding pit production at LANL, as well as the proposed consolidated plutonium center (CPC). Commentors stated that the LANL Site-Wide EIS should follow the Complex Transformation SPEIS.

Response: NNSA added analysis of an alternative that would upgrade facilities at LANL for a smaller pit production capacity (up to 80 pits per year) than the baseline capacity (125 pits per year, single shift) of the proposed CPC (see Section 3.4.1.2). NNSA is evaluating increasing its current capacity to produce nominally 20 pits per year at LANL in a site-wide EIS (LANL 2006a). It is expected that a final LANL Site-wide EIS will be issued prior to completion of this SPEIS.

Comment: Commentors stated that a site near the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, should be considered as a reasonable location for a CPC.

Response: In order to determine the reasonable site alternatives for a CPC, all existing, major DOE sites were initially considered as a potential host location for a CPC. Sites that do not maintain Category I/II SNM were eliminated from consideration, as were sites that did not conduct major NNSA program activities. WIPP did not meet these siting criteria. Other DOE sites were not considered reasonable locations because they do not satisfy certain criteria such as population encroachment, mission compatibility, or synergy with the site's existing mission. Following this process, NNSA decided that Los Alamos, NTS, Pantex, SRS, and Y-12 constitute the range of reasonable site alternatives for a CPC.

As a result of the scoping process, NNSA made the following significant changes to the scope of the Complex Transformation SPEIS:

- A consolidated centers of excellence (CCE) alternative was added as a reasonable alternative (see Section 3.5). NNSA would consolidate plutonium, uranium, and weapon assembly/disassembly functions into a CNPC at one site or into Consolidated Nuclear Centers (CNCs) at two sites.

- A discussion was added of effects on the Complex of an even smaller nuclear weapons stockpile than the current level envisioned under the Moscow Treaty (see Section 5.11).

- A discussion was added of the RRW's possible impact on the nuclear weapons stockpile and decisions about Complex Transformation. An analysis was added to determine what, if any, changes to the Complex would be required if the RRW were to be developed (see Chapter 2).

- A more detailed analysis of the potential impacts of NNSA flight testing was added in order to inform the public and NNSA of the potential socioeconomic impacts to the Tonopah community from the alternatives (see Section 5.15.4.2).

- An analysis of a smaller pit production facility (50 to 80 pits per year) was added (see Section 3.4.1.2).

- A more detailed explanation of why the Kansas City Plant non-nuclear operations are not included in this SPEIS was added (see Section 3.2.10).

Table D.2-2—Summary of Scoping Comments

Topic 1. Policy

Subtopic	Comment Summary	Documents	SPEIS Reference
Existing Treaties—General	Commentors believe that the current nuclear 'deterrence' policy has failed and has placed the world on the brink of nuclear winter. Enduring and legally binding U.S. Treaty Obligations must inform the domain of reasonable alternatives for analysis. As part of the supreme law of the land, U.S. treaty obligations are far more dispositive than the strategic ramblings of now discredited and departed senior Pentagon bureaucrats. As one of his first official acts, after taking office in January 1977, President Jimmy Carter asked the Secretary of Defense for an analysis of the implications of mutual U.S. and Soviet reductions in the number of strategic nuclear delivery vehicles to 200–250. If the President of the U.S. could find such a greatly reduced nuclear force to be sufficiently reasonable, at the height of the Cold War, to merit commissioning a Pentagon study of it, surely it is objectively reasonable for NNSA today—16 years after the dissolution of the Soviet empire that prompted deployment of U.S. nuclear weapons in such vast quantities—to analyze the implications of comparable and even smaller nuclear forces for the future configuration of the U.S. nuclear weapons complex. Commentors state that DOE should consider the 1996 World Court decision that nuclear weapons are illegal; the proposed action therefore violates this determination and is unlawful.	2, 6, 104, 138, 196, 263, 348, 1209, 1220	Chapter 2
Presidential Directives, Public Law, and Current Policies	Commentors state that DOE should take into consideration an adverse change in the American political climate as part of the global political climate due to expanding U.S. nuclear arsenal and wait until the next administration to continue with the project. DOE should adopt new policies that will favor disarmament and a 'no-first-use' policy. Commentors expressed concern that the U.S. has halted progress in the development of the Fissile Material Cutoff Treaty (FMCT) and that the artificial enrichment with plutonium or uranium will violate	Campaign 18, 4, 67, 104, 111, 263, 281, 511, 320, 378, 516, 781, 1218, 947, 1152, 1190	Chapter 2, Chapter 3, Section 2.1.4, Chapter 5, Section 10.4

Table D.2-2—Summary of Scoping Comments (continued)

Topic 1. Policy

Subtopic	Comment Summary	Documents	SPEIS Reference
	the current fissile material ban being negotiated by the Conference on Disarmament. Commentors also support a fissile materials treaty to prevent the creation and transportation of HEU and plutonium.		
Nuclear Posture Review	The December 2001 Nuclear Posture Review is not a sufficient basis for the purpose and need for agency action. It does not comprise an act of law or even a formal policy directive, and in no way establishes or constrains the domain of future stockpile requirements that may be considered reasonable. The theory advanced in the NPR that a weapons stockpile provides deterrent value is flawed and undermines nonproliferation work.	2, 6, 1048, 1090, 1220	Sections 2.1, 2.1.2
Comprehensive Test Ban Treaty	Commentors stated that the Complex Transformation plan goes against the NPT and would result in the end of the Comprehensive Test Ban Treaty. Complex Transformation is a step toward rejecting ratification of CTBT and is preventing ratification; ratification of the CTBT should be considered.	104, 263, 333, 335, 1137, 1220, 263, 690, 1210, 4	Section 2.1.3
Treaty on the Non-Proliferation of Nuclear Weapons	Commentors stated that the NOI is false in stating that the number of weapons to be produced would be consistent with international arms-control agreements. They are not consistent with the NPT. Commentors stated that accelerating nuclear weapons manufacture is a violation of the NPT as well as Article IV of the Constitution, and will further the global proliferation of nuclear weapons. Commentors believe the U.S. should be complying with NPT and denuclearizing our arsenal. Commentors suggested that the SPEIS should discuss existing treaty limitation concerning proliferation of nuclear material/weapons (including U.S. efforts to limit proliferation) and analyze how the proposed action will/will not jeopardize existing international agreements. Commentors stated that the U.S. should commit to the elimination of nuclear weapons no later than Transformation.	Campaign 4, Campaign 5, Campaign 6, Campaign 7, Campaign 10, Campaign, 12, Campaign 14, Campaign 15, Campaign 17, Campaign 18, 1, 2, 3, 4, 5, 6, 7, 9, 10, 18, 20, 22, 23, 24, 30, 31, 37, 57, 59, 60, 63, 65, 67, 71, 75, 80, 81, 83, 85, 87, 88, 91, 92, 94, 96, 102, 103, 104, 105, 107, 110, 111, 113, 126, 128, 132, 133, 134, 138, 141, 145, 152, 153, 164, 190, 196, 199, 204, 207, 208, 210, 234, 216, 217, 220, 260, 263, 281, 285, 286, 300, 303, 316, 318, 319, 320, 324, 326, 330, 333, 335, 338, 339, 343, 348, 355, 358, 360, 361, 363, 367, 371, 373, 378, 379, 380,391, 394, 396, 399, 401, 402, 403, 404, 405, 406, 408, 410, 411, 413, 414, 418, 423, 424, 425, 427, 428, 430, 437, 438, 434, 439, 444, 446, 454, 458, 464, 472, 476, 479, 488, 492, 497, 510, 524, 529, 530, 540, 536, 544,	Chapter 2, Sections 2.1.3, 2.1.4, 2.1.5, 2.1.6

Table D.2-2—Summary of Scoping Comments (continued)

Topic 1. Policy

Subtopic	Comment Summary	Documents	SPEIS Reference
		550, 560, 585, 586, 587, 589, 571, 577, 596, 595, 597, 603, 607, 608, 615, 618, 619, 621, 626, 627, 634, 635, 636, 644, 649, 660, 674, 675, 686, 689, 695, 696, 697, 701, 716, 719, 721, 716, 723, 725, 732, 734, 737, 740, 741, 747, 749, 751, 753, 758, 760, 761, 762, 764, 765, 767, 769, 780, 843, 850, 860, 854, 872, 876, 878, 906, 898, 899, 902, 1087, 1099, 1188, 1123, 1126, 1128, 1143, 1208, 1209, 1210, 1217, 1218, 1219, 1222, 1223	
Moscow Treaty	Commentors stated that DOE must comply with Moscow Treaty. The Strategic Offensive Reductions Treaty commits us to the reduction of our strategic nuclear arsenal from the estimated 5,000 to at least 2,200 in the next six years. In this case it seems the Moscow Treaty is a flawed treaty that provides a minimal benefit that is insufficient to mitigate the negative implications of the proposed action.	Campaign 18, 145, 164, 263, 516, 898, 769, 943, 1004, 1181, 1190, 1211, 1212	Section 2.1.5
International Policies	Commentors criticized that the U.S. is legally obligated to adhere to the requirements of customary international law, such as START I and II, and is violating international law and treaties and should support a fissile materials treaty to prevent creation and transport of HEU and plutonium.	4, 426, 445, 138, 752, 524, 883, 904, 837, 823, 1101, 1009, 1059, 1043, 1046, 1047, 1050, 1178, 1190, 1194, 1153, 1208, 1211, 1212, 1219, 1210, 1215, 1222, 1223, 263, 313, 320, 383, 450, 482	Sections 2.1.2, 2.1.3, 2.1.4, 2.1.5; the proposed action would not violate any existing international law.
Nuclear Waste Policy Act	Transformation contradicts intent of NWPA and project operations must be in compliance to protect public health.		Section 10.3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 2. NEPA Process

Subtopic	Comment Summary	Documents	SPEIS Reference
General NEPA Process	Commentor expressed opinion regarding the limitation of the NEPA process. Another commentor suggested that NNSA give a basic introduction of what is planned for people who are not technically proficient in the NEPA process.	6, 1219	Section 1.5, 1.6
Whether To Prepare a New PEIS Versus a Supplemental PEIS	Commentor stated that supplementing the aging and flawed SSM-PEIS of 1996 may not be the best strategy for NEPA review of “complex transformation.” The original SSM-PEIS was very far from comprehensive in its coverage: non-nuclear component manufacturing ,tritium production and recycling, and weapons-usable fissile material storage and disposition, all activities intrinsic to the operations of the U.S. nuclear weapons complex were segmented from the original proposal for a comprehensive post-cold war “Reconfiguration PEIS” and subsequently analyzed in separate NEPA documents supporting a series of staggered and haphazard restructuring decisions throughout the decade of the 1990’s. Commentor stated that the SSM PEIS focused by default on a narrow range of remaining “decisions” about the “reconfigured” complex, some of which had already in effect been made years earlier while others turned out to be far less consequential than originally advertised by NNSA’s predecessor DOE Defense Programs. The NOI is rife with evidence of rampant illegal segmentation of NEPA analysis in a manner that obstructs formulation of reasonable programmatic alternatives and analysis of cumulative and connected impacts. Commentors also stated that since the previous PEIS, Complex programs will have changed. A new PEIS is required, covering all aspects of the plan to develop 'replacement' nuclear weapons and facilities to provide opportunity of a review of the whole system. Commentors also suggested that tailoring the inclusion or exclusion of major and very costly proposed projects to suit the parochial interests of particular sites, or the immediate programmatic goals of NNSA as currently defined, defeats the purpose of a NEPA	2, 4, 5, 9, 716, 1218	Chapter 1, Sections 1.5, 1.6, 2.0, 2.1, 2.5, Chapter 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 2. NEPA Process

Subtopic	Comment Summary	Documents	SPEIS Reference
	programmatic analysis, by creating "facts on the ground" that arbitrarily foreclose consideration of reasonable consolidation and location alternatives.		
Stakeholder Involvement	Commentors stated that DOE involve all stakeholders in the decision-making process including the Western Shoshone people in the central decision-making process, and request that International Atomic Agency (IAEA) and other international law experts formally submit comments to this proposed action. Commentors suggest polling long-time residents of Nevada concerning safe storage of radioactive waste in Nevada. One commentor stated that tables should be set up for the display of NGO literature and be in a prominent location where people can easily access provided information. Commentors also suggested that DOE speak with the communities, including Native American Tribes, surrounding the proposed sites and along transportation corridors regarding their current traditional and foreseeable future use of land and resources.	215, 263, 763, 1208, 1223, 1179	Section 1.6, Chapter 2 Tables were provided to NGOs at scoping meetings. DOE conducts public meetings allowing the public to participate in the decision-making process.
Scoping Process—Notification	Commentors stated that the public comment period is only publicized and convenient to those who are educated. Public hearing notices should be published 45 days before the first hearing and should appear in the appropriate newspapers the Sunday before the hearings and also on the day before each hearing.	9, 1179, 1209	Section 1.6
Length of Scoping Period—Number and Location of Scoping Meetings	Commentors requested that the public comment period be extended from 60 days to 180 days and additional meetings be added. Commentors suggested that future hearings and meetings be properly and widely advertised and held in locations that are easily accessible to the public (i.e., via public transportation and all through the day and night to accommodate various work schedules). Commentor suggested discussing the logistics of meetings with community members in advance. Specific comments on locations of public meetings included changing the venue for the Los Alamos meetings, meetings should also be held in Espanola and Pojoaque, NM; additional public	Campaign 19, 4, 5, 9, 47, 53, 191, 207, 215, 296, 315, 325, 500, 745, 763, 1048, 1044, 1048, 1050, 1083, 1216, 1218, 1125, 1134, 1179, 1209	Section 1.6

Table D.2-2—Summary of Scoping Comments (continued)

Topic 2. NEPA Process

Subtopic	Comment Summary	Documents	SPEIS Reference
	hearings for SRS should be held at the state capital, additional meetings should also be held in Nevada, Utah, eastern California, Salt Lake City/St. George, near Livermore, and near Kansas City. Meetings should also be held at major population centers such as San Diego, CA; Phoenix, AZ; New York City, NY, Boise, ID; Las Vegas, NV, etc. In addition, meetings should also be conducted in areas downwind, down gradient, and along shipping routes One commentor had specific concerns about how the first public hearings were held in Clark County, as opposed to the actual proposed site of Tonopah.		
Scoping Meeting Format, Scoping Meeting Fact Sheets	Commentors suggested that a combination of an "open house" with roundtable discussions to allow for the possibility of real negotiations and questions/answers from both sides and a facilitated hearing is the best way to maximize the solicitation of scoping comments and inform the public of the proposed action with longer time for the public to speak. Some commentors stated that the poster session was insufficient. Commentors also suggested the use of a court reporter at hearings. Another commentor had a specific comment regarding an incomplete sentence on a fact sheet handed out during the scoping meetings and requested that the sentence be completed. Commentor questioned when the public would be able to sign up to speak. Commentor requested that detail on special security requirements be provided to the public and public leaders. Commentor requested that daycare be provided during scoping meetings. Commentor asked why RRWs are not on any other fact sheets other than the fact sheet entitled "Getting the Job Done." Commentor suggested being consistent with the use of “security” on	4, 5, 9, 167, 215, 303, 641, 763, 1048, 1050, 1146, 1212, 1213, 1217	Sections 1.6, 2.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 2. NEPA Process

Subtopic	Comment Summary	Documents	SPEIS Reference
	fact sheets.		
Scoping Comments	Commentor suggested that DOE provide the opportunity to comment both in private and in public and that DOE report how many Complex Transformation scoping comments state that the proposed Transformation will result in proliferation, a decrease in proliferation, or will have no effect. Other commentors requested an explanation of the impacts the scoping comments from the public would have.	4, 5, 146	Section 1.6
Availability of Information	Commentors stated that insufficient information is provided to the public and that NNSA seems to be prejudicing the outcome of Complex Transformation by not providing handouts for all scenarios proposed. Commentors requested that DOE release secure documents and all previous tiered NEPA documents available on the project Web site and make all reference documents for the SPEIS available on the internet and on CD format. Commentors also stated that DOE should provide a complete listing and presentation of all documents upon which it intends to rely for the Complex Transformation along with all references, and related site-specific EAs and EISs.	Campaign 19, 4, 5, 6, 9, 48, 263, 1209, 1218, 1225	Chapter 2, 12 The Administrative Record will be available to the public. NNSA has made every effort to provide the reader with sufficient information to satisfy NEPA requirements. Release of sensitive information is an issue of law and national security.
NEPA Compliance	Commentors believe that the project is not compliant with NEPA and its implementing regulations and it is speculated that DOE is intentionally circumventing meaningful NEPA compliance. Comments submitted regarding compliance with NEPA included concern about the chronological release of the LANL SWEIS and Complex Transformation process. The LANL SWEIS NEPA process should follow (not precede) the Complex Transformation NEPA process as the outcome of the LANL SWEIS may substantially determine NNSA's pit production strategy. In addition, the commentor objected to the declared intention to press ahead with an EIS and ROD covering modernization of Y-12 capabilities	2, 4, 6, 18	Chapter 1, Sections 1.5.2, 1.5.4.2

Table D.2-2—Summary of Scoping Comments (continued)

Topic 2. NEPA Process

Subtopic	Comment Summary	Documents	SPEIS Reference
	even as the Complex Transformation SPEIS gets underway. Under at least some reasonable scenarios for deep reduction in the nuclear stockpile, it would make economic, security, and logistical sense to consolidate a portion or all of these activities at LANL, or at some other site or sites closer to the geographic center of a future complex in the southwestern triangle formed by Pantex, SNL, and LANL. Commentors objected to the arbitrary and counter-productive exclusion of options for consolidating uranium, secondary, and case fabrication activities currently performed at Y-12 in Oak Ridge, TN. Commentors stated that the CMRR decision appears to prejudice both the current LANL SWEIS and Complex Transformation.		
NEPA Conflict-of-Interest	Commentors suggested that DOE has a conflict-of-interest with projects at LANL that would prejudice the present SPEIS decision-making process.	6	Section 1.5.4.2

Table D.2-2—Summary of Scoping Comments (continued)

Topic 3. Programmatic Purpose and Need

Subtopic	Comment Summary	Documents	SPEIS Reference
Purpose and Need—General	Commentors suggested that the SPEIS develop a fair and objective statement of the "Purpose and Need for the Proposed Action" that is based on more than the 2001 NPR. The purpose and need must also consider the NPT and International Court of Justice in the Hague opinion. The purpose and need should take into account the broader missions of the NNSA that include preventing proliferation, ensuring the effectiveness of NPT and developing strategies for ensuring the peaceful denuclearization of existing and threshold nuclear states and the legal obligations and treaty commitments that underpin them. The purpose and need must clearly state and include the full ramifications of the proposed project and how it will better secure the health and safety of the American people. Commentors also stated that the construction of the CPC is unjustified and questioned the purpose of the 125 certified pits. Commentor suggested that JASON's review data should be considered and be included in the purpose and need. Commentors also suggested that the purpose and need should clarify the meaning of "modernization activities, changing character", and developing a "responsive infrastructure."	2, 4, 9, 190, 215, 263, 323, 491, 690, 715, 769, 781, 1048, 1149, 1162, 1218, 1225	Section 1.4 Chapter 2, Sections 2.1, 2.1.4, 2.1.5, 2.1.7, 2.2.2, 2.3.3, 2.3.4, 2.5.6, 3.1, 3.3.1, 3.4.1 As NNSA dismantles more retired nuclear weapons, the number of pits in storage does increase.
Relationship to Stockpile Stewardship and Management	Commentors questioned why we are presently renewing our nuclear weapons under the Stockpile Stewardship Program, making our warheads last over 100 years. Has the 'no new plutonium sites' policy in the 1996 Final SSM PEIS changed? Commentors also questioned if any of the sites (Pantex, NTS, and Y-12) considered by the 1996 SSM PEIS were found NOT to be reasonable candidates for plutonium handling missions and had become plutonium sites since 1996?	73, 92, 105, 111, 1220	Chapter 2, Section 2.2.2 NNSA is not proposing to create a new nuclear site in this SPEIS. This SPEIS has only proposed alternatives.
Question the Need for Complex Transformation	Commentors questioned the need for Complex Transformation when a nuclear weapons arsenal already exists and weapons that have been NNSA certified are available. Commentors stated that the SPEIS needs to explore the need for the proposed action and how it will better secure health and safety of the American people.	Campaign 1, Campaign 2, Campaign 5, Campaign 7, Campaign 8, Campaign 9, Campaign 10, Campaign 14, Campaign 16, Campaign 17,	Chapter 2, Sections 2.1, 2.1.4, 2.1.5, 2.1.6, 2.1.7, 2.2.2. 2.3.1, 2.3.2, 2.3.3.2, 2.3.3, 2.4, 3.3.1

Table D.2-2—Summary of Scoping Comments (continued)

Topic 3. Programmatic Purpose and Need

Subtopic	Comment Summary	Documents	SPEIS Reference
	Commentors stated that building up our nuclear capabilities makes no sense when our biggest threat is from non-state terrorist groups and the proliferation of weapons to other states. The U.S. cannot produce nuclear weapons while insisting other countries not pursue nuclear capabilities Numerous commentors stated that DOE must prove that the plutonium pit-aging phenomenon is occurring and problematic and explain why there is a need to expand pit production over existing capabilities when the number of pits is already oversized and unneeded. Commentors stated that consolidation and downsizing of the complex is not dependent on Complex Transformation and questioned how having a responsive infrastructure will help strengthen the global nonproliferation regime. Commentors stated that the U.S. should proceed with nuclear disarmament because there is no need to be armed with nuclear weapons.	Campaign 12, Campaign 18, 1, 2, 4, 5, 6, 10, 22, 31, 32, 48, 57, 66, 67, 68, 75, 76, 80, 96, 97, 99, 104, 107, 108, 110, 111, 128, 145, 146, 149, 153, 191, 193, 204, 207, 209, 211, 215, 263, 265, 266, 268, 272, 275, 277, 320, 323, 326, 327, 328, 330, 331, 333, 336, 340, 342, 343, 348, 354, 355, 359, 361, 368, 369, 380, 390, 391, 392, 402, 403, 406, 411, 413, 422, 423, 427, 428, 430, 431, 437, 440, 441, 443, 444, 445, 450, 491, 529, 535, 538, 540, 541, 548, 550, 552, 567, 571, 586, 587, 588, 589, 591, 593, 634, 652, 682, 684, 686, 687, 690, 693, 695, 697, 700, 723, 725, 743, 763, 765, 769, 770, 771, 781, 787, 798, 800, 801, 807, 810, 827, 820, 822, 828, 843, 845, 859, 861, 889, 907, 953, 962, 965, 972, 973, 974, 976, 1045, 1048, 1054, 1056, 1087, 1095, 1097, 1099, 1100, 1103, 1107, 1111, 1112, 1113, 1123, 1132, 1137, 1138, 1142, 1143, 1153, 1155, 1181, 1188, 1190, 1191, 1200, 1205, 1206, 1208, 1209, 1210, 1213, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1220, 1222, 1223, 1224	

Table D.2-2—Summary of Scoping Comments (continued)

Topic 4. Programmatic No Action Alternative

Subtopic	Comment Summary	Documents	SPEIS Reference
No Action Alternative—General	Commentors suggested including an 'amended' no action alternative which aims to not expand the nuclear pit fabrication capacity of the U.S.	Campaign 5, Campaign 9, 52, 686, 693, 894, 1218, 1223	Section 3.3.1, 3.4.1.6
No Action Alternative Needs To Be a True No Action	Commentor stated that the “No Action” Alternative must be genuine. We object to the current NOI’s definition of “No Action” Alternative which actually incorporates a host of activities and proposed actions that a direct bearing on the future structure of the weapons complex under review. We strongly urge that analysis of major new projects covered by the ongoing Y-12 and LANL Site Wide EIS’s be placed on hold and made subordinate to the analysis and outcomes of the SPEIS process. To do otherwise would severely compromise the integrity and utility of the SPEIS, which would then be compelled to wrap itself around site-specific decisions and projects that will effectively predetermine and artificially constrain the consideration of programmatic alternatives for the complex as a whole.	2	Chapter 3
Viability of the No Action Alternative	This SPEIS must present a credible analysis of the No Action Alternative including the "viability" of the No Action Alternative for meeting existing pit production requirements necessary to satisfy requirements of stockpile stewardship inventories.	47, 904, 910, 937, 1057, 1213, 1216	Section 3.4.1.6
Justification of the No Action Alternative	Commentors requested a description of how the reduced operations and no action alternatives differ to require analyses in a complex-wide SPEIS as neither includes construction of a CPC, consolidation of SNM and elimination of duplicate facilities, flight testing, reduction of production capacities at Pantex, Y-12, and SRS, and dismantlement activities. In addition, DOE must provide legal justification for choosing or not choosing the No Action Alternative in the Draft SPEIS.	5, 1218	Section 3.1, 3.3, 3.6, Chapter 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 5. Programmatic Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
Programmatic Alternatives—General	The current proposal only has three options and is too limited; there should be more alternatives. The alternatives presented in the NOI are also unresponsive to key members of Congress and to the NPT. Commentors also stated that any alternative that contemplates developing weapons of mass destruction posses an unacceptable risk to the environment, country, species and the planet. Proposed alternatives threaten human health. Commentors also suggested that each alternative include an analysis of the potential for a new international arms race and the local, regional, and international impacts; how nuclear weapons increase global security; how proposed action will impact specifically Middle Eastern peace and security; who will benefit from a reciprocal reaction from other states; who will be impacted internationally, as well as locally, regionally, and nationally by proposed activity; who will benefit from the proposed alternatives; and the environmental and human health impacts both nationally and internationally from the arms race that would be instigated by a reciprocal action from other states.	Campaign 15, Campaign 17, 6, 555, 1216, 1135, 1153, 1154, 1210, 1217, 1218, 1223	Chapters 3, 5, Sections 2.1.4, 2.4 3.1, Sections 5.x.11 for all sites
Development of Programmatic Alternatives	Commentors questioned the development of the alternatives and stated that transformation is not a consolidation plan, it is a revitalization plan. It goes from 8 sites to 8 sites. Consider a real consolidation plan. Commentors expressed the concern that the nuclear weapons produced by Complex Transformation will be used in the future with negative consequences. One commentor stated that all major nuclear weapons sites are to be retained in NNSA's plan, an assumption which the House Appropriations Committee and the Secretary of Energy's SEAB have opposed. NNSA offers only two alternatives: (1) a somewhat reduced level of manufacturing expansion accompanied (by) some consolidation within sites and elimination of unspecified duplicate facilities; and (2) implementation of plans in place today, involving	6, 9, 104, 747, 1208, 1209, 1217, 1219, 1220, 1222, 1223	Chapter 3, Section 3.5, Appendix C

Table D.2-2—Summary of Scoping Comments (continued)

Topic 5. Programmatic Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	manufacturing expansion as well. The same commentor also stated that NNSA's plans to build thousands of new warheads in the RRW program over the next quarter century, which have not been endorsed by the DoD or approved by Congress, while at the same time maintaining and extending the working life of existing warheads until the new RRWs could take their place, appears to underlie the choice of alternatives in the Complex Transformation Plan. It should be unnecessary to remind NNSA that alternatives proposed by DOE's own SEAB is a reasonable alternative. The same commentor also stated that the NEPA history of radiographic hydrotesting is an object lesson in what must be avoided this time around. The Supplemental PEIS must include a comprehensive and detailed presentation of the full suite of presently planned and "reasonably foreseeable" hydrotesting capabilities, and "reasonable" alternatives thereto, over the full time period covered by the analysis. The set of "reasonable alternatives" for analysis for this and indeed all aspects of the SPEIS, is bounded not by what the proposing agency itself "desires" or "prefers" but by what an objective informed observer would regard as economically, technically, and environmentally reasonable in light of a reasonably foreseeable range of future nuclear weapons requirements. These alternatives in turn must be bounded by a "decent respect for the opinions of mankind." Even in the case of possibly legitimate fears of impending WMD attack, U.S. first use of nuclear weapons in a "preemptive strike" would likely result in a disproportionate, overwhelming, and indiscriminate use of military force in violation of international humanitarian law. We therefore find it entirely reasonable to insist that the range of reasonable alternatives for the 2030 nuclear weapons complex must embrace options that not only include very deep nuclear stockpile reductions, but also exclude NNSA complex support for weapons and capabilities required to implement illegal preemptive and preventive nuclear attacks.		

Table D.2-2—Summary of Scoping Comments (continued)

Topic 5. Programmatic Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	Commentors also stated that national security is enhanced by this project through consolidation at one site. NNSA fails to name or consider any alternative which realistically treats environmental, economic, and geopolitical realities which the average citizen can recognize as being of great importance. All the alternatives fall short of a feasible long-term sustainable plan for facilitating the health and safety of U.S. citizens.		
Programmatic Proposed Action: Distributed Centers of Excellence	Commentors stated that this alternative directly contradicts the NPT obligation and needs to be proven that the CPC is necessary in light of our obligation to comply with the NPT to reduce the nuclear arsenal. Commentors suggested that this alternative be eliminated. Numerous commentors made suggestions regarding the analysis of this alternative. These include: discussion of the facilities and industrial processes that are involved with the CPC; define baseline capacity; question if the CPC is a design-build project and why; explain the rationale for the order of the baseline CPC schedule and why the need to approve the mission in 2008, will the decision be made before the ROD, questions whether this decision is prejudice, and will the decision to proceed with the CPC be made in the ROD?; what will the site decision be based on?; when analyzing CPC include analysis on environmental justice, environmental safety threats, and regional cumulative impacts; and requested that decisions on the replacement UPF be deferred pending evaluation of the consolidated complex. Commentors also expressed specific questions regarding the CPC: • How will the CPC enhance deterrence when resumed industrial-scale nuclear weapons production could encourage other countries to follow the U.S.'s lead? • What is the ratio of pits produced to certified pits expected to be for the CPC? Is the ratio expected to be different for different	Campaign 5, 4, 5, 330, 792	Chapters 2, 5, 6, 13, Sections 1.5, 1.5.3, 3.1, 3.4, 3.16

Table D.2-2—Summary of Scoping Comments (continued)

Topic 5. Programmatic Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	pits? How is this ratio estimated? Does a baseline capacity mean 125 pits produced or certified pits? • At which site will the CPC cause the most environmental impacts and need the most mitigation measures?		
Programmatic Alternative 2: Consolidated Nuclear Production Center	Commentor stated that in light of its lower security overhead and environmental advantages the CNPC proposal is objectively reasonable and must be analyzed for a range of stockpile sizes including very low levels of nuclear forces.	2	Section 3.5
Programmatic Alternative 3: Capability-Based	Commentors stated that a drawback of Alternative 3 is that the production capacity would not be sufficient to meet current national security objectives. Commentors requested the specific definition of "nominal level" as well as the justification for this determination. Another commentor suggested the elimination of plutonium production and surveillance and research and development for this alternative. Commentor is concerned that under this alternative the removal of Category I/II SNM from LANL would have instant ramifications on the site and result in the cancellation of more than a billion dollars in new construction projects listed and analyzed in the LANL SWEIS.	5, 6, 1210, 1215	Sections 2.3.3.2, 3.4.1.4, 3.5, 3.6

Table D.2-2—Summary of Scoping Comments (continued)

Topic 6. Project-Specific Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
High Explosives R&D	Commentors were concerned about the effects this alternative would have on the environment and requested that environmental, socioeconomic, demolition and transportation impacts at all sites be evaluated and provide a baseline for each of these resources. Commentor expressed concern that DOE has predetermined that HE production, pressing, and machining will be located at Pantex. Commentors had specific questions regarding HE R&D: • How many HE R&D experiments are conducted annually and will any alternatives reduce the number of HE R&D experiments? • Will downsizing of HE R&D require new buildings?	4, 104, 1219	Sections 3.2.5, 3.8, 3.15, 5.10, 5.17, Chapter 5
Tritium R&D	Commentors requested the necessity of this alternative especially if the production of nuclear weapons is abandoned. Commentors were also concerned about effects this alternative would have on the environment and requested that environmental, socioeconomic demolition and transportation impacts at all sites be evaluated and provide a baseline for each of these resources. Commentors also requested that environmental impacts at sites with increased activity due to consolidation of tritium R&D at some sites be analyzed and to consider the production of tritium and the commercial use of nuclear power reactors for tritium production. Commentors had specific questions regarding Tritium R&D: • How many Tritium R&D experiments are conducted annually and will any alternatives reduce the number of Tritium R&D experiments? • Will downsizing of Tritium R&D require new buildings? • Will the downsizing of Tritium R&D have any effect on the location of a CPC? • Do the properties of tritium change?	4, 1210, 1219	Chapter 3, Sections 2.1.4, 3.8, 3.9, 5.10, 5.17
NNSA Flight Test Operations	Commentors were concerned about effects this alternative would have on the environment and requested that environmental,	4, 47, 104, 1197, 1219	Sections 3.10, 3.10.1, 5.15, 5.15.5, 5.17

Table D.2-2—Summary of Scoping Comments (continued)

Topic 6. Project-Specific Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	socioeconomic, demolition, and transportation impacts at all sites be evaluated and provide a baseline for each of these resources. Commentors also had specific questions regarding flight test operations: ● How many flight tests are conducted annually and will any alternatives reduce the number tests? ● Will the number of tests be reduced under this alternative? ● Will the selection of a location for the flight tests have any effect on the location of a CPC? ● What are the required geological conditions needed to successfully support all flight testing requirements? ● Is it legal to perform these tests on Native American lands? Commentors suggested evaluation of the relocation of the flight test operations without transformation of the whole complex. Commentors were also concerned that flight test operations may stir up radioactive dust from previous ground testing.		The CPC, which is a programmatic decision, has no bearing on the Flight Test Program, which is a project-specific decision.
Major Hydrodynamic Test Facilities	Commentors were concerned about the effects major hydrodynamic test facilities would have on the environment and the impacts of leaving waste from the tests on and in the ground. Commentors suggested that the SPEIS include a comprehensive and detailed presentation of presently planned and reasonably foreseeable hydrotesting capabilities and reasonable alternatives thereto over the full 30-year period covered by the analysis and also requested that environmental, socioeconomic, demolition, and transportation impacts at all sites be evaluated and provide a baseline for each of these resources. Commentors also suggested that the impacts from LANL, DARHT, and LLNL's Site 300 hydrotesting activities be analyzed, list all materials and amounts by isotope used in all types of hydrotesting including non-fissile radioactive isotopes. Commentors requested that DOE explain why LANL performed at least one hydrotest for a speculative RRW design while at the same time it is far behind on hydrotests designed to baseline the safety	2, 4, 104, 1219	Sections 3.11, 3.11.1, 3.11.1.2, 3.11.1.3, 3.11.2.1, 3.11.2.3, 5.16, 5.16.3, 5.17

Table D.2-2—Summary of Scoping Comments (continued)

Topic 6. Project-Specific Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	and reliability of existing nuclear weapons. Commentors suggested that the consolidation of hydrotesting be addressed without transformation of the whole complex and also consider ramping down hydrodynamic testing at all sites. Commentors stated that it seems that NNSA has predetermined the large-scale hydrotesting facility will be located at NTS. Commentors also had specific questions regarding major hydrodynamic test facilities: • Is DARHT a large-scale hydrotest facility? • Is moving the location of these sub-critical experiments being considered? • Will any alternative reduce the number of hydrotest experiments? How many experiments are conducted annually? • Will consolidating hydrotesting require new buildings? If so, what are the projected costs?		
Major Environmental Test Facilities	Commentors were concerned about effects this alternative would have on the environment and requested that environmental, socioeconomic, demolition, and transportation impacts at all sites be evaluated and provide a baseline for each of these resources. Commentors requested that an explanation be provided regarding consolidating environmental test facilities which are contradictory with removing SNM. Commentors question the necessity in future event that production of nuclear weapons is abandoned.	4, 104, 1219	Sections 3.12.1, 5.17

Table D.2-2—Summary of Scoping Comments (continued)

Topic 7. Other Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
Other Alternatives—General	Commentors suggested that DOE identify other alternatives.	5, 774	Sections 3.1
Transportation of Nuclear Materials	Include an alternative which involves little to no transport of nuclear materials.	1210	Section 3.5.1
Disarmament, Dismantlement or Decommissioning Alternatives	Commentors requested an option for disarmament or decommissioning of nuclear warheads and the elimination of the production of nuclear weapon components, the use of the volatile, toxic substances involved in weapons production. Commentors stated that NNSA needs to provide an alternative/plan that will put the warhead complex on a reasonable path toward dismantlement, while also maximizing security, minimizing costs and impacts, retaining a declining nuclear arsenal, and maximizing administrative freedom to pursue paths toward further nuclear disarmament by future administrations.	Campaign 5, Campaign 9, Campaign 12, Campaign 18, 4, 5, 6, 24, 26, 63, 65, 67, 68, 75, 79, 78, 111, 129, 138, 263, 286, 292, 300, 303, 316, 317, 318, 326, 333, 344, 348, 354, 355, 361, 368, 384, 387, 389, 391, 392, 397, 393, 400, 404, 406, 409, 413, 427, 428, 431, 440, 441, 443, 454, 457, 466, 469, 471, 472, 477, 519, 524, 540, 541, 549, 551, 552, 554, 559, 561, 564, 567, 571, 584, 585, 586, 588, 592, 599, 601, 602, 608, 613, 631, 636, 639, 644, 645, 652, 662, 664, 665, 672, 673, 674, 675, 688, 690, 704, 719, 725, 727, 732, 735, 737, 752, 754, 761, 762, 766, 769, 771, 772, 781, 811, 825, 829, 850, 855, 883, 887, 906, 938, 986, 1032, 1041, 1046, 1068, 1076, 1162, 1209, 1210, 1211, 1212, 1215, 1217, 1218, 1220, 1222, 1223, 1224	Sections 2.3.1, 2.3.2, 2.6, 3.15, Chapter 3
Reduce Stockpile Alternatives	Commentors suggested including an option to reduce the current stockpile. Some commentors also suggested an alternative that requires the minimum amount of maintenance on our existing stockpile while simultaneously phasing out our nuclear weapons.	Campaign 12, Campaign 15, Campaign 18, 2, 31, 111, 303, 332, 338, 339, 343, 354, 358, 360, 368, 396, 408, 418, 423, 425, 434, 438, 444, 445, 541, 544, Campaign 18, 571, 581, 569, 594, 872, 639, 643, 677, 678,	Sections 2.1.4, 2.1.5, 2.1.6, 2.1.7, 2.6, 2.6.3, 3.1

Table D.2-2—Summary of Scoping Comments (continued)

Topic 7. Other Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
		697, 710, 734, 735, 737, 738, 741, 749, 781, 825, 826, 830, 850, 938, 952, 1032, 1126, 1219, 1210, 1153, 1154, 1183, 1185, 1190, 1195, 1217, 1220, 1223	
Downsizing-in-Place Alternatives	Commentor questioned whether downsizing of ETFs/ HE R&D/Tritium R&D/ hydrotesting will have an effect on the location selection of a CPC. Some comments received supported the proposal's stated aim for downsizing the nuclear weapons infrastructure. Commentors expressed that downsizing facilities in one place might cause increased activities at other sites. Commentors requested that the SPEIS include environmental impacts of increased activities as a result of downsizing facilities in one place. Commentors suggested that DOE provide an alternative with a consolidated network with refined capability with smaller size and maximum production.	Campaign 7, 4, 673, 877, 1210	Chapters 3, 5, Sections 3.4.1, 5.17
Responsible Curatorship Alternatives	Commentors requested that DOE include an alternative that evaluates a “Responsible Curatorship” case for the full range of reasonable stockpile sizes, that is built on the premise that no new or replacement nuclear components will be fabricated for the entire period covered by the SPEIS, and that pit and secondary refurbishment operations will be kept to the minimum level consistent with continued reliability and safety.	Campaign 19, 2, 4, 6, 9, 32, 129, 529, 544, 747, 1083, 1218, 1219, 1220, 1222, 1223	Chapter 3, Section 3.15
Alternatives That Comply With the NPT	Numerous commentors suggested alternatives that comply with the NPT. Commentors stated that an alternative should be added which would comply with [“comply with” or “satisfy” rather than “meet”?] the NPT by reducing current operations at active facilities to those necessary to perform critical storage, disassembly, dismantlement, and disposition missions. This alternative will put the warhead complex on a reasonable path toward dismantlement, while also maximizing security, minimizing costs and impacts, retaining a declining nuclear arsenal, and maximizing	6, 367, 1056, 1095, 1134, 1135, 1212, 1220	Section 2.1.4, Chapter 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 7. Other Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	administrative freedom to pursue paths toward further nuclear disarmament by future administrations Under an alternative that complies with the NPT, there would be no need to make pits; therefore, there is no need for a consolidated pit production facility, no need to operate LANL's TA-55 facilities for pit production, and no need for a CMRR.		
Comprehensive Test Ban Treaty Alternatives	Commentor suggested to be consistent with the CTBT define and evaluate an alternative that involves the complete cessation of NNSA weapons activities at NTS and the elimination of any underground nuclear experiments, wherever located.	2	Section 2.1.3
Security Alternatives	Commentors suggested including an option to secure current weapons inventory.	Campaign 12, 281, 320, 458, 464, 465, 111, 639, 781	Section 2.3.5
Safety Alternatives	Commentors suggested analyzing an option to store toxic materials like plutonium and HEU as safely as possible.	672	Sections 2.3.5, 3.5, 3.7
Alternatives Involving Policy	Commentors suggested that DOE must analyze for an alternative where nuclear deterrence is not the cornerstone of U.S national security policy and for an alternative in which the U.S. complies with Article IV of the U.S. Constitution. Commentors also suggested another way to increase our nation's security such as providing an alternative that aims to reduce the role of nuclear weapons in U.S. security strategies.	Campaign 12, 5, 111, 570, 571	Section 2.3.5, Chapters 2, 3
Test readiness Alternative	Commentors stated the test readiness alternative should include an analysis which includes answers to issues relating to environmental impacts of maintaining test readiness; ability to certify the design of a nuclear weapon without testing; national and international environmental and public health impacts from past nuclear weapons testing; and the projected costs of compensation under the Radiation Exposure Compensation Act.	5	Chapter 3
Site Alternatives	Numerous commentors suggested alternative uses for candidate sites: • Consider lowering production at LANL and forget about the rest of the other potential locations. • Provide an alternative where LANL is used for better benefits	2, 4, 9, 24, 30, 31, 32, 75, 264, 692, 747, 879, 1218, 1224, 1217, 1222	Sections 1.5.4.2, 2.3.3.2, 2.5, 3.1, 3.4.1.6, 3.6, 3.7.2, 3.15, Chapters 2, 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 7. Other Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	than creating more nuclear weapon systems, consolidating plutonium, etc. • The current production level of 20 pits per year at LANL is sufficient for maintaining deterrence. • Commentor urged that analysis of major new projects covered by the ongoing Y-12 and LANL SWEIS be placed on hold and made subordinate to the analysis and outcomes of this SPEIS. • Removal of nuclear materials/waste from LLNL • It would make economic, security, and logistical sense to consolidate a portion or all activities at LANL, Pantex and/or Sandia (southwestern triangle). • Suggest stopping the CMRR project since this building would become obsolete by the new consolidated plutonium facility. Instead co-locate future production capacity and radiological chemistry materials research workout. • DOE should consider the alternatives of joint operations of new LLNL facilities with other federal agencies such as DHS, FBI, NASA. • Convert nuclear weapons labs to facilities that promote technologies that meet human needs. • Analyze plutonium at existing Category I/II SNM sites, uranium at Y-12, A&D at Pantex, and tritium at SRS as an alternative without the so-called transformation and with existing facilities that could be downsized and consolidated. • Alternative missions for present day weapons sites must also be considered. • Develop alternative options for the research conducted at our national labs that would benefit our planet. • Define alternative consolidation plans for specific areas including hydrodynamic testing, strategic computing, environmental testing, flight testing, fissile material operations and storage, non-nuclear component fabrication, HE and detonator fabrication and testing and tritium operations and R&D. • Terminate all bomb development related tests and analyze the		

Table D.2-2—Summary of Scoping Comments (continued)

Topic 7. Other Alternatives

Subtopic	Comment Summary	Documents	SPEIS Reference
	safest and secure locations to conduct maintenance tests.		
Nonproliferation Alternative	Commentors suggested that NNSA develop an alternative that focuses on nonproliferation. Include an alternative that excludes NNSA complex support for weapons and capabilities required to implement illegal preemptive and preventive nuclear attacks on other states that might in the future seek to arm themselves with weapons of mass destruction.	Campaign 5, Campaign 9, 2, 63, 213, 368, 387, 850, 734, 768, 1166, 1209, 1210, 1221, 1223, 68	Sections 1.2, 2.1.3, 2.1.4, 2.3.1, 2.3.2
Cleanup Alternatives	Commentors suggested that resources and expertise of national laboratories should be directed toward cleanup.	Campaign 4, Campaign 5, Campaign 6, Campaign 9, Campaign 12, Campaign 18, 1, 55, 164, 260, 287, 300, 303, 317, 318, 333, 368, 372, 380, 471, 499, 501, 525, 540, 541, 552, 555, 584, 585, 631, 681, 691, 747, 768, 781, 811, 861, 897, 962, 998, 1059, 1104, 1111, 1208, 1210, 1217, 1218, 1220, 1221, 1222, 1223, 1224	Chapter 2, Chapter 3, Section 3.15
New Triad	Commentors suggest providing alternatives that support the "New Triad" and the balance it brings concerning enemies and allies and discusses what the effects are of not having met the needs of this New Triad.	4	Section 2.3.1
Alternatives Promoting Peace	Commentors suggested that DOE should pursue more diplomatic alternatives, pursue the process of scientific conversion of military production to peaceful uses. Commentors also suggested an alternative where security is provided through conflict resolution and mediation.	Campaign 4, Campaign 6, 592, 1216	Section 3.15, Chapters 2, 3
Future of the Nuclear Weapons Complex	Commentors stated that the EIS should cover a range of alternatives that future presidents and Congress would face regarding our nuclear weapons Bombplex and abandon plans to build new nuclear weapons.	12, 57, 223, 326, 343, 358, 360, 396, 408, 418, 423, 425, 434, 444, 525, 710, 747, 749, 781, 938, 944, 1209, 1224, 1217, 1222, 1223	Section 3.1

Table D.2-2—Summary of Scoping Comments (continued)

Topic 8. Reliable Replacement Warhead

Subtopic	Comment Summary	Documents	SPEIS Reference
RRWs—General	A commentor expressed that the RRW program must be viewed as optional.	2	Sections 2.5, 2.5.1, 2.5.9
Opposition to RRWs	Commentors oppose the RRW because the RRW is not a legitimate element of the scope in this process and could imperil national security by substituting untested designs for already tested ones. Commentors also state that the RRW will promote nuclear proliferation.	4, 22, 32, 128, 168, 326, 1104, 1205, 1210	Section 2.5
RRWs and Pit Production	Commentors requested a discussion about the life cycle management of existing pits inventories and how new production will fit into existing management and disposition systems and questioned if different margins are expected for different pit sizes.	4, 26, 27, 587	Sections 2.5, 3.4.1
RRW—Analysis	Commentors submitted comments associated with the type of analysis that should be included regarding the RRW. These included: • Clarify the role of the RRW program as currently envisioned in Complex Transformation. • Analyze the environmental impacts for all RRW design concepts in the draft SPEIS.	5, 1218	Section 2.5
Questions Regarding the RRW	Commentors submitted comments with questions on the RRW. These included: • How long will it take to produce an RRW to respond to geopolitical change? And why aren't current ones suited for this considering most types are understood to be variable yield? • Will our needs for a responsive infrastructure and war be the same in 2030 as they are now? • How would RRW, as new warheads be used towards emerging threats? Would they have a new military mission compared to existing U.S. nuclear weapons and if so this seems contrary to congressional intent? • Why are new weapons designs not mentioned in stockpile management activities on the fact sheets or under the proposed action?	4, 503	Section 2.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 8. Reliable Replacement Warhead

Subtopic	Comment Summary	Documents	SPEIS Reference
	• What is the true need for new design nuclear weapons and for the production of 125 pits per year? • Will there be a time when there will be both RRW warheads and the warheads they are replacing in the stockpile?		
Relationship Between the RRW and Complex Transformation	Commentors questioned the relationship between the development of RRWs and alternatives for Complex Transformation. Commentors stated that if the complex must be reformed with or without new RRW designs, how can the RRW be the "enabler" for the project. Justification for the project seems to be a moving target therefore it is hard to discern if this SPEIS is for support of the existing stockpile, new design nuclear weapons, or some combination of the two. Commentors stated that expanded pit production is primarily about RRW pits for new nuclear weapons design and is the driver for the 125 pits per year desired level of production.	4, 1219	Sections 2.5, 2.3.1
Question the Need for RRWs	Numerous commentors questioned the need for RRWs and the need to replace refurbished warheads with RRW warheads when a recent report indicates that the existing stockpile is not degrading.	4, 516, 603, 876, 942, 947, 1064, 1065, 1190, 1192, 1211, 1046, 1058, 1216	Section 2.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 9. Cost and Schedule

Subtopic	Comment Summary	Documents	SPEIS Reference
Cost-Effectiveness of Existing Nuclear Weapons Complex	Several comments were received regarding concern about the cost of the project and questioned anticipated costs, costs of accidents, and remediation efforts. Commentors also questioned the cost-effectiveness of Complex Transformation when DOE claims that the SSP is not failing after spending $90 billion. Why then is the Program not adequate for maintaining the stockpile? How can increased costs for Complex Transformation be justified? Explain why the existing nuclear complex can't be made more cost effective. What needs to be changed to update it?	Campaign 2, Campaign 5, Campaign 4, Campaign 6, Campaign 7, Campaign 9, Campaign 10, Campaign 17, Campaign 18, 3, 4, 9, 10, 31, 75, 104, 107, 109, 110, 203, 208, 210, 303, 329, 335, 344, 351, 355, 367, 368, 391, 395, 402, 430, 432, 437, 445, 460, 525, 567, 584, 674, 689, 690, 693, 740, 727, 731, 732, 735, 738, 753, 752, 754, 765, 845, 860, 951, 955, 401, 1084, 790, 1089, 1100, 1126, 1218, 1142, 1143, 1149, 1161, 1162, 1200, 1209, 1210,1220, 1223, 1217, 1218, 1219, 1222, 1223	Chapter 2, Section 3.1
Better Use of Resources	Numerous commentors provided suggestions for better use of resources. These include: • Funds should be spent on maintaining safety and security at existing sites • Funds should be spent on dismantlement • Funds should be spent on infrastructure	Campaign 1, Campaign 19, 1, 5, 12, 19, 66, 67, 74, 77, 80, 96, 104, 109, 110, 126, 132, 133, 138, 153, 191, 368, 390, 541, 380, 320, 585, 684, 691, 692, 723, 740, 747, 758, 769, 783, 894, 1081, 1104, 1111, 1117, 1188, 1137, 1200, 1205, 1206, 1208, 1209, 1057, 1205, 1209, 1210, 1212, 1211, 1218, 1224, 1220, 1222	Chapter 2, Section 3.1
Factors That Could Increase Proposed Costs	Commentors expressed concern regarding factors that could increase proposed costs and requested additional discussion. Factors included: • Security • Increased mitigation and environmental restoration	4, 1218, 1217, 1223	Chapter 2, Section 3.1
Cost of Cleanup	Commentors questioned the cost of the current cleanup that is needed.	1213	Chapter 2, Section 3.1

Table D.2-2—Summary of Scoping Comments (continued)

Topic 9. Cost and Schedule

Subtopic	Comment Summary	Documents	SPEIS Reference
Cost of Each of the Alternatives	Commentors submitted comments on the cost of each of the alternatives and questioned if construction and operation costs would be the same at each candidate site. Commentors requested a discussion of the cost of siting the CPC at each of the candidate sites. A specific comment was submitted regarding TTR and remediation costs of associated with moving testing operation from TTR would be cost effective compared to keeping the testing at TTR. [Edit—words missing.] It was also suggested that transition to lower cost of operations for NNSA, without so-called transformation of the complex, be analyzed.	4, 9, 685	Chapter 2, Section 3.1
Cost-Benefit Study	Commentors requested the inclusion of a cost-benefit analysis of different alternatives (ETF/JFTP [joint flight testing program?]/HE R&D/Tritium R&D/Hydrodynamic Testing costs; an estimated breakout of all costs of downsizing-in-place and/or eliminating specific activities at sites performing Environmental Testings/JFTP/HE R&D/ Tritium R&D/Hydrodynamic Testing) including SNM consolidation without transformation and SNM consolidation as part of transformation. The cost-benefit analysis should also be based on a life cycle budget for the project including not only the cost of construction, but operation, decommissioning and waste disposal	4, 5	Chapter 2, Section 3.1
Timeline	Commentor submitted questions regarding the timeline of the proposal. These included: • Is the schedule different for each site? • Explain rationale for the order of the baseline CPC schedule? Why approve the Mission Need (CD-0) in 2008? Will it be before the ROD? Isn't that prejudicial? Will the decision to proceed with the CPC be made in the ROD?	4	Chapters 2 and 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 10. Candidate Sites

Subtopic	Comment Summary	Documents	SPEIS Reference
Candidate sites—General	Commentors submitted comments regarding candidate sites that were general in nature. While many commentors provided comments on specific sites, other comments stated: • DOE must consider the psychological impact of living in a state with four sites devoted to nuclear weapons activities, as well as being the birthplace of the atomic bomb, and the site of its first detonation. • In order to comply with the 'no new plutonium sites' determination, plutonium activities should be placed at sites which currently have facilities with a history of safe plutonium operations. • Consider the synergistic impact of the location of two of the nation's nuclear weapons laboratories (LANL, SNL/NM) located within 60 miles of one another in New Mexico. • Discuss the reduction of NNSA sites. • The SEAB 2005 report contradicts the criteria for candidate site consideration (i.e., population encroachment) in the NOI stating that the majority of sites are bordered by residential and/or commercial communities. • Find financial means to make reparations to those communities whose soil, air and water have been contaminated.	Campaign 12, 4, 5, 73, 111, 540, 792, 1218, 1208	Sections 2.3.4, 3.14, 4.1, 4.1.9, 4.6.9, 5.5.15, 5.9.15
LANL (New Mexico)	Commentors submitted comments regarding the siting of “Complex Transformation” at LANL, these included: • New studies need to be conducted to analyze the social, environmental, economic, and health impacts associated with an expansion at LANL. • Concern about safety from toxic wastes for residents residing upwind of Los Alamos. • Explain how NNSA came up with the 40% reduction of nuclear facility space at LANL. • Concern for safety and liability issues especially since security and environmental responsibility at LANL is lacking. • Provide justification for increasing the production at LANL from ~20 ppy to 200 ppy at a cost of ~$4 billion. • LANL’s mission should be redirected to cleanup and securing	Campaign 12, 2, 4, 5, 6, 73, 77, 111, 146, 209, 327, 333, 781, 792, 1128, 1215, 1217, 1218	Sections 1.1, 1.2, 1.5.3, 1.5.4.2, 2.3.3.2, 3.11.1.2, 3.4.1.5, 3.4.1.6, 3.7, 4.1, 4.1, 5.1, 5.1.4, 5.1.12, 10.6, Chapters 2, 4

Table D.2-2—Summary of Scoping Comments (continued)

Topic 10. Candidate Sites

Subtopic	Comment Summary	Documents	SPEIS Reference
	the existing stockpile and waste. • Explain why LANL was selected as a candidate site when its location is not favorable (on top of a windswept mountain, on an earthquake fault, in a wildfire zone, and at the source of a watershed that serves 10 million people). • Discuss containment methods for DARHT and explain if they conform to the DARHT EIS ROD. • Provide a discussion on facilities containing SNM and the management of these facilities by another group if by 2022 LANL is not expected to operate facilities containing Category I/II SNM. • Concern regarding LANL's future direction. • The decision to locate a CPC at LANL is prejudicial and premature until a decision regarding the CMRR is made. • Concern regarding LANL's chances of actually producing 10 certified W88 pits when it has yet to produce a certified pit. • LANL's current weapons-related plutonium infrastructure should be more than sufficient to meet the needs of maintaining the U.S. nuclear stockpile. • Suggest performing another more updated EIS. • Concern about DOE's poor decision-making as shown in the decisions regarding the FXR facility the DARHT facility. Some commentors also submitted comments in reference to the LANL SWEIS.		
LLNL (California)	Commentors submitted comments regarding the siting of "Complex Transformation" at LLNL, these included: • Complex Transformation plan should terminate high explosives tests at Site 300 and concentrate on cleanup there and the main site. Address issues of encroachment to surrounding recreational and residential areas of pollutants from explosive testing. • LLNL would not be a suitable location because of its dense population, small facility and transportation and storage problems. LLNL is also a Superfund Site. • Direction from Congress to remove weapons usable material	4, 9, 32, 1219, 1220, 1222	Sections 3.2.2, 3.3.1, 3.7.2, 3.8.1.1, 3.9.5.3, 3.13.2, 3.15, 4.2, Chapter 10

Table D.2-2—Summary of Scoping Comments (continued)

Topic 10. Candidate Sites

Subtopic	Comment Summary	Documents	SPEIS Reference
	from LLNL. • Complex Transformation would add to the already existing 2-mile plume that extends to the City of Tracy. • Discuss the closure of LLNL. • Discuss the role of the National Ignition Facility mega laser in Complex Transformation. • Concern regarding continued tritium operations. • Suggest phasing out operations at LLNL and move to LANL and make LLNL an alternative energy plant. • Concern regarding documentation by Tri-Valley CAREs showing the threat at least three-quarters of a million curies of tritium have come out of the twin stacks of Building 331. • Evaluate a proposal to place a National Bio and Agro Defenses Laboratory at LLNL.		
NTS (Nevada)	Commentors submitted comments regarding the siting of “Complex Transformation” at NTS, these included: • NPR indicates concern over current 2-3 yr. nuclear test readiness at NTS which may not achieve the stated goal of a "responsive" complex. • Need to be very clear and explicit regarding assembly and disassembly of nuclear weapons at NTS as it is a new activity and not analyzed in the NTS SWEIS. • Discuss plan for an Advanced Hydrotest Facility. • Clarify how the mission of the NTS is to be realigned. • Evaluate to what extent the NTS would be a consolidation site. • Missions at NTS related to sub-critical tests are inconsistent with the proposed action. • NTS is an unsuitable location for siting the proposed CPC. • Discuss impacts, if sited at NTS, the proposed action would have on Yucca Mountain. • Consider impacts to Nellis Air Force Base, Area 5 and Area 3. • Concern in DOE’s poor decision-making as shown in the decisions regarding the AHF at NTS.	2, 4, 215,587, 1048	Sections 2.1.2, 2.3.1, 3.2.3, 3.4.1, 3.12.3, 3.14.3, 6.2.3, Chapter 2, 3, 4
TTR (Nevada)	Commentor suggested that TTR be considered as a site for	793	Section 3.5.1, 3.10,1

Table D.2-2—Summary of Scoping Comments (continued)

Topic 10. Candidate Sites

Subtopic	Comment Summary	Documents	SPEIS Reference
	consolidation.		
Pantex (Texas)	Commentors submitted comments regarding the siting of "Complex Transformation" at Pantex, these included: • Examine integrating test flight operations with existing DoD test capabilities such as TTR. • Consider the dangers of airports in the area or consider moving location of flight paths so they are not over Pantex. • Pantex is not ready for W88 production because of shortage of existing resources. • Dismantlement should be given priority over weapons programs. • Stated that Pantex should not be considered a reasonable candidate site when Pantex has public access to fence lines that are only a short walk from the border of the site.	4, 6, 73, 792, 1125, 1207, 1224	Sections 3.2.3, 3.10.4, 3.15, 4.5, 5.5.12
SNL (New Mexico)	Commentor submitted comments requesting the following discussion for SNL/NM be included: • Discuss the role SNL will play in certifying the plutonium pits. • Discuss the increased potential for tritium releases. • Discuss the increase in explosive components testing and the release of toxic contaminants. • Discuss if SNL will be operating its thermal treatment unit and what toxic pollutants will be released. • Discuss the potential for tritium accidents that can occur at SNL. • Suggest preparing a more updated EIS and specifically address water consumption rates.	1217	Sections 3.2.6, 3.9.1.4, 3.12.1.3, 5.13, Chapters 2, 4
SRS (South Carolina)	Commentors submitted comments regarding the siting of "Complex Transformation" at SRS, these included: • Clarify if the SRS SNM is included in the consolidation. Is consolidation aimed at both weapons and non-weapons related SNM? • Consider that the attitude at SRS concerning support for Complex Transformation at SRS does not reflect the opinion of the entire state.	4, 405	Section 3.7.1.3, Chapter 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 10. Candidate Sites

Subtopic	Comment Summary	Documents	SPEIS Reference
Y-12 (Tennessee)	Commentors submitted comments regarding the siting of "Complex Transformation" at Y-12, these included: • Objection to the counter-productive exclusion of options for consolidating uranium, secondary, and case fabrication activities currently performed at Y-12 and the declared intention to press ahead with an EIS and ROD covering modernization of Y-12 capabilities even as the Complex Transformation SPEIS is underway. • Concern about soil, water, and air pollution caused by Y-12. • Concern about the construction of the HEU Facility in reference to the proposed construction of the CNPC at Y-12. • Suggested that environmental cleanup of the site be included as a key component. • Expressed support for Y-12 remaining the weapons' complex center of excellence for uranium and other SNM. • Expressed concern about beryllium toxins in Oak Ridge. • Stated that Y-12 should not be considered a reasonable candidate site when Y-12 has public access to fence lines that are only a short walk from the border of the site.	2, 73, 208, 322, 792, 795, 1129	Sections 1.5.4.2, 3.2.9, 3.5.1.1, 4.9, 5.9.12, Chapter 10

Table D.2-2—Summary of Scoping Comments (continued)

Topic 11. Additional Analysis

Subtopic	Comment Summary	Documents	SPEIS Reference
Additional Analysis—General	Comments were received requesting that additional analysis be conducted. General comments included: • Site-specific EIS evaluations and impact mitigation strategies for all potential CPC sites must be completed in the Draft SPEIS. • Separate impact studies should be conducted for downwind and down gradient communities. • SPEIS must list the number of augmentation weapons, reliability-reserve weapons and weapons to fulfill NATO commitments.	4, 536	Sections 2.3, 4.x.4.11 for all sites, Chapter 5
Nuclear Weapons Activities	Commentors submitted comments regarding additional analysis pertaining to nuclear weapons activities. These included: • Analysis of historical, current, and international consequences due to U.S. nuclear weapons activities, including who have been impacted internationally, as well as locally, regionally, and nationally by the proposed future activities; who have benefited from the past nuclear weapons activities; how U.S. nuclear weapons have increased global security; and environmental and health impacts (nationally and internationally) from Cold War arms race. • Include analysis of possible use of one weapon currently in stockpile, an advanced concept, or RRW from smallest nuclear weapon to largest. • Include analysis showing the number of DOE-sponsored hydrodynamic shots at each site that are devoted to in whole or part of nuclear weapons development and for those that are strictly for maintenance. • SPEIS must list the number of augmentation weapons, reliability-reserve weapons and weapons to fulfill NATO commitments. • Clarify reliable or usable nuclear stockpile of weapons. • Study the phase-out of duplicative facilities.	5, 9, 263, 1219, 1222	Sections 2.1, 2.2, 2.5, .5, 3.7, 3.8, 3.9, 3.11, 3.12, Chapter 5
Special Nuclear Material	Amount of SNM declared as surplus should increase as disarmament advances. Discuss how materials would be	9	Section 6.2.4, 6.3.4

Table D.2-2—Summary of Scoping Comments (continued)

Topic 11. Additional Analysis

Subtopic	Comment Summary	Documents	SPEIS Reference
	immobilized in forms that are difficult to assess and retrieve under the NPT Compliance/Disarmament Alternative.		
Environmental Analysis	Commentors submitted comments regarding the analysis of environmental impacts. These included: ● DOE should provide a thorough analysis of the environmental effects of dismantling international anti-proliferation treaty and disarmament efforts with special attention to the U.S.'s effect on the international community as the world's superpower. ● Include analysis focusing on global environmental effects from developing new nuclear weapons and furthering the nuclear arms race. ● Due to increased rains a study of global warming and the increased flash floods needs to be done. Past studies will not be adequate if we are facing more storms and more runoff during the summer.	Campaign 18, 31, 75, 339, 1128	Chapter 5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 12. Kansas City Plant

Subtopic	Comment Summary	Documents	SPEIS Reference
KCP—General	The KCP should be relocated to Albuquerque to save travel between sites and facilities	574	Sections S.3.2.10, 1.5.2.1, and Chapters 1, 2
Objection to Exclusion of KCP	Commentors object to the exclusion of KCP, as it blatantly seeks to prejudice and preempt the consideration of cost-effective complex consolidation options that would redistribute remaining KCP missions and capabilities to LANL and SNL where some 10% of KCP employees are already assigned. Commentors also state that the full cost of Complex Transformation is not being represented by the exclusion of KCP. Commentor also objects to the exclusion of an analysis of further non-nuclear consolidation and production modernization at the KCP as it seeks to prejudice the consideration of cost-effective complex consolidation options that would redistribute remaining KCP missions and capabilities to LANL and SNL.	2, 4	Sections S.3.2.10, 1.5.2.1, and Chapters 1, 2
NEPA Analysis for KCP	Commentor questions where and what is the status of the separate NEPA analysis that the Complex Transformation NOI cites for KCP.	4	Sections S.3.2.10, 1.5.2.1, and Chapters 1, 2

Table D.2-2—Summary of Scoping Comments (continued)

Topic 13. Waste Isolation Pilot Plant

Subtopic	Comment Summary	Documents	SPEIS Reference
WIPP—General	Commentors submitted comments that were general in nature regarding WIPP. These included: • Commentors questioned what other WIPPs or extensions of WIPP are being considered for Complex Transformation. • Commentor suggested that WIPP or WIPP substitutes and TRU waste final disposition need to be considered and analyzed. • Not one site in the complex has been cleaned up because of WIPP. • Include an analysis on impacts of transportation of waste, not only to WIPP, but also to subsequent disposal facilities.	4, 5, 1218	Sections 5.10, 5.11, 10.5.5
WIPP as a Candidate Site	Commentor requested an explanation as to why WIPP/Carlsbad was not considered as a site for Complex Transformation.	1218	Sections 3.1, 3.2, 3.3
Future of WIPP	Commentors questioned the plans for future waste disposal after WIPP is closed.	4, 5	Section 10.5.5
Support for WIPP as a Candidate Site	A commentor expressed support for Carlsbad because it has remote location to promote security, has the community support for nuclear weapons production, has two national labs, and has complete radiological monitoring capabilities.	1218	Sections 3.1, 3.2, 3.3, 10.5.5
Opposition to WIPP	Commentor expressed opposition to WIPP being redeveloped or maintained in NM or any other State. Another commentor expressed opposition to siting a Complex Transformation facility at WIPP/Carlsbad.	216, 1218	Sections 3.1, 3.2, 3.3, 10.5.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 14. Sabotage and Terrorism

Subtopic	Comment Summary	Documents	SPEIS Reference
Sabotage and Terrorism—General	Commentor expressed concern about possible safety breaches at Y-12. Commentor stated that production of nuclear weapons and consolidation of storage of nuclear materials at one site would provide one target that is more susceptible to terrorist acts.	33, 71, 96, 104, 221, 286, 320, 374, 405, 450, 562, 525, 526, 723, 731, 845, 955, 1102, 1210, 1176, 1210, 1222, 1223	Section 1.1.2, Appendix H
Evaluation of Sabotage and Terrorism	Commentors generally expressed the opinion that Complex Transformation could be targets for sabotage and/or terrorism (intentional destructive acts). Commentors suggested that the SPEIS address safety issues and security risks if security is breached, calculate human error risks, and analyze the possibility of construction of an improvised nuclear device made from stolen or diverted plutonium or HEU. Several commentors expressed concern with risks associated with shipment of nuclear materials. Analyze terrorist attack associated with transportation of nuclear materials. Commentors requested that the SPEIS consider the additional security and emergency response capabilities that may be needed by the local governments immediately adjacent to facilities.	Campaign 7, Campaign 14, Campaign 19, 4, 5, 9, 31, 184, 191, 294, 329, 383, 405, 460, 516, 636, 725, 770, 861, 1083, 1188, 1187, 1209, 1213, 1217, 1218, 1219	Section 21.1.2, .3.5, Sections 5.x.12 for all sites, Appendix C, Appendix H
Suggested Actions To Protect Against Sabotage and Terrorism	Commentors expressed a concern over the possibility of sabotage and/or terrorism. Commentors provided suggested actions to protect against sabotage and/or terrorism. These included: • Commentors expressed the need to consider possibility of accidental or intentional detonations of nuclear devices by accident or terrorist attack. • One commentor urged that tighter oversight and more token enforcement be applied at all levels of the mission. • Commentor requested an analysis of whether existing programs can be used to meet unanticipated events, instead of Complex Transformation. • Commentor suggested that a security assessment be done to provide input on the various ways the material will be made	4, 5, 9, 10, 322, 466, 568, 1044, 1213, 1216	Sections 1.1.2, 2.3.5, Chapter 2, Appendix C, Appendix H

Table D.2-2—Summary of Scoping Comments (continued)

Topic 14. Sabotage and Terrorism

Subtopic	Comment Summary	Documents	SPEIS Reference
	vulnerable including storage, transportation, loading/unloading, packaging, processing, etc. • Commentor suggested that an evaluation of the complex-wide safety and security problems be conducted and include plans to address these issues. • Commentor requested an explanation of the insecurity of current plutonium operations and the need for increased security. • Provide detailed analysis of expected increased safety that will occur. As a baseline, provide potential impacts of maintaining the current level of security and safety along with the impacts of upgrading current security. • Suggestion to perform an investigation into each police officer's background for terrorist activities or corruption; abuse of U.S. citizen, motorists and visitors; and the potential threat to U.S. security before storage of any nuclear material at one site.		
LANL	Some commentors had specific concerns on the risk at LANL. Some LANL facilities are relatively vulnerable to attack from the ground; most are vulnerable from the air. A commentor also stated that Complex Transformation threatens the LANL community with increased risk of warhead production. Another commentor stated that transportation of larger amounts of plutonium makes LANL a target for a terrorist attack.	4, 6, 10, 320, 538	Sections 5.1.12, 5.2, Appendix H
Pantex	Commentors had specific concerns on the risks at Pantex. Given the proximity of the airport to Pantex, constant air traffic, and addition of more dangerous operations, the consequences of a terrorist attack should be evaluated	Campaign 20, 954, 1224	Appendix H
LLNL	Commentors had specific concerns on the risks at LLNL. LLNL’s plutonium should be moved only once and should not be used in new nukes. Moving plutonium twice is not safe or secure.	4, 9	Section 3.7.2

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
Land Use			
Land use—General	Commentor requested existing square footages and proposed square footages for all facilities (existing, proposed and proposed to be eliminated) and analyze environmental impacts at sites with increased activity due to consolidation of SNM at some sites. Another commentor suggested that cumulative impacts section include local renovation, expansion, and development information in the ROI. Commentor also suggested that all candidate sites complete a Land Use Management Plan EIS.	4, 1225	Sections 3.4, 3.5, 3.6, 4.x.1 for all sites, 4.x.3 for all sites, 5.12
LANL	Commentors provided specific comments on LANL land use. These included: • Provide impacts of SNM on land use. • Provide impacts to pueblos and sites where facilities are to be developed.	1217. 1219	Section 5.1.1
Pantex	Commentors provided specific comments on Pantex land use. These included: • Will the land area of Pantex need to be expanded? • Complete a full analysis of land use.	330, 1212	Section 5.5.1
Visual Resources			
NTS	Commentor requested that the SPEIS include an assessment of mitigation measures (use of existing facilities/infrastructure, "dark sky" measures, logical improvements and use of appropriate screening/structure colors) that can be included to abate cumulative visual impacts. Commentor also expressed concern on cumulative visual impacts to public land users' experiences.	173	Section 5.3.1, 5.3.2
Site Infrastructure			
Site Infrastructure—General	Commentor stated that specific information on supplier plans to meet expectations of increased demand on site infrastructure resources must be provided in detail.	1225	Section 4.x.3 for all sites

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
LANL	Commentors provided specific comments on LANL site infrastructure. These included: • TA-55 remains without adequate continuous power supply. • Entire LANL site lacks a secure electrical power grid. • Concern that infrastructure and operation budget has been scaled back to account for future missions activities with subsequent inadequate reinvestment in HVAC and fire systems. • Concern that LANL still lacks ventilation and monitoring systems at PF-4 which will continue to function following serious accidents. LANL was still insisting on applying this same loose approach to its proposed new CMRR facility. • LANL does not have infrastructure to support Complex Transformation operations.	6	Sections 4.1.3, 4.1.12
Pantex	Commentors provided specific comments on Pantex site infrastructure. These included: • Provide discussion of facilities that will be used and any modifications or new facilities that will be needed for the storage of SNM. • Provide water and utility needs be for the various combinations of current work.	330	Sections 3.7.3, 5.5.3, 5.5.4, 5.12.3
SRS	Commentors stated that SRS has modern infrastructure with large-scale plutonium experience and national lab with core competency in plutonium R&D and is capable of handling operations dealing with Complex Transformation construction and operation.	922, 928, 929, 930, 931, 932, 933, 934, 935, 936, 912, 913, 915, 916, 918, 919, 920, 1212	Section 3.2.8
Y-12	Commentor stated that investment in the modernization of Y-12 must continue to ensure safe, secure working conditions.	1129	Section 3.3.1
Air Quality and Noise			
Air Quality and Noise—General	Commentors provided comments on air quality and noise that were general in nature. These included: • Incorporate plants and all other parts of the ecosystems that may be damaged by ozone. • NNSA must publish and make publicly available prior to the issuance of the Draft SPEIS a comprehensive list of "duplicative facilities." The Draft SPEIS must analyze the various alternatives for eliminating such duplicative facilities.	525, 1225	Sections 3.8, 3.9, 3.11, 3.12 4.x.7 for all sites

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
LANL	Commentors provided specific comments on LANL air quality and noise. These included: • LANL must be required to reevaluate and broaden their air sampling programs. • Complex Transformation will increase dangerous air emissions. • Concern that no air quality studies, health studies or EJ studies have been performed downwind from LANL even though LANL has violated the CAA through its emissions.	206, 536, 1128, 1218, 1221	Sections 4.1.4, 5.1.4,
Water Resources			
LANL	Commentors provided specific comments on LANL water resources. These included: • Expressed concern that chemicals and radionuclides have been found in plumes close to drinking water sources near Los Alamos and springs that feed the Rio Grande, which is a drinking water source and the largest source for irrigation water in NM. • Provide explanation on how NNSA proposes to remediate the aquifer under LANL. • Stated that data collected from groundwater wells at LANL is unreliable and that DOE is not in compliance with DOE Order 450.1 Environmental Protection Program, which requires LANL to have a groundwater surveillance monitoring program in place by December 31, 2005. • Expressed concern that proposed activities would increase water usage above the amount allotted to it from the regional aquifer. • Concern that groundwater contaminants from current operations have moved off-site and are contaminating the drinking water supply wells for Los Alamos County and the Buckman Wellfield, where over 40% of Santa Fe's drinking water supply is located.	Campaign 12, 5, 48, 67, 96, 111, 206, 300, 320, 324, 536, 538, 507, 590, 684, 781, 1056, 1104, 1217, 1218, 1221, 1223	Sections 4.1.5, 5.1.5
LLNL	Commentors provided specific comments on LLNL water resources. Commentor expressed concern about the serious problem of uranium in the water table. Another commentor questioned how many years before the water on the earthquake fault will be affected around LLNL.	1219, 1220	Sections 4.2.4, 4.2.5, 4.2.6

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
NTS	Commentors provided specific comments on NTS water resources. These included: • Provide detail regarding the contamination of groundwater with physical data and show that the statement that "much of the radioactivity exclusive from tritium, remains captured in the original cavity, and thus not available to leach into the groundwater" is valid. • Concern that U-238 and tritium will be used in test shots because use of U-238 and tritium are not included in water permit. • Concern regarding DOE's ability to accurately characterize groundwater contamination and migration within the 300-square miles under NTS.	215, 587, 1048, 1219	Section 4.3.5
TTR	Commentors provided specific comments on TTR water resources. These included: • Expressed that water is not an issue in the TTR area and that there is enough to support the complex. • There is commitment to protect the aquifer.	534, 1212, 1213	Sections 4.4.4, 4.4.5
Pantex	Commentors provided specific comments on Pantex water resources. These included: • Concern about the project's impact on the water supply of the Ogallala Aquifer in reference to agriculture and potable water. • Concern about severe water shortage in Texas. • Concern about ecological effects to scarce water resources in the Great Basin. • Concern about impacts on water resources. • Stated that water impacts must be examined individually and cumulatively for each alternative. • Provide long-term ecological effects of leaving radioactive and chemical contaminants that may pollute water resources while other facilities are being built.	153, 325, 388, 475, 700, 701, 757, 892, 893, 789, 1205, 1206, 1051, 1212, 1219, 1217, 1222, 1223, 1224	Sections 4.5.5, 4.5.7, 5.5.4, 5.5.7
SNL	Commentor questioned the anticipated impact on downstream cities when the aquifer is dried up.	1215	Section 4.6.5
WSMR	Commentor is concerned about the water supply contamination from WSMR activities.	1218	Section 4.7.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
SRS	Commentors provided specific comments on SRS water resources. These included: • Determine/ensure compliance of operations with current NPDES permit (i.e., Hg effluents). • Expressed concern on the Jasper-Beaufort Water District, which is measuring around 600pCi/L of tritium in the drinking water, which is a direct result of the current inventory and stockpiles of weapons-grade nuclear materials. • Concern about existing groundwater contamination as a result of tank residues. • Concern about cleanup/remediation of aquifer near SRS. • Concern about danger of further contamination of SC or GA water supply due to releases by SRS.	405, 511, 572, 783, 1208, 1209	Sections 4.8.5, 10.5, 10.6.5
Water Resources			
Water Resources—General	Commentor stated that the groundwater around Rocky Flats is polluted, and needs to be cleaned up.	1217	Section 4.6.5
SRS	Commentor expressed concern about previous contamination of SRS and expressed a specific concern regarding the threat posed by tank residues to groundwater.	404	Section 5.8.5, 5.8.11
Geology and Soils			
Geology and Soils—General	Commentors expressed concern for the loss of fertile soils used for agriculture.	947	Sections 4.x.6 for all sites
LANL	Commentors provided specific comments on LANL geology and soils. These included: • Concern for the approximately 50,000 drums of TRU waste stored in tents at TA-54, one mile upwind from White Rock; an earthquake could cause drums to rupture and release approximately 1/4 of above-ground TA-54 radioactivity. • Seismic issues at LANL need to be adequately analyzed as most environmental assessments appear to be in significant error.	6, 281, 947, 1177, 1217, 1218	Section 4.1.6, 4.1.6.3, 4.1.13, 5.1, 5.1.14, Chapter 7, Section 9.1
LLNL	Commentors expressed concern for the 7 million people that live in a 50-mile radius of LLNL where the main site is 200 feet from earthquake faults and Site 300 has a fault running through it.	9, 300, 320, 692	Sections 4.2, 5.2, 4.2.6.3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
NTS	Commentors provided specific comments on NTS geology and soils. These included: • Need to determine the existing soil contamination data throughout NTS, surrounding areas, and areas downwind. • Soil analysis data should contain the inventory of radionuclides present at various depths to a depth of at the very least 20 cm. • Concern that the NTS area has experienced 620 earthquakes in the last 20 years with the largest a magnitude of 5.6. An earthquake with a magnitude of 7 is possible. Discuss how design of facilities can be built to prevent damage and radiological releases. NTS should not be considered for plutonium operations and SNM consolidation because of seismic activity.	47, 215, 587, 1048, 1221	Sections 4.3, 4.3.6.2, 4.3.11, 5.3, 10.5, 10.6
SRS	Commentors expressed concern regarding location of SRS, which is located within proximity to a fault line responsible for the Charleston earthquake of 1868.	1208	Sections 4.8, 4.8.6
Y-12	Commentors stated that fractured limestone with caverns, fissures, sinkholes make recovery from project construction and operations impossible.		Sections 4.9, 5.9
Biological Resources			
Biological Resources—General	Commentors suggested that DOE consider the ecology and environment and characterize any changes to the Complex in order to take remedial action, if necessary. Commentors also expressed concern regarding explosive testing effects on T&E species.	459, 1225, 1189	Sections 4.x.7 for all sites, 5.x.7 for all sites
NTS	Commentor suggested that DOE explore whether various plants and animals within and near NTS have radionuclide concentrations.	1048, 215	Section 4.3.7
Cultural and Archaeological Resources			
Native American Resources	Commentors suggested that an assessment of the possible endangerment of the Native Americans and other indigenous people be considered. Numerous commentors were concerned about activities occurring on Native American lands or taking advantage of indigenous/aboriginal people and stated that Native Americans have been wiped out from nuclear material contamination.	104, 538, 1111, 1216, 1217	Sections 5.x.8 for all sites
Western Shoshone	Commentors stated that the SPEIS must include an explanation of how U.S. government and Shoshone Nation Agreement in the Treaty of Ruby Valley of 1872 can be ignored. The SPEIS must	9, 215, 763, 1048, 1223	Section 4.3.8

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	also include how gradual encroachment (as the ICC alleged and was upheld by the Supreme Court) is a plausible reason for taking of Shoshone land when that is the ruling of only one Nation (the US). The IACHR and UNCERD decisions that the U.S. was unjust in the taking of land need to be considered.		
LANL	Commentors stated that the Jemez Mountain range is the ancestral homeland to the surrounding Sovereign Pueblo Nations and should be considered in the analysis of LANL.	538, 1056	Sections 4.x.8 for all sites, 5.x.8 for all sites
Socioeconomic Resources			
Socioeconomic Resources—General	Commentors provided comments on socioeconomic resources that were general in nature. These included: • Define the size of the workforce and the socioeconomic impacts to all proposed sites for the consolidated plutonium center, assembly/disassembly, hydrodynamic testing and sub-critical testing. • Create jobs and security through devising cleanup activities. • Consider the impacts to American exports abroad as a result of the use and development of nuclear weapons. • Consider whether the community is tied too closely to a dangerous and unstable industry and thus unable to attract other jobs, investments, and residents. • Concern that decision to support project are based on financial reasons (no other opportunity for local area employment) versus making decisions based on health. • Perform careful studies of the economies, populations, and tax structures of existing nuclear communities compared to similar but non-nuclear communities. • Concern that Complex Transformation would devastate real estate values and businesses. • Stated that New Mexico dependence on nuclear industry is not entirely true. • Provide an analysis of economic impacts to businesses from a nuclear incident. • Socioeconomic scope must be broader and include more factors relating to regional socioeconomic characteristics. • Perform assessment of socioeconomic impacts to local	4, 327, 328, 376, 616, 747, 1125, 1208, 1209, 1210, 1217, 1218, 1224, 1125	Sections 4.2.9 for all sites, 5.x.9 for all sites

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	communities. • Provide information on how many jobs will be lost from consolidation to one site. • Consider benefits from direct and indirect jobs, taxes and payments in lieu of taxes (PILT). • Consider whether too much of the land in the community would be taken up by the project and not be available for other economic uses and whether the jobs created would be relatively few and unstable jobs done for the most part by contractors. • Overall socioeconomic impact to local communities should be included as an evaluation criterion for deciding on a specific site. • Realistic estimates of increased/decreased workforce, identification of support industries and businesses that would be added/reduced, as well as indirect impacts to county infrastructure should be included.		
LANL	Commentors provided specific comments on LANL socioeconomic resources. These included: • Stated that budgeted $155 billion will benefit New Mexico with jobs and status and economic development. Benefit would be marginal. • Stated that for the past 20 years NM has received more net federal spending per capita, much military, yet social, environmental, and economic well-being have declined. Complex Transformation claims the budgeted 155 billion dollar project will benefit NM with jobs and status and economic development. How will it be different from past funding? • Concern about the Santa Fe tourism industry.	10, 84, 146	Sections 5.1.9
NTS	Commentors were concerned about how the employment profile would be affected since weapons assembly and disassembly would be a new activity at NTS and given the stated need to reduce the nuclear stockpile and update stockpile weapons. It should be assumed that the workforce for NTS would come from Nye County.	1048, 1125, 215	Sections 4.3.9, 5.3.9

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
TTR	Commentors provided specific comments on TTR socioeconomic resources. These included: • Stated that the loss of 100-150 jobs will reduce resources and services in Tonopah and other Northern Nye and Esmeralda County communities. Commentor requests that the ROI take into account not only Tonopah but surrounding rural communities. • Expressed concern that closing TTR would significantly impact local community. Tonopah does not have the economic base to retain citizens within the community if jobs at TTR are lost. 50 percent of volunteers/organization members are County/State/TTR employees and 50 percent of the Tonopah Volunteer Fire Department is TTR employees. Mitigation measures should be presented for both adverse and beneficial impacts. • Consider that funds required to keep TTR operational are lower than facility upgrades at other sites. • Address impacts from continuation of operations at NTS and TTR using workforce primarily outside of Nye County; continuation and/or addition of operations using more workforce and resources from Nye County; and discontinuation or reduction of operations at NTS and TTR.	724, 793, 858, 1125, 1197, 1196, 1213	Sections 4.4.9, 5.4.9, 5.15.4.2
SNL	Commentor stated that for the past 20 years NM has received more net federal spending per capita, much military, yet social, environmental, and economic well-being have declined. Complex Transformation claims the budgeted 155 billion dollar project will benefit NM with jobs and status and economic development. How will it be different from past funding? Another commentor expressed concern about the tourism industry in Santa Fe.	84, 146	Sections 5.6.9
Pantex	Commentor stated that Pantex is a valuable economic asset for the region.	1212	Sections 4.5.9, 5.5.9
SRS	Commentors stated that SRS employees fill a variety of community service positions and that the CPC will employ over 2,500 people.	923, 924, 1209	Sections 4.8.9, 5.8.9
Y-12	Commentors supported the operations at Y-12 and stated that Y-12 has a tremendous economic impact on the region.	463, 940, 941, 917, 918, 1198	Section 4.9.9, 5.9.9
Environmental Justice			

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
Environmental Justice—General	Commentors provided comments on environmental justice resources that were general in nature. These included: • Stated that the poorest communities bear most impacts. • Studies to ensure the poor/minority/disabled populations aren't suffering the brunt of emissions must be included. • Environmental justice analysis for transportation routes and disposal areas, private and public, needs to be included. • Provide an EJ analysis in case pueblos have to be abandoned for all options including LANL. • Include analysis of impacts to young children and women; health impacts related to exposure to radiation and other contaminants generated during the proposed activities (i.e., cancer fatalities, non-cancer effects, non-fatal instances of cancer, and psychological impacts); health impacts from the entire life cycle (including transportation); and health impacts from pathways used by indigenous people.	Campaign 2, Campaign 8, 5, 76, 451, 536, 678, 715, 646, 653, 943, 1068, 1152, 1156, 1178, 1190, 1191, 1217	Sections 4.x.10 for all sites, 5.x.10 for all sites, 5.10
LANL	Commentors stated that operations at LANL are a major violation of environmental justice. New Mexico has the second highest minority population in the country and it is not possible that LANL activities would have no effect on these populations. Environmental justice issues in NM must be analyzed.	5, 260, 1056, 1221	Sections 4.1.10, 5.1.10
NTS	Commentors stated that the SPEIS should consider potential impacts on eastern Nevada, southern Nevada, western Utah, areas previously subject disproportionately to exposure to radiation from above and vented underground nuclear weapons tests.	302	Sections 4.3.9, 5.3.9
SNL	Commentors stated that DOE must analyze for the many environmental justice issues in NM.	5	Sections 4.6.9, 5.6.9
SRS	Commentor requested that an assessment of impacts from high levels of tritium in Savannah River to subsistence fishermen/women (i.e., especially those women who are pregnant and subsist on a diet primarily consisting of fish from the Savannah River) be included. Commentor also suggested that DOE consider adverse impacts to at-risk (minority or low-income) populations.	1209	Section 5.8.10
Health and Safety			

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
Health and Safety—General	Several commentors provided comments on health and safety that were general in nature. These included: • Concern about daily risks associated with operations. • Include the results of epidemiologic studies of radiation health of workers and communities, updating its Comprehensive Epidemiologic Resource program of the early 1990's. • Commentors expressed that the government should not consider the production of new nuclear weapons while we still are struggling to address past risks to the health of those living near or working in the weapons complex. • Suggested that cancer incidence published by the BEIR VII report for its cancer estimates since the report provides the most recent scientific assessment by the National Research Council. • Stated that nuclear weapons production poses a significant health hazard for workers and a human health risk assessment should be included in the SPEIS. • Requested that lethal dose of nuclear weapons in relation to human life be included. • Concern about increased incidence of cancer in surrounding communities due to increased exposure to radioactive materials from Complex Transformation. • Evaluate impacts to the worker, community, and environmental health from daily operations, emissions, and potential accidents associated with plutonium pit manufacturing. • Concern that the CPC would have similar or more detrimental effects on the environment and to surrounding communities than did Rocky Flats Plant. • Provide analysis of long-term environmental and public health effects of plutonium pit production.	Campaign 18, Campaign 20, 3, 4, 6, 31, 38, 39, 47, 96, 104, 111, 125, 129, 138, 145, 152, 153, 157, 190, 191, 203, 209, 210, 214, 268, 303, 324, 332, 337, 340, 344, 367, 386, 390, 395, 398, 405, 421, 422, 440, 460, 478, 504, 525, 541, 543, 557, 562, 564, 593, 571, 578, 594, 599, 611, 663, 668, 671, 673, 674, 675, 678, 684, 698, 715, 719, 743, 747, 751, 767, 777, 781, 789, 811, 812, 872, 877, 954, 1083, 1101, 1102, 1104, 1126, 1128, 1135, 1152, 1156, 1183, 1202, 1208, 1209, 1210, 1212, 1217, 1218, 1219, 1215, 1222, 1223	Sections 5.x.11 for all sites, Chapter 6, Appendix C
LANL	Commentors provided specific comments on LANL health and safety. These included: • Concern about health and safety issues at LANL. • Concern over elevated levels of americium in the northern foothills of Sangre de Cristo Mountains downwind from LANL. • Radioactive debris associated with uranium mining in NM	6, 209, 536, 538, 684, 777, 1216, 1218, 1221, 1223	Sections 4.1.7, 5.1, 5.1.11

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	continues to be a significant source of sickness and premature death. • LANL has a poor history of providing adequate health and safety to workers and the community. • Concern about increased incidence of cancer in surrounding communities due to increased exposure to radioactive materials from increased operations at LANL.		
LLNL	Commentor expressed concern about increased risk to public health as the population has grown significantly in the area surrounding the site. Commentor expressed concern about additional tritium activity.	27, 692	Sections 5.12, 5.13, 5.14
NTS	Commentors expressed concern for worker and the surrounding community's exposure to weapons assembly and disassembly activities and suggested that health implications for workers and the surrounding communities be addressed.	4, 215, 302, 587, 1048, 1213	Section 5.3.11
Pantex	Commentors requested that worker, community and environmental health impacts from daily CPC operations and emissions be evaluated and also to provide impacts to the Pantex region and nation if there were to be a nuclear detonation at Pantex. Commentors suggested that Pantex expansion needs to be conducted in a way that will not impair the health and safety of area residents or have adverse effects on the environment.	64, 184, 167, 330, 700, 884, 885, 1224	Section 5.5.11
SNL	Commentor requested that each facility be identified and a description of what levels will increase at each facility that will be involved in the new Complex Transformation and provide the risks to the public.	1217	Sections 5.13, 5.14, 5.16, 5.17
SRS	Commentor expressed concern that there is currently no monitoring of any radionuclide releases from SRS. Commentor suggested that a characterization study should be performed to account for the number of people who have been affected physically (health-wise) and who have died as a result of what is occurring at SRS.	1209	Sections 4.8.4, 4.8.5, 4.8.11
Transportation			
Transportation—General	Several commentors provided comments on transportation that were general in nature. These included: • Concern for the potential for release of materials during	Campaign 14, 4, 104, 153, 329, 376, 383, 451, 546, 571, 606, 672, 674, 861, 725, 754, 1044,	Sections 1.5.4.1, 5.x.13 for all sites, 5.10

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	transportation accidents that would threaten the environment and human health/safety. • Suggested that the transportation of plutonium should not occur until it is decided that it will not be moved again. • Consider transportation issues in/out of facilities and the need to bolster local security and emergency response capabilities. • Assess environmental and security risks associated with transportation of SNM as well as transport of nuclear bombs and bomb components. • Explain how ongoing transfers of SNM will not prejudice decisions yet to be made under the Complex Transformation SPEIS.	1188, 1209, 1210, 1220	
LANL	Commentors provided specific comments on LANL transportation. These included: Commentor suggested that quantities of hazardous materials shipped through the local airports be included.	1225	Section 5.1.12
LLNL	Impact analysis on traffic volumes and congestion of California highway system traffic analysis should be prepared.	945	Section 5.212
NTS	Commentors suggested considering the transportation of SNM and weapons into and out of NTS and its impacts to the surrounding region including Nevada highways and communities. Commentor suggested that the SPEIS assess cumulative impacts and risks to NV highways and communities from transportation of materials and wastes due to current NTS activities, the Yucca Mountain repository program, and Complex Transformation. Commentors suggested that rail transport of SNM at NTS offers security advantages over highway transport.	4, 173, 215, 302, 546, 587, 1048, 1213	Sections 5.3.13, 5.10
TTR	Commentor stated that transportation routes at TTR are well maintained due to the rural location, accidents are at a minimum.	534	4.4.12
Pantex	Given the proximity of the airport to Pantex, constant air traffic, and addition of more dangerous operations, the consequences of accidents should be evaluated.	167, Campaign 20, 884, 954, 789, 1224	Section 5.10

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
SNL	Commentors provided specific comments on SNL transportation. These included: • Several questions regarding how materials will be transported, how much will be transported, who will be notified, and can safety be guaranteed. • Provide information on how the production of more nuclear weapons will affect the storage dump at KAFB. • Stated that use of Interstate 3 for transport of nuclear materials is not acceptable and questioned if DOE has been a party to the proposal to build Interstate 3.	1210, 1217	Sections 5.8.12, 5.17
SRS	Commentor questioned whether there will be international traffic in nuclear materials through the Port of Savannah as part of Complex Transformation or other DOE programs.	1209	
Waste Management			

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
Waste Management—General	Several commentors provided comments on waste management that were general in nature. These included: • Concern about the storage location of the significant amount of waste generated from tritium production when the current storage sites remain radioactive and environmental threats. • SPEIS needs to include its current plans for disposing of radioactive waste and account for new research showing that synthetic zircons used to contain plutonium-rich materials are much less durable than previously thought. • Consider storing all waste on-site. • Clarify how plutonium storage, handling, production, destruction, or use is interchangeable in GNEP and Complex Transformation. • Include an analysis of the environmental and human health impacts and the costs of decommissioning, cleaning up, and waste disposal for all facilities which DOE proposes to construct, as well as existing facilities that will be demolished as a result of the proposal and how this is "economically sustainable." • Storage at Yucca Mountain needs to be addressed. • What are some of the specific factors related to disposal of hazardous wastes on- and off-site (volumes, types, how, where, impacts)? • A plan for long-term storage and mobilization should be developed.	Campaign 12, Campaign 20, 4, 5, 103, 104, 111, 153, 303, 376, 401, 428, 433, 450, 516, 525, 544, 552, 553, 578, 562, 570, 674, 684, 712, 735, 741, 789, 954, 1208, 1209, 1210, 1211, 1218, 1217, 1218, 1220, 1222, 1223, 1224,	Section 5.x.14 for all sites, 6.3.2
LANL	Commentors provided specific comments on LANL waste management. These included: • Resuming pit production will significantly contribute to existing risks associated with waste management (generation, disposal, and storage). • Concern for use of 'transportainers' as temporary vaults of fissile material at TA-55. • Comment on impacts from improper waste storage at LANL, including what would happen in event of a large fire or weather event.	Campaign 12, 5, 6, 67, 111, 260, 300, 324, 769, 781, 947, 1218, 1221, 1223	Sections 5.1.14

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	• Explain the effects caused by rejected pits to the waste stream. • The SPEIS must analyze for the impacts of LANL becoming the second transuranic waste disposal facility in NM. • Address how NNSA proposes to deal with the huge nuclear waste dump on the Pajarito Plateau. • Explain how NNSA intends to deal with the 12,500 drums of nuclear waste at Area G buried before 1971 that are currently contaminating the aquifer under LANL. • LANL has inadequate waste storage practices with waste stored in temporary areas i.e., tents in fire-prone areas.		
LLNL	Commentors expressed concern that the LLNL site has been environmentally contaminated for years and cleanup is far from over.	692, 1222	Section 5.2.14
NTS	Commentors questioned if the radioactive material from weapons assembly and disassembly would be disposed of or stored at NTS. Commentors suggested that the nature of management of SNM be described (where and how, what volume, and the radioactive inventories that could be anticipated) be incorporated into the document, and for the document to also evaluate to what extent NTS would be a consolidation site. Commentors also suggested that disposal of material associated with sub-critical testing be addressed.	4, 215, 302, 587, 1048	Section 5.3.14
Pantex	Commentors requested a discussion of emissions and waste streams generated; facilities needed; disposal options; and waste processing or storage at Pantex. Commentors also expressed concern about safety with regards to waste management at Pantex. Commentors stated that the proposed expanded operations would generate 25,000 cubic meters of TRU and WIPP only has space for 17,130 cubic meters, the excess would have to be left on-site, either in Area G or in the canyons that flow into the Rio Grande.	388, 330, 789, 1217, 1224	Sections 5.5.14, 10.5.5

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
SNL	Commentor expressed concern on the ability of the current Hazardous Waste Management Facility at SNL to handle the increased quantities of RCRA hazardous waste (up from ~53K kilos) and infrastructure related wastes (~175K kilos/yr) and questioned how the facilities will be decontaminated. Another commentor expressed concern for mixed waste dumps found on land planned for housing projects.	1216, 1217	Section 5.17
SRS	Commentors requested that DOE assess incremental impact of managing TRU, LLW, and HLW due to the siting of the project at SRS. Another commentor requested that the need for plutonium storage facilities apart from the current KAMS facility must be examined from an environmental, security, and cost perspective	572, 1188, 1209	Section 5.8.14
Y-12	Commentor suggested considering the disposition of the radioactive materials and how they will be staged, stored, or used in manufacturing at Y-12.	463, 1147, 1210	Section 5.9.14
Facility Accidents			
	Commentors provided comments regarding the analysis of facility accidents that were general in nature. Commentors were generally concerned about the danger of facility accidents. Other commentors suggested: • Including the basis for its estimates of the probabilities of accidents so that the public can comment upon the reasonableness of the estimates. • Including information on the ability of the nuclear weapons complex to respond to a problem with a deployed warhead. • For severe accident consequences (i.e., large fires involving plutonium or facility-wide plutonium spill) a part of the risk analysis between alternatives should be a comparison of the consequences, given that the event occurs. • Providing a reasonable scenario of an unanticipated event. • The SPEIS should include an estimate of the consequences to the present national nuclear posture in the case that a severe event (i.e., facility wide plutonium spill) would occur, and an	3, 4, 138, 562, 770, 1218, 1209	Sections 5.x.12 for all sites, Appendix C, Appendix H

Table D.2-2—Summary of Scoping Comments (continued)

Topic 15. Resources

Subtopic	Comment Summary	Documents	SPEIS Reference
	evaluation of whether the entire site would have to be abandoned or closed, or whether parts of operation could be continued in some locations, etc.		
LANL	Commentors provided specific comments on facility accidents at LANL and their concern regarding the occurrence of facility accidents at LANL. Some commentors suggested: • Provide a description of consequences of major spills at LANL or major fires in terms of cancer deaths. • Extending accident analysis radius to include impacts on Albuquerque for all alternatives including LANL. • Providing a detailed analysis of the consequences of severe plutonium releases on the Rio Grande, on the economy and society of nearby communities, of NM, and of states near NM for all alternatives including LANL. • Including an estimate of consequences to economy and society of NM in case of severe event for all alternatives including LANL.	3, 781, 1223	Sections 5.1.5, 5.1.9, 5.1.10, 5.1.11, 5.1.12, Appendix C

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
General Support for Complex Transformation	Commentors provided statements in support of the Complex Transformation proposal.	6, 73, 576, 580, 1209, 1218, 166, 171, 331, 305, 310, 311, 366, 416, 539, 545, 568, 576, 580, 759, 794, 775, 784, 960, 1208, 1209, 1218, 1222	Comment noted.
Support for the No Action Alternative	Commentor supports the No Action Alternative	1220	Comment noted.
Support for CNPC	Commentors provided statements in support of a CNPC as it would offer advantages in environmental impact, security, cost, shipping, waste management, and technical support.	73, 535, 539, 941	Comment noted.
Support for the Capability-Based and Reduced Operations Alternative	Commentors provided statements in support of the Capability-based and Reduced Operations alternative as it has significant advantages over DCE and CNPC alternatives, including no new facility construction, no increase in Pu production, reduction in # of sites with Category I/II SNM, reductions in production capacity at certain sites, and continued D&D.	460, 322	Comment noted.
Support for Siting at LANL	Commentors provided statement in support of siting at LANL because pit production would provide legitimacy for LANL.	6, 49	Comment noted.
Support for Siting at LLNL	Commentors provided statement in support of siting at LLNL because LLNL has the best combination of scientific capabilities and scientific staff in the United States and it has a long, thoroughly demonstrated track record of accomplishments that are second to none.	201, 1221, 1222	Comment noted.
Support for Siting at NTS	Commentor provided statements in support of consolidating SNM to fewer locations, nuclear storage, HE R&D, and hydrotesting at NTS.	44, 534, 576, 1213	Comment noted.
Support for Siting at Pantex	Commentor provided statements in support of keeping site plutonium functions where storage and handling capability already exists.	64, 202, 282, 493, 506, 884, 885, 1067, 1201, 1202, 1203, 1204, 1212, 1218	Comment noted.
Support for Siting at SRS	Commentor provided statements in support of siting at SRS. Nearly 90 percent of the land at SRS is open and free of the encroachment issues compared to other DOE sites and SRS has the established	36, 73, 199, 288, 290, 299, 304, 331, 364, 365, 366, 419, 420, 459, 523, 522, 523, 632, 657, 730, 755, 792, 912, 913, 914, 915, 916, 917, 918,	Comment noted.

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
	infrastructure to support operations of Complex Transformation.	919, 920, 921, 922, 923, 924, 926, 927, 928, 929, 930, 931, 932, 933, 934, 936, 948, 958, 959, 960, 961, 1055, 1208, 1209	
Support for Siting at Y-12	Commentors provided statements in support of siting Complex Transformation at Y-12 because Y-12 is acknowledged as America's center of uranium excellence.	Campaign 11, Campaign 13, 46, 90, 98, 199, 205, 206, 222, 223, 226, 261, 298, 416, 417, 518, 520, 521, 532, 547, 580, 628, 630, 640, 661, 706, 707, 709, 711, 713, 714, 733, 736, 739, 742, 759, 773, 775, 784, 788, 795, 856, 871, 873, 874, 875, 880, 881, 956, 786, 788, 969, 956, 1088, 1122, 1147, 1170, 1198, 1211	Comment noted.
Opposition to Complex Transformation	Commentors provided general statements in opposition to the Complex Transformation proposal.		Comment noted.
Campaign 3, Campaign 4, Campaign 6, Campaign 7 Campaign 8, Campaign 10, Campaign 15, Campaign 16, 1, 10, 11, 12, 13, 17, 21, 22, 23, 25, 50, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 67, 80, 94, 95, 157, 158, 159,160,161,162, 165, 168, 170, 172, 174,175,176, 177, 178,180, 179, 181, 182, 183, 185, 186, 187, 189, 190, 192, 193, 194, 195, 196, 197, 199, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 262, 278, 279, 280, 281 330, 536, 1048, 104, 63, 65, 66, 68, 74, 72, 69, 71, 75, 76, 216, 219, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 283, 284, 285, 286, 287, 291, 292, 332, 334, 335, 336, 337, 338, 340, 341, 346, 347, 349, 351, 352, 353, 354, 355, 356, 357, 359, 361, 368, 387, 390, 391, 392, 394, 395, 397, 400, 401, 402, 403, 406, 407, 409, 410, 411, 412, 413, 414, 421, 422, 427, 428, 430, 429, 431, 432, 433, 436, 437 , 440, 441, 442, 443, 445, 541, 542, 543, 544, 549, 550, 551, 553, 554, 555, 546, 140, 141, 142, 143, 144, 145, 293, 297, 300, 301, 306, 307, 308, 309, 312, 313, 315, 316, 317, 318, 319, 321, 323, 370, 371, 372, 373, 374, 375, 378, 379, 380, 381, 382, 383, 384, 446, 447, 448, 449, 450, 452, 453, 454, 455, 456, 457, 461, 462, , 1082467, 468, 469, 470, 471, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 492, 495, 496, 497, 498, 499, 500, 501, 502, 504, 585, 588, 589, 591, 592, 593, 572, 575, 577, 578, 579, 581, 582, 583, 584, 556, 557, 559, 560, 561, 562, 564, 565, 567, 569, 570, 594, 111, 113, 114 115, 116, 117, 118, 120, 596, 597, 598, 595, 598, 599. 600, 662, 664, 665, 666, 667, 668, 669, 670, 672, 673, 674, 675, 676, 846, 847, 848, 849, 850, 851, 852, 853, 855, 857, 860, 854, 677, 678, 679, 680, 681, 682, 683, 686, 687, 688, 689, 690, 691, 726, 725, 727, 729, 732, 734, 148, 149, 151, 152, 154, 153, 125, 129, 130, 137, 138, 139, 146, 147, 723, 738, 740, 743, 744, 746, 747, 748, 751, 752, 753, 754, 756, 758, 524, 525, 526, 527, 528, 529, 533, 535, 540, 508, 509, 510, 514, 515, 601, 602, 603, 604, 605, 606, 608, 609, 610, 611, 612, 613, 614, 615, 617, 618, 619, 620, 621, 622, 623, 625, 626, 629, 631, 633, 635, 636, 637, 638, 639, 642, 644, 645, 646, 647, 649, 651, 653, 656, 658, 659, 660, 876, 878, 888, 889, 891, 892, 893, 894, 906, 907, 897, 898, 899, 900, 901, 902, 903, 904, 905, 760, 762, 764, 765, 766, 767, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 966, 970, 971, 972, 975, 976, 977, 978, 979, 980, 951, 953, 955, 957, 963, 964, 1077, 1078, 1079, 1080, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 1081, 1085, 1086, 1090, 1091, 1093, 1096, 1097, 1098, 785, 787, 790, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 1105, 1106, 1107, 1109, 1110, 1112, 1113, 1114, 1115, 1116, 1117, 1119, 1120, 770, 771, 772, 777, 781, 782, 783, 1123, 1126, 1130, 1131, 1133, 1134, 1136, 1137, 1138, 1139, 1140, 1141, 1145, 1148, 1149, 1150, 1151, 1153, 1154, 1151, 1157, 1158, 1159, 1160, 1161, 1163, 1164, 1165, 1166, 1205, 1210, 1219, 937, 943, 944, 945, 947, 949, 950, 906,908, 909, 910, 911, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1041, 1041, 1043, 1045, 1046, 1047, 1049, 1050, 1052, 1053, 1054, 1056, 1057, 1059, 1060, 1061, 1064, 1065, 1068, 1069, 1070, 1071, 1167, 1168, 1169, 1171, 1172, 1173, 1175, 1176, 117, 1178, 1180, 1181, 1182, 1184, 1186, 1189, 1191, 1192, 1194, 1199 1212, 1211, 1213, 1224, 1217, 1220, 1219, 1215, 1221, 1216, 1222, 1223			

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
Opposition to Siting at LANL	Commentors provided statements in opposition to siting at LANL. Statements included general statement of opposition. Other commentors opposed because of: • Commentors support of increased cleanup. • LANL has had chronic safety and security issues and history of environmental contamination. • LANL's proximity to populated areas. • LANL's violations of the Clean Air Act. • Instances of contaminated groundwater and stormwater.	3, 6, 259, 260, 264, 590, 616, 624, 682, 777, 1128, 1218, 1220	Comment noted.
Opposition to Siting at LLNL	Commentors provided statements in opposition to siting at LLNL. Statements included general statement of opposition.	9, 26, 156, 164	Comment noted.
Opposition to Siting at NTS	Commentors provided statements in opposition to siting at NTS. Statements included general statement of opposition.	47, 155, 587	Comment noted.
Opposition to Siting at SRS	Commentors provided statements in opposition to siting at SRS. Statements included general statement of opposition. Other commentors opposed because: • SRS has poor soil characteristics. • SRS is located above a major aquifer and located near an important river system. • Commentor supports accelerated dismantlement activities of aging stockpile weapons. • SRS has relatively high earthquake risk.	405, 572, 1208, 1218	Comment noted.
Opposition to Siting at Pantex	Commentors stated that DOE should not include Pantex as a candidate site for consolidation, relocation, or elimination.	64, 169, 289, 494, 507, 757, 1051, 1224	Comment noted.
Opposition to Siting at SNL	Commentors stated that DOE should not include SNL as a candidate site for consolidation, relocation, or elimination.	512, 1215, 1216	Comment noted.

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
Opposition to Siting at Y-12	Commentors stated that DOE should not include Y-12 as a candidate site for consolidation, relocation, or elimination.	187, 342, 398, 607, 809, 1210, 942	Comment noted.
Divine Strake Environmental Assessment	Commentor submitted comments on the preparation of the Divine Strake Environmental Assessment being prepared at NTS.	263	The Divine Strake Environmental Assessment is a NEPA analysis being prepared independent of the Complex Transformation SPEIS.
Other Projects and Sites	Commentors provided comments on other projects or sites. Comments included: • Construction of a biological weapons complex. • National Bio and Agro Defenses- hydrodynamic testing in relation to the City of Tracy in California. • Issues at Yucca Mountain. • Cumulative and synergistic impacts of GNEP and Transformation on one community and environment should be incorporated into one single NEPA analysis.	29, 385, 735, 1219, 1220, 1223	Comments on other projects and sites are beyond the scope of this SPEIS. The GNEP PEIS addresses use of nuclear energy for the commercial generation of electricity. This SPEIS deals with the weapons complex as related to national security. Cumulative impacts are discussed in Chapter 6 of this SPEIS.
Moral and Ethical Issues	Commentors provided comments regarding general moral/ethical implications of the Complex Transformation proposal. Comments included: • The support of sustainable interactions among people and the Earth. • Request for the consideration of karmic forces when following through with the transformation. • Complex Transformation regresses in reasserting America's moral heritage and imperils the pursuit of "Life, Liberty, and the Pursuit of Happiness." • Lyrics to “What a Wonderful Life.” • Suggest teaching diversity and non-violence as alternatives to building nuclear weapons and promote peace.	Campaign 8, 9, 10, 11, 24, 40, 65, 66, 70, 76, 204, 218, 228, 268, 276, 317, 351, 390, 421, 429, 515, 544, 555, 582, 584, 595, 670, 672, 850, 854, 681, 690, 721, 734, 829, 796, 998, 1003, 1217, 1222, 1223	Comment noted.
Proliferation and Nonproliferation	Commentors submitted comments stating that Complex Transformation increases global proliferation of nuclear weapons and hinders	31, 18, 6, 5, 3, 741, 9, Campaign 18, 65, 67, 80, 81, 85,87, 88, 701, 91, 75, 153, 303, 315, 332, 338, 344, 348,	Comment noted.

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
	nonproliferation	349, 355, 356, 359, 361, 367, 387, 393, 401, 402, 404, 405, 406, 413, 424, 427, 433, 437, 439, 440, 441, 442, 443, 444, 525, 543, 549, 551, 554, 559, 560, 567, 586, 591, 593, 571, 577, 559, 111, 569, 663, 668, 669, 671, 673, 674, 675, 860, 686, 697, 701, 704, 705, 710, 715, 717, 718, 720, 725, 732, 738, 743, 747, 748, 751,760, 761, 762, 765, 767, 771, 781, 787, , 803, 812, 817, 824, 883, 962, 1104, 815, 1105, 1218, 1208, 1209, 1210, 1046, 1217, 1220, 1222, 1223	
Criticism of the Current Administration and Policy	Commentors submitted comments criticizing the current administration and demanding a change in nuclear weapons policy.	4, 263, 571, 1222	The change in nuclear weapons policy and the current administration is beyond the scope of this SPEIS.
International Relations/Policy	Commentors submitted comments suggesting the Complex Transformation would increase danger of war with foreign countries and impact relations with foreign countries.	Campaign 4, Campaign 6, Campaign 14, 69, 76, 104, 128, 135, 132, 149, 263, 413, 515, 564, 639, 671, 747, 781, 1104, 1117, 1134, 1144, 1045, 1152, 1175, 1212, 1217, 1220, 1223, 1215, 1217, 1218, 1219	Comments dealing with international policy and relations with foreign countries are beyond the scope of this SPEIS.
Nuclear Weapons	Commentors submitted comments regarding nuclear weapons and weapons of mass destruction. Commentor questioned what new threats would emerge that would require the production of new nuclear weapons. Other commentors provided suggestions regarding nuclear weapons. These comments suggested: • Addressing how NNSA is upholding its mission to reduce global danger of nuclear weapons by creating a new nuclear weapons production complex. • Considering the increased threat of other countries getting and using nuclear weapons as a	Campaign 14, 263, 460, 555, 735, 781, 861, 898, 952, 1135, 1188, 1218, 1223	Chapter 2

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
	direct result of our resuming nuclear weapons production. - Eliminating all tactical nuclear weapons that have the purpose of being used on the battlefield. - Committing to further reductions in the number of nuclear weapons.		
Nuclear Power	Commentors provided statements regarding nuclear power and skepticism of the consideration to expand nuclear energy. One commentor suggested that materials used for nuclear power not be used for the development of nuclear weapons. Commentors also suggested an alternative that researches non-nuclear, renewable energy.	Campaign 4, Campaign 6, 8, 77, 203, 214, 263, 310, 333, 386, 435, 555, 562, 570, 575, 699, 747, 851, 1208, 1209, 1215, 1218, 1219, 1220, 1222, 1223, 1224, 1225	This SPEIS deals with the weapons complex as related to national security not nuclear power.
War on Terror	Commentors submitted comments regarding what role U.S. nuclear weapons will have on the current war on terror. Commentors are concerned that the proposed project will invoke international fears of a U.S. first strike. Commentors also requested that DOE assess impacts of restarting a nuclear war.	4, 303, 735, 819, 838, 1218, 1219, 1223	Chapter 2, Chapter 3

Table D.2-2—Summary of Scoping Comments (continued)

Topic 16. General

Subtopic	Comment Summary	Documents	Response/SPEIS Reference
IAEA Inspections in the U.S.	Commentors stated that the U.S. should lead the way and be an example for other countries when dealing with nuclear weapons. One commentor questioned why the U.S. has not allowed IAEA weapons inspections; the consequences and benefits of allowing such inspections to take place; how such inspections by IAEA would support positive U.S. foreign relations; and who would benefit from the U.S. continuing to keep IAEA from inspecting the nuclear weapons arsenal.	1, 5, 16, 17, 68	Chapter 2

Appendix E
ADDITIONAL PROJECT DETAILS

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This appendix includes additional project details specific to project sites discussed in Chapter 4 of the Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS).

WATER CONTAMINATION ISSUES IN THE RIO GRANDE, FROM THE COLORADO BORDER TO THE MIDDLE-RIO GRANDE

SUMMARY

Public meetings held by the U.S. Department of Energy (DOE), National Nuclear Security Administration in 2006 identified public concerns regarding contamination of the Rio Grande. The Rio Grande has been a source for drinking water supply since the earliest settlements. Land practices in the upper and middle Rio Grande basins have contributed to contamination of soils, surface water and groundwater resources. Contaminant pathways into the Rio Grande and onto public lands are poorly understood and continue to be a focus of ongoing research. While contamination from DOE activities in the upper and middle Rio Grande basins has occurred, it has not caused exceedances of regulatory standards off DOE property.

Since the 1920s, the Federal government has intervened in the management of flows to assist in delivery of water to communities for drinking water supply, irrigation, industrial and agricultural uses. Communities in New Mexico traditionally utilize groundwater resources as community potable water sources. However, drought conditions and over-mining groundwater resources has prompted many to seek surface water resources to replace or augment their community drinking water source. The Rio Grande is the fifth largest river in North America. Its flows are sustained by surface water runoff and San Juan-Chama Project water. The San Juan-Chama Project, initiated in 1962 and managed by the U.S. Bureau of Reclamation, transfers water from the San Juan River basin in southern central Colorado to the Rio Grande basin in northern central New Mexico through a system of diversion structures and tunnels. Recent changes to San Juan-Chama Project agreements has enabled communities the opportunity to directly access San Juan-Chama water from the Rio Grande. Although several communities have expressed an interest in developing direct access to the San Juan-Chama water, three diversion projects are in various stages of development.

E.1 INTRODUCTION

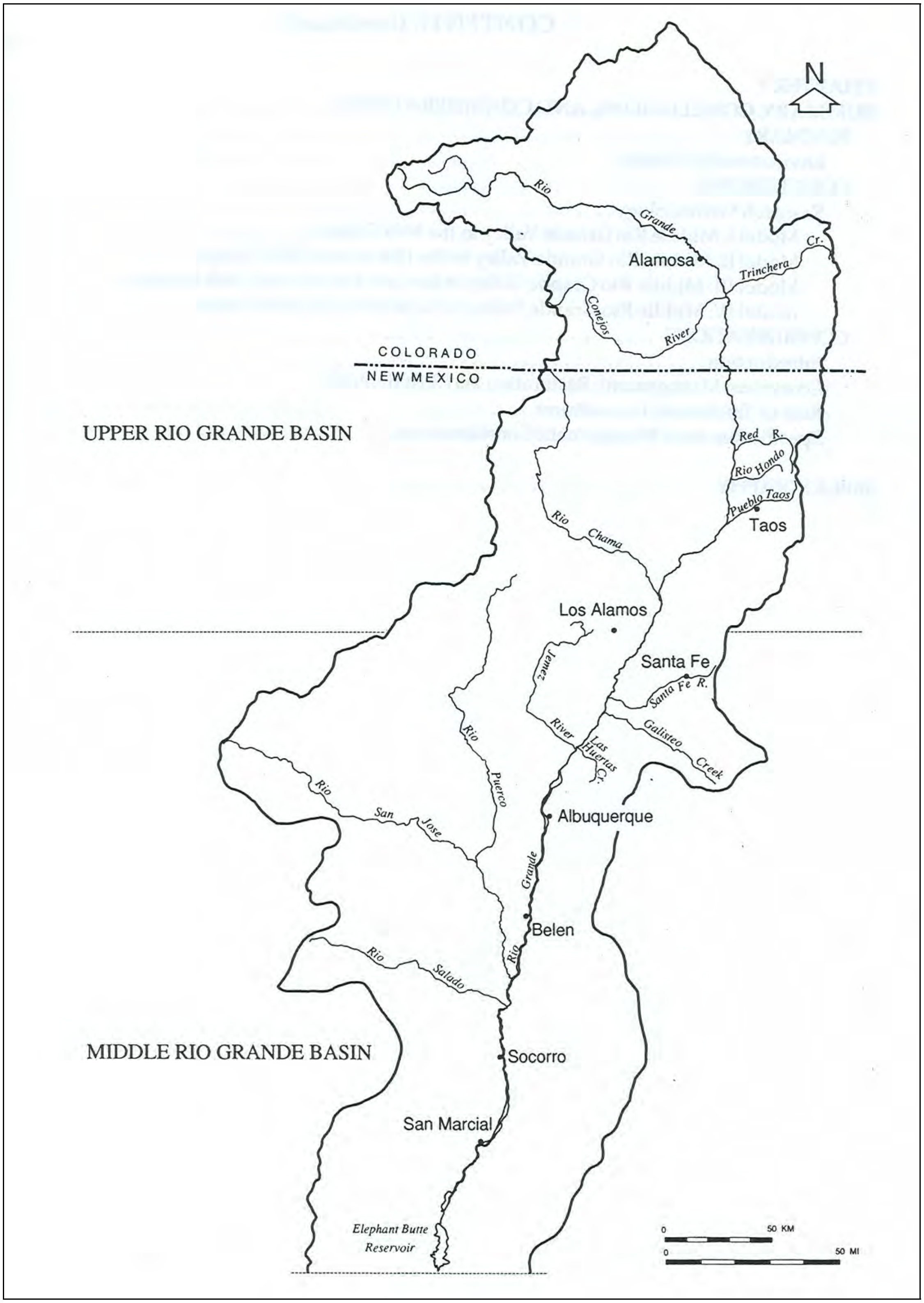
In 2006, the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) undertook an effort to analyze the environmental impacts of the continued transformation of the United States' nuclear weapons complex by implementing the NNSA's vision of the complex as it would exist in the future, otherwise known as Complex 2030 (71 FR 61731). Scoping meetings held for the Complex Transformation project in 2006 identified several areas of concern in New Mexico, one of them being concern over water issues. In this paper, water issues in northern New Mexico are examined based upon existing research conducted by various agencies and groups. No new studies were completed for this analysis.

This paper focuses upon the Rio Grande and its major tributaries in northern New Mexico, from the Colorado border to Albuquerque, in central New Mexico (Figure E.1-1). The Rio Grande is the fifth largest river in North America. It flows 1,885 miles from southern Colorado to extreme southern Texas, where the river empties into the Gulf of Mexico (USDA 1998). The discharge area of the Rio Grande in New Mexico is estimated at 27,760 square miles, with direct tributary drainage area of 24,760 square miles (USDA 1998). Rio Grande headwater elevations range from 8,000 to 12,000 feet and flatten to between 5,225 to 4,450 feet in the middle Rio Grande Valley, near Albuquerque (USDA 1998). For the purposes of this discussion, the tributaries in the upper and middle Rio Grande basins are Red River, Rio Hondo, Rio Pueblo de Taos, Rio Chama, Santa Fe River, Jemez River, and the Santa Fe River. Predominant communities along these tributaries are the Town of Taos, Cities of Española, Los Alamos, Santa Fe and Albuquerque, Pueblo of Taos, Ohkay Owingeh Pueblo (formerly San Juan Pueblo), Pojoaque Pueblo, Tesuque Pueblo, San Ildefonso Pueblo, Picuris Pueblo, Cochiti Pueblo, Santa Ana Pueblo, and Sandia Pueblo.

E.2 HISTORY OF ACTIVITIES

The Rio Grande has been a source of water for generations. At the time of first European contact, there were more than 50,000 Pueblos living in over 100 villages in the middle and upper basins of the Rio Grande (USDA 1998). Irrigation ditch agriculture was limited at this time, but intensified as larger populations settled the areas. Acequia systems took root as conveyors for drinking water, bathing, washing clothes, irrigation, and watering livestock (USDA 1998). As irrigation intensified, river flow in the Rio Grande was severely reduced or even halted. Reduced flows in the Rio Grande have been recorded since 1925.

In 1923, Federal legislation established conservancy districts to address surface water issues. These conservancies were tasked with regulating stream flow, developing or reclaiming sources of water, and generating electrical energy. In 1928, a plan to develop various water control measures was announced, which called for the construction of dams and diversions along the Rio Grande. From 1930 to 1934, six diversion dams, the El Vado dam and storage reservoir on the Chama River, 250 miles of main irrigation canals, 350 miles of drainage canals, and 190 miles of levees was completed (USDA 1998). Between 1935 and 1975, the Middle Rio Grande Conservancy District, the U.S. Army Corps of Engineers (ACOE) and the U.S. Bureau of Reclamation (BOR) constructed and presently manages six major dams on the upper and middle Rio Grande drainages to control floods, store water, and catch sediment (Table E.2-1).



Source: USDA 1998.

Figure E.1-1—Geographic Layout of Streams, Mountain Ranges and Communities Along the Rio Grande

Table E.2-1—Upper and Middle Rio Grande Dams and Reservoirs

Name	Stream	Year Completed
Flood Control- Water Storage		
El Vado	Chama	1936
Jemez Canyon	Jemez	1953
Abiquiu	Chama	1963
Heron	Willow	1963
Galisteo	Galisteo	1970
Cochiti	Rio Grande	1975
Irrigation Diversion- Rio Grande		
Cochiti		1936
Angostura		1936
Isleta		1936
San Acacia		1936

Source: USDA 1998.

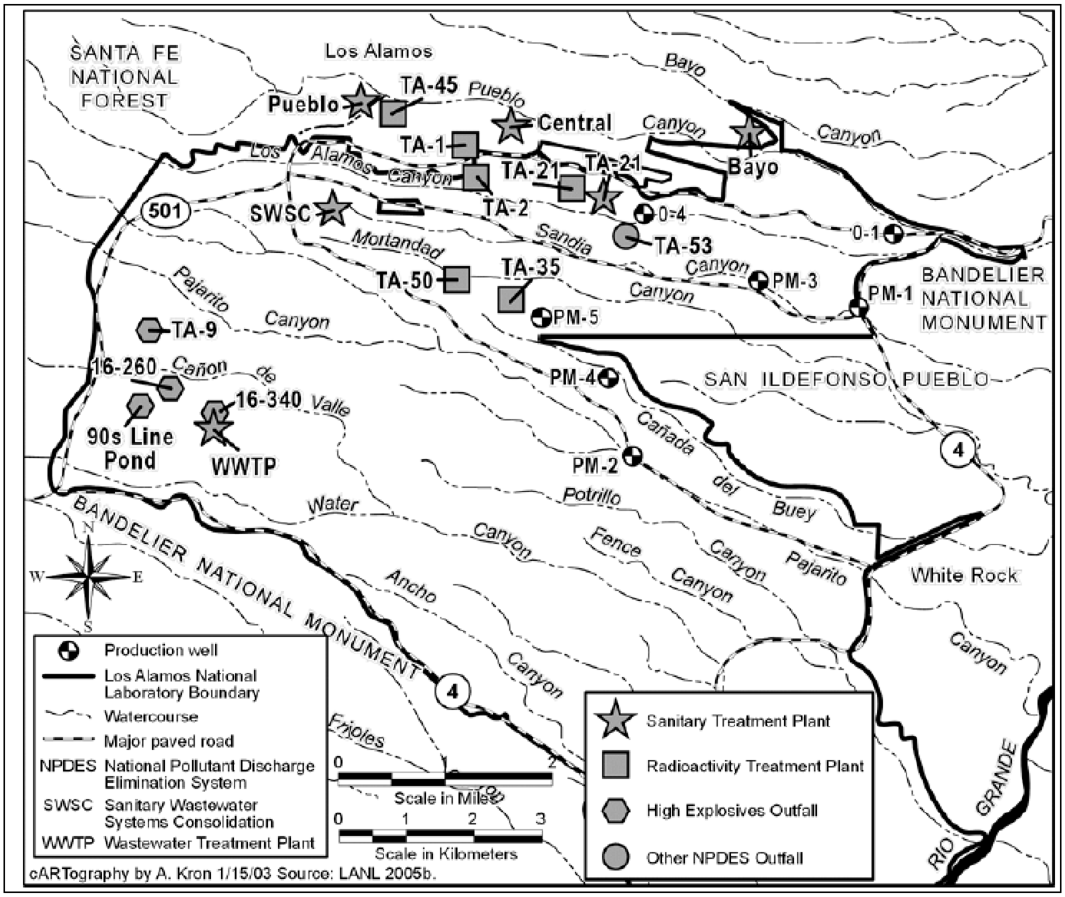
The San Juan-Chama project was initiated in 1962 (BOR 2006). The San Juan-Chama Project diverts water from the upper tributaries of the San Juan River, through the Continental Divide, and into the Rio Grande Basin. It consists of a two storage dams, two reservoirs, three diversion dams, six carriage facilities, five tunnels and the Azotea Creek and Willow Creek Conveyance Channels for transmountain movement of water, originating in Archuleta County in southern central Colorado and Rio Arriba County in northern central New Mexico (BOR 2006). The San Juan-Chama Project provides an average annual diversion of about 110,000 acre-feet of water (BOR 2006). The primary purposes of the San Juan-Chama Project are to furnish a water supply to the upper and middle Rio Grande valley for municipal, domestic, and industrial uses. The San Juan-Chama Project is also authorized to provide supplemental irrigation water and incidental recreation and fish and wildlife benefits. The BOR is the agency responsible for the San Juan-Chama Project.

E.3 LOS ALAMOS NATIONAL LABORATORY

Los Alamos National Laboratory (LANL) was established in 1943 with the mission to research and develop the world's first atomic bomb. The mission of LANL has continued to evolve as our Nation's needs change. Improvements in laboratory practices and establishment of environmental regulations fostered stewardship of the environment. LANL sits atop Pajarito Plateau in north central New Mexico, approximately 40 miles northwest of Santa Fe. The Pajarito Plateau consists of a series of east-west oriented mesas separated by deep canyons with perennial and intermittent streams. LANL is bounded on the west by the Jemez Mountains and on the east by the Rio Grande.

From 1943 to the present, operations at LANL have generated, treated, stored and disposed of solid wastes, hazardous wastes, and hazardous wastes mixed with radioactive wastes. Solid, hazardous, and radioactive waters were disposed of in numerous septic systems, surface impoundments, pits, trenches, shafts, landfills, waste piles, and other sites located throughout LANL. The types of hazardous and solid wastes that have been handled and disposed of include chlorinated and non-chlorinated solvents, high explosives, metals, polychlorinated biphenyls (PCBs), nitrates, and radionuclides (NMED 2005a). Over the last 50+ years, the wastes from LANL began to migrate down the complicated mesa-and-canyon geography, toward the Rio

Grande (Buske 2003). Past LANL activities have resulted in contamination of sediments both onsite and downstream, primarily transported by effluent discharges from LANL outfalls and stormwater runoff (LANL 2008). Figure E.3-1 shows the major liquid release sources at LANL. Current LANL operations are stringently controlled to minimize the amount of contamination introduced into the local canyons. LANL has 21 outfalls currently permitted which discharge into six local canyons. Five canyon that previously received LANL discharges are no longer receiving nay industrial effluent L Pueblo, Cañada del Buey, Guaje, Chaquehui, and Ancho Canyons. Total effluent discharges from LANL decreased by about 50 percent over the past five years (LANL 2008).



Source: LANL 2008.

Figure E.3-1—Major Liquid Release Sources at LANL

The Cerro Grande Wildfire in 2000 revealed how dramatically changing conditions can suddenly flush contaminants from LANL towards the Rio Grande. Springs on the flanks of the Sierra de los Valles supply base flow into upper reaches of some of the canyons (Guaje, Los Alamos, Pajarito, Cañon del Valle, and Water Canyons), but the amount is insufficient to maintain surface flow across the plateau before it is depleted by evaporation, transpiration, and infiltration. Runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year in some drainages (Purtymun 1995). Spring discharge in lower Pajarito and Ancho Canyons is of sufficient volume to support perennial flow into White Rock Canyon and the Rio Grande (Purtymun 1995). Table E.3-1 shows the surface water and sediment contamination attributable to LANL operations (LANL 2008). Other possible sources of surface water impacts are isolated spills, former photographic processing facilities, highway runoff, and residual Cerro Grande Fire ash (LANL 2008).

Table E.3-1—Surface Water and Sediment Contamination Attributed to LANL Operations

Contaminant	Onsite	Offsite	Significance	Trends
Radionuclides in sediments	Higher than background in sediments because of LANL contributions in Pueblo, DP, Los Alamos, Pajarito and Mortandad Canyons	Yes, in Los Alamos, Acid, and Pueblo Canyons; and slightly elevated in the Rio Grande and Cochiti Reservoir.	Sediments below health concern, except onsite along a short distance of Mortandad Canyon; exposure potential is limited.	Increased transport of contaminated sediments in Pueblo Canyon in response to post-fire flooding and increased urbanization.
Radionuclides in surface water	Higher than background in runoff in Pueblo, DP, Los Alamos, and Mortandad Canyons.	Yes, in Los Alamos and Pueblo Canyons.	Minimal exposure potential because storm events are sporadic. Mortandad Canyon surface water is 60 percent of Derived Concentration Guide.	Flows in Pueblo Canyon occurring more often after the Cerro Grande Fire. Flows in other LANL canyons recovered to near pre-fire levels.
Polychlorinated biphenyls in sediments	Detected in sediment in nearly every canyon.	Yes, particularly in Los Alamos and Pueblo Canyons.	Wildlife exposure potential in Sandia Canyon. Elsewhere, findings included LANL and non-LANL sources.	None
Polychlorinated biphenyls in surface water	Detected in Sandia Canyon runoff and base flow above New Mexico Water Quality Standards.	No.	Wildlife exposure potential in Sandia Canyon. Elsewhere, findings included LANL and non-LANL sources.	None
Dissolve copper in surface water	Detected in many canyons above New Mexico acute aquatics life standards.	Yes, in Los Alamos Canyon.	Origins uncertain; probably multiple sources.	None
High explosive residues and Barium in surface water	Detections near or above screening values in Cañon de Valle base flow and runoff.	No.	Minimal potential for exposure,	None
Benzo(a)pyrene	Detections near or above industrial screening levels in Los Alamos Canyon.	Yes, in Los Alamos and Acid Canyons.	Origins uncertain; probably multiple sources.	None

Source: LANL 2008.

Three zones of groundwater occur on the Pajarito Plateau: (1) perched alluvial groundwater in canyon bottoms, (2) zones of intermediate depth perched groundwater whose location is controlled by availability of recharge and by subsurface changes in permeability; and (3) the regional aquifer beneath Pajarito Plateau (LANL 2008). Alluvial water is groundwater that occurs in canyon-floor sediments. Perched intermediate groundwater is water that has moved downward from the surface and becomes trapped above tight geologic formations, such as basalts and clay-rich rocks. The regional groundwater is the deep reliable source of drinking water for residents of Los Alamos, Española, Santa Fe and neighboring Pueblos. The regional aquifer discharges to springs along the Rio Grande. The knowledge base of recharge, discharge, and how waterborne contaminants interact with and move through geology into perched water zone and the regional aquifer below LANL is growing. Models are being improved based upon updated data for groundwater and surface water from LANL and NMED (LANL 2008).

Perched water bodies are important elements of the hydrogeology of LANL for several reasons. There is a probability that the zones can intercept contaminants that are being transported downward through the vadose zone. The perched water can be a permanent or long-term residence for contaminants because the chemical makeup of the geology may result in adsorption. Perched water can also serve as a place where dilution occurs lowering the concentration of contaminants. There is a possibility that perched zones may be intersected by streams in the lower parts of the canyons, resulting in lateral flow under the influence of gravity out of the canyon walls into the aquifer, and subsequently the Rio Grande (LANL 2008). Little contamination reaches the deep regional aquifer because it is separated from the perched groundwater by hundreds of feet of dry rock (LANL 2008). Results of groundwater monitoring show the presence of LANL-produced contamination, above water quality standards, in the alluvial groundwater and in some perched intermediate groundwater in Mortandad, Los Alamos, Cañon del Valle DP and possibly Pueblo Canyons (LANL 2006). Groundwater in Mortandad Canyon area is contaminated with tritium, perchlorate, chloride, and nitrate at levels below drinking water standards (NMED 2005b).

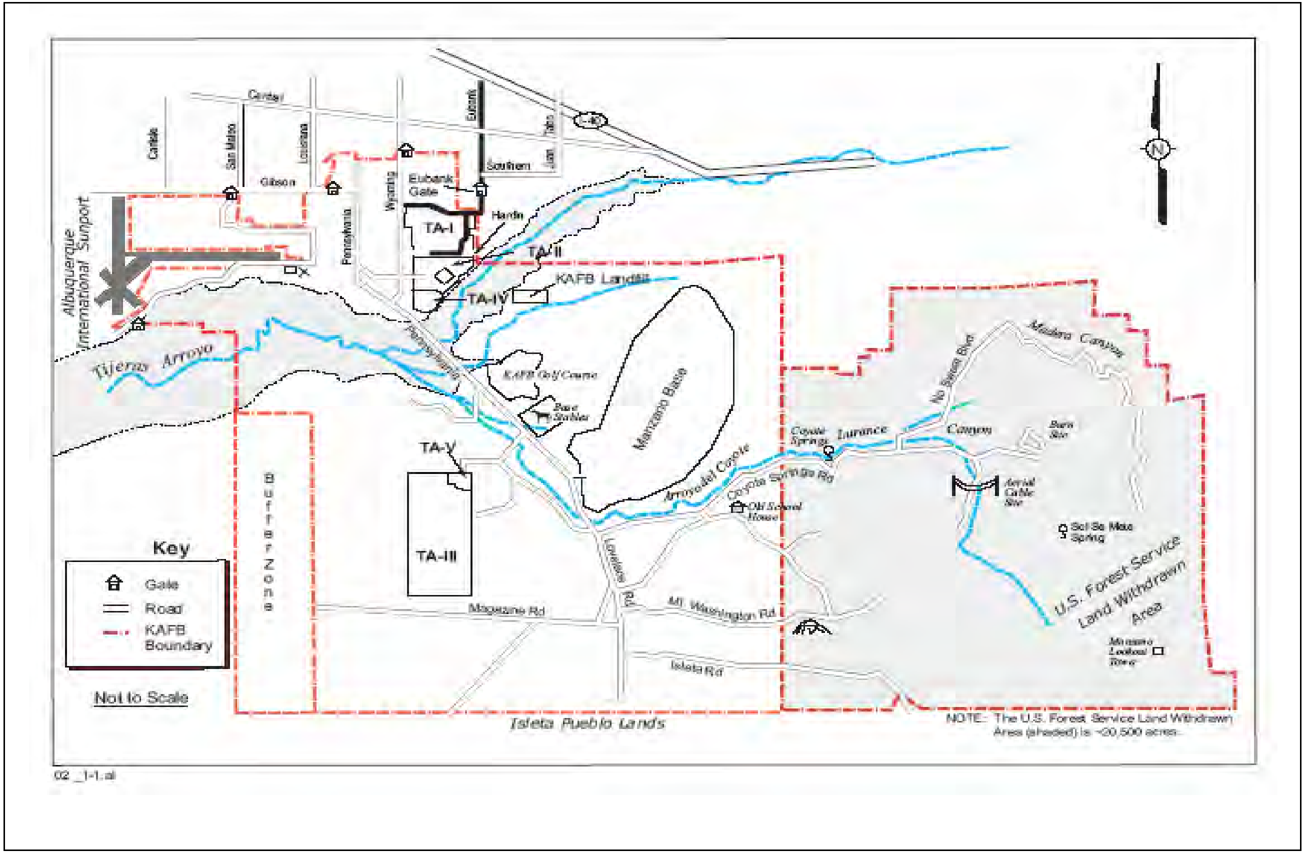
A separate study, conducted by George Rice for Concerned Citizens for Nuclear Safety (CCNS), found that contamination from LANL is likely to reach the Rio Grande (Rice 2004). Citing data from NMED and LANL, Rice models groundwater transport from LANL to the Rio Grande. He concluded that although the travel time of contaminants varies, it is possible for contaminants from LANL to reach the Rio Grande in 61 years or less (Rice 2004).

Further groundwater studies conducted jointly by The RadioActivitst Campaign (TRAC) and the CCNS indicated that radioactive waste has migrated from LANL via groundwater pathways to springs seeping into the Rio Grande, albeit at levels far too low to be considered a public health concern (Buske 2003). Low levels of radioactive cesium-137 (Cs-137) from LANL have been detected in groundwater seeping into Pajarito Stream, which flows into the Rio Grande (Buske 2003). This is the first report of radioactivity entering the Rio Grande directly connected with LANL activities. Additional analysis is necessary to adequately characterize and identify the pathway and extent of contamination.

E.4 SANDIA NATIONAL LABORATORY

Sandia National Laboratory (SNL) is located on Kirtland Air Force Base (KAFB) in Albuquerque, New Mexico, along the eastern portion of the Sandia Mountains in the southeast quadrant of the city. SNL began in 1945 as a part of the Manhattan Project, which produced the world’s first nuclear weapon (SNL/NM 2006). SNL’s enduring mission is to provide science and engineering support for the nuclear weapons stockpile (SNL/NM 2006).

SNL is situated at the base of the Sandia Mountains. The Sandia Mountains form a 13-mile long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons. Tijeras Canyon divides the Sandia Mountains to the north from the Manzanita Mountains to the south. Sediments transported from the canyons and draws of these mountains have formed coalescing alluvial fans, called bajadas. These bajadas slope west across KAFB and are dissected by the Tijeras Arroyo, smaller arroyos and washes. Tijeras Arroyo traverses across SNL in a southwestern direction, and discharges to the Rio Grande approximately 8 miles west of the KAFB boundary (Figure E.4-1). The major surface drainages at SNL are Tijeras Arroyo and Arroyo del Coyote. With the exception of two short sections of channel with intermittent flow (spring fed), these drainages flow only during storm events. Tijeras Arroyo is the only substantial outlet for surface water exiting KAFB. Arroyo del Coyote joins Tijeras Arroyo approximately 2 miles up stream where Tijeras Arroyo leaves KAFB, northwest of the KAFB Golf Course.



Source: SNL/NM 2006.

Figure E.4-1—Map of SNL

E.4.1 Surface Water Monitoring

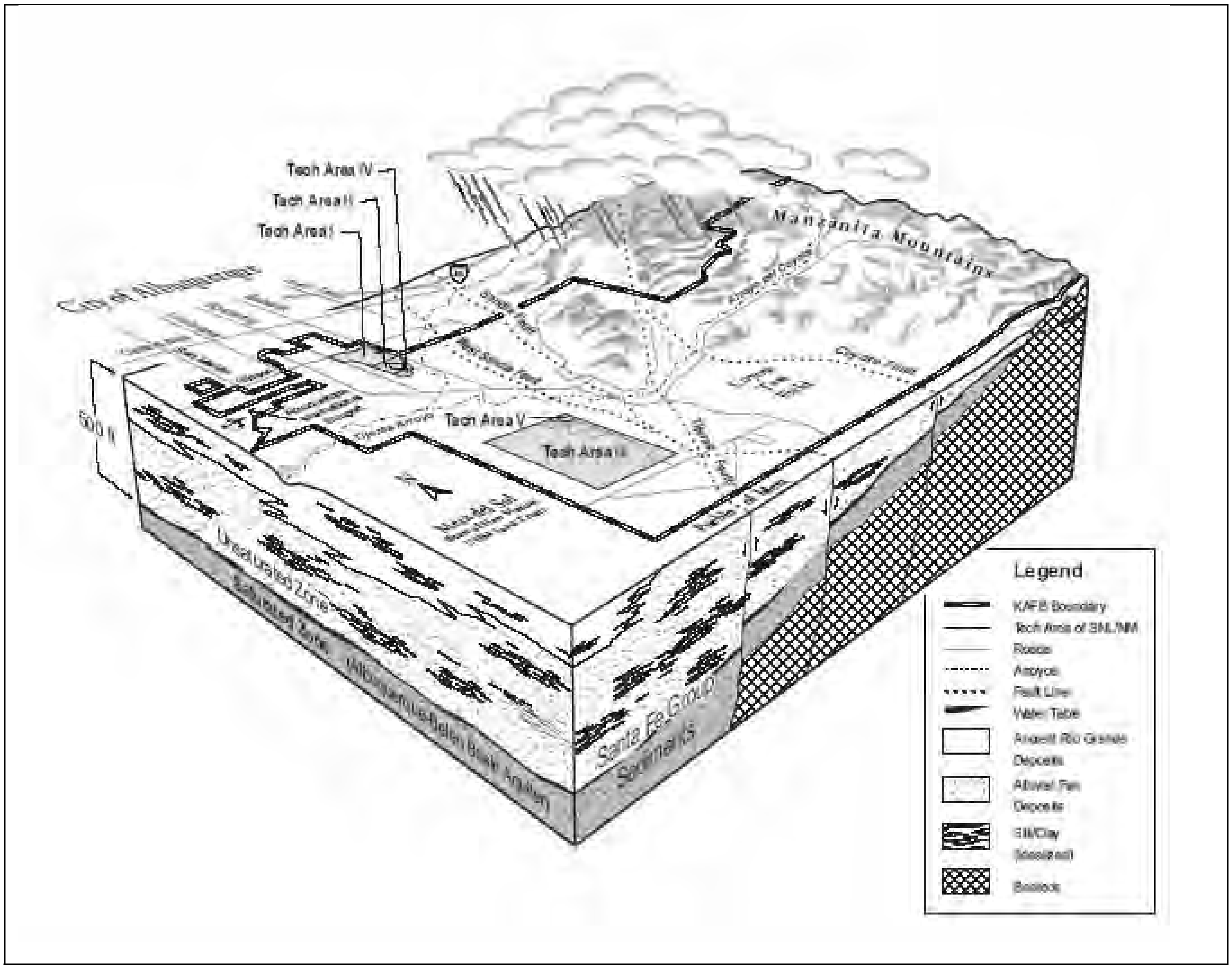
The surface water system on KAFB is a reflection of the dry high-desert climate of the area. Surface water flows through several major and many minor unnamed arroyos, primarily during summer monsoon events. With the exception of flow from two springs, there are no perennial streams or other surface water bodies at KAFB. Several unnamed arroyos and drainages to the south of Arroyo del Coyote dissipate as the topographic relief decreases to the west. Storm water in this area either evaporates or infiltrates into the soil. Therefore, there is no hydrologic surface connection from these areas to Tijeras Arroyo or the Rio Grande.

Surface discharges are releases of water and water based compounds made to roads, open areas or impoundments. Surface discharges are only made with the approval of the Internal Surface Discharge Program. Proposed discharges are evaluated for potential contaminants and concentration levels to determine if the discharge complies with strict water quality guidelines for surface releases. Uncontaminated water discharges must also be approved since large volumes of water discharged in areas of prior contamination could increase infiltration rates and move contaminants deeper into the soil column.

E.4.2 Groundwater Monitoring

Water resources at SNL are characterized through an extensive network of wells and monitoring stations. The network supports an active environmental monitoring program covering groundwater, surface water and air. The Groundwater Protection Program (GWPP) and the Environmental Restoration (ER) Project collect groundwater data at SNL. Both programs coordinate to monitor wells throughout SNL. The GWPP establishes baseline water quality and groundwater flow information, determines if any impact from SNL operations is affecting groundwater quality, and maintains compliance with local, state, and federal regulations. The ER Project conducts groundwater monitoring in six project areas: Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG, formerly Sandia North) Investigation, Canyons Area, and Drain and Septic Systems (DSS).

The groundwater beneath the western portion of KAFB is part of an interconnected series of water-bearing geologic units within the Albuquerque Basin that form the Albuquerque-Belen aquifer (Figure E.4-2.). Groundwater beneath the eastern portion of KAFB occurs in limited quantities in fractured bedrock. Over 170 wells are used to monitor and supply water to KAFB and the surrounding areas of the City of Albuquerque. The ER project has detected chromium concentrations exceeding EPA maximum containment level values. However, these exceedances correlate with nickel results and may be attributed to corrosion of Type 304 stainless steel well screens (SNL/NM 2007). The stainless steel corrosion product is in a particulate form, and as such, is unlikely to migrate into groundwater. Although water levels may fluctuate over the course of the year in response to seasonal recharge and groundwater withdrawal, the overall level of the regional aquifer within the basin continues to decline at about one foot per year (SNL/NM 2006).



Source: DOE 1999.

Figure E.4-2—Conceptual Diagram of Groundwater Systems Underlying KAFB

In 2006, the GWPP reported the detection of trace amounts of VOCs, elevated nonmetal inorganic compounds, and levels of beryllium and uranium above the MCL[1], and elevated gross alpha (SNL/NM 2007). None of the VOCs exceeded MCL standards. VOCs are attributed to laboratory cross-contamination or residual disinfection products. Elevated concentrations of non-metal inorganic compounds (e.g., chloride, sulfate, fluoride, etc.) are attributable to natural sources in the local area (SNL/NM 2007). At all locations except one perchlorate was detected at concentrations above the detection limit. However, perchlorate was detected at 1.26 milligrams per liter and 1.08 milligrams per liter (SNL/NM 2007). No MCL or MAC are established for perchlorate. In 2006, metals were detected below the MCLs and MACs at all locations except Coyote Springs and EOD Hill. Beryllium detected at Coyote Springs appears to be of natural origin and consistent with previous analysis (SNL/NM 2007). Uranium was detected above the MCL at EOD Hill. Mercury was not detected in any of the groundwater

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[1] The U.S. EPA regulates drinking water constituents by setting a maximum contaminant levels (MCLs). The New Mexico Water Quality Control Commission (NMWQCC) regulates drinking water constituents by establishing maximum allowable concentrations (MACs).

samples. Additionally, analysis for radionuclide activity, when uncorrected, shows values above the MCL. However, removing the natural sources from the analysis, results in radioactivity levels below the MCLs. Exceedances for uranium and corrected gross alpha were detected above the recently established MCL at EOD Hill (SNL/NM 2007). Corrected gross alpha accounts for natural uranium levels in the surrounding environment. Wells with elevated uranium are located east of the Tijeras fault complex, where groundwater contacts bedrock material that contains minerals naturally high in uranium (SNL/NM 2007). Radium-226 was detected above the MCL for combined radium-226 and -228 (SNL/NM 2007).

The groundwater beneath the SNL and adjacent areas is the source of drinking water for SNL, KAFB, adjacent portions of the City of Albuquerque, and the Pueblo of Isleta. Groundwater quality can be influenced by the presence of contaminants in the soil column above the groundwater, as well as the groundwater itself. These influences are of major concern to the ER Project, which is investigating the nature and extent of groundwater contamination from past activities. All known groundwater contamination is the result of past activities that occurred before the enactment of environmental regulatory laws. The ER Project monitors sites of known or potential groundwater contamination. Measurements of indicate that some contaminants exceed regulatory limits (Table E.4-1). Investigations or remediation of these sites is on-going. The following discussion on groundwater contaminants is based on 2005 monitoring and assessment data (SNL/NM 2006).

Past surface water sampling results from 1998 and 1999 analysis have shown a presence of metals such as zinc, magnesium, and iron elevated above the benchmark values. No unusual characteristics were observed in 2001, 2002, and 2003. No monitoring was required in 2000. Monitoring results in 2004 identified elevated levels of total suspended solids (TSS) and magnesium. Albuquerque’s semiarid climate with sparse vegetative cover and high erosion rates naturally produce high TSS levels. SNL has reduced TSS levels in developed areas through best management practices, such as retention and detention ponds, landscaping conducive to infiltration and lining of storm drain channels for erosion reduction. All monitoring points show elevated levels of magnesium even though they are separated by several miles and collect runoff from several different drainages. The presence of zinc, magnesium and iron may be due to natural conditions associated with rocks and soils derived from the igneous/metamorphic complex of the Manzanita Mountains.

Table E.4-1—ER Project Groundwater Monitoring Results from Calendar Year 2006

Sample	Concentration	Period
Beryllium MCL = 0.004 mg/L	0.00805 mg/L	February/March 2006
Radium 226 MCL (226 + 228) = 5 pCi/L	8.24 pCi/L	February/March 2006
Fluoride MCL + 4.0 mg/L MAC = 1.6 mg/L	1.64 mg/L	February/March 2006
	1.61 mg/L	February/March 2006
	2.67 mg/L	February/March 2006
	2.66 mg/L	February/March 2006
	1.62 mg/L	February/March 2006
	1.82 mg/L	February/March 2006
	3.57 mg/l	August 2005
Uranium MCL = 0.30 mg/L	22.1 pCi/L	August 2005
Chromium MCL = 0.1 mg/l	0.219/0.232 mg/L+	April 2006
	0.208/0.197 mg/L+ (dup)	April 2006
	0.133/0.169 mg/L+	April 2006
Trichloroethene (TCE) MCL = 5 µg/L	15.3 µg/L	November/December 2005
	15.8 µg/L	January/February/March 2006
	14.9 µg/L	May 2006
	12.9 µg/L	August/ September 2006
	5.37 µg/L	May 2006
	5.81 µg/L (dup)	November/December 2005
	6.34 µg/L	August/September 2006
	5.07 µg/L	October/ November 2005
	7.61 µg/L	October/ November 2005
	7.85 µg/L	January/ February 2006
	6.73 µg/L	April/ May 2006
	7.87 µg/L	July/August 2006
Nitrate (as Nitrogen) MCL = 10 mg/L	10.6 mg/L	November/ December 2005
	13.3 mg/L	January/February/ March 2006
	13.0 mg/L	August/ September 2006
	12.0 mg/L	May 2006
	25.2 mg/L	October/ November 2005
	25.2 mg/L	January/ February 2006
	25.5 mg/L	April/ May 2006
	24.9 mg/L (dup)	April/ May 2006
	28.8 mg/L	July/ August 2006
	10.2 mg/L	January/ February 2006
	10.2 mg/ L (dup)	January/ February 2006
	10.1 mg/L	January February 2006
	25.4 mg/L	October/ November 2005
	26.1 mg/L	January/ February 2006
	25.2 mg/L	April/ May 2006
	17.4 mg/L	July/August 2006
	28.0 mg/L	October/ November 2005
	29.0 mg/L	January/ February 2006
	28.9 mg/L	April/ May 2006
	27.5 mg/L	July/ August 2006

Table E.4-1—ER Project Groundwater Monitoring Results from Calendar Year 2006 (continued)

Sample	Concentration	Period
Nitrate (as Nitrogen) MCL = 10 mg/L	20.6 mg/L (dup)	July/August 2006
	23.9 mg/L	March 2006
	24.1 mg/L (dup)	March 2006
	32.6 mg/L	June 2006
	29.5 mg/L (dup)	June 2006
	30.4 mg/L	September 2006
Gross Alpha Corrected [a] MCL = 15 pCi/L	21.6 pCi/L	February/ March 2006
Gross Alpha Uncorrected MCL = 15 pCi/L	15.7 ± 1.92 pCi/L	August 2006
	37.8 ± 11.1 pCi/L	June 2006
	34.0 ± 10.6 pCi/L	June 2006

Source: SNL/NM 2007.
[a]Corrected gross alpha accounts for natural uranium levels in the surrounding environment.
dup = duplicate sample
MAC = maximum allowable concentration
MCL = maximum contaminant level
mg/L = milligrams per liter
pCi/L = picocuries per liter
µg/L = micrograms per liter

Studies by the New Mexico Bureau of Mines and Mineral Resources and the USGS have concluded that the volume of water-producing zone within the Albuquerque Aquifer is much less than earlier studies had estimated (NMMMR 1992; USGS 1993, 1995). USGS estimated the aquifer is being depleted at a rate that is twice that of the recharge to the aquifer from the Rio Grande and other sources (USGS 1995). As a result, the reliance on the regional Albuquerque Aquifer as the sole drinking water source for the City, including SNL and KAFB facilities, is unsustainable.

E.5 COMMUNITIES ALONG THE RIO GRANDE

Most communities use groundwater for drinking water sources. Predominant communities along the upper and middle Rio Grande basins are the Town of Taos, Cities of Española, Los Alamos, Santa Fe and Albuquerque, Pueblo of Taos, Ohkay Owingeh Pueblo (formerly San Juan Pueblo), Pojoaque Pueblo, Tesuque Pueblo, San Ildefonso Pueblo, Picuris Pueblo, Cochiti Pueblo, Santa Ana Pueblo, and Sandia Pueblo. Surface water contamination issues are of particular importance to area Pueblos, as many use local surface water sources for sacred and traditional ceremonies, including immersion in and ingestion of untreated surface waters.

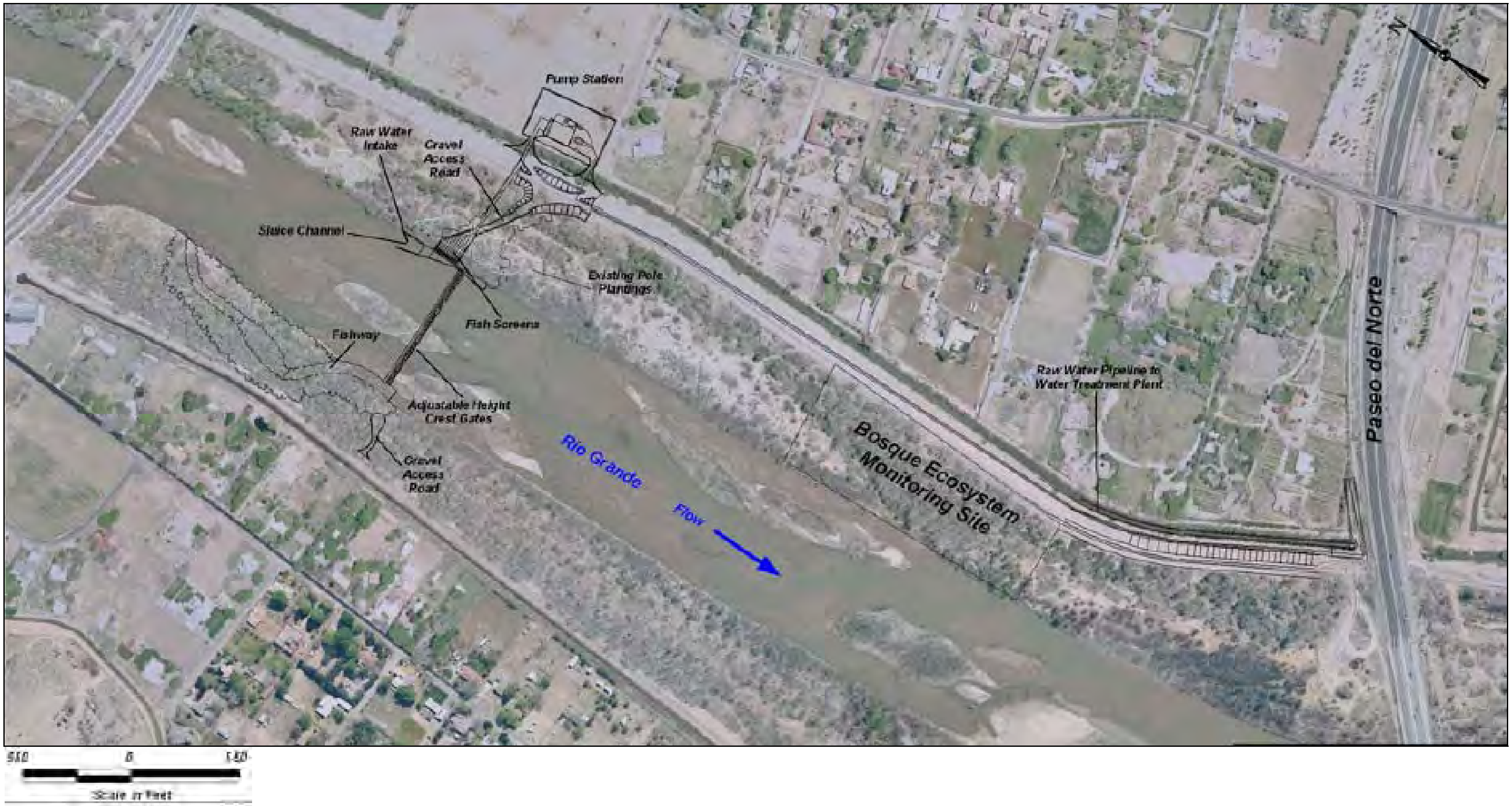
Recent challenges to drinking water resources, such as drought conditions, ground subsidence, and contamination issues, are forcing communities to seek alternative sources to replace or augment their present drinking water sources. In 2006, the BOR converted the original water service contracts for the San Juan-Chama Project, enabling individual communities to access directly their allotments of San Juan-Chama water (OSE 2006). Seven communities in the upper and middle Rio Grande basins have expressed an interest in direct access to San Juan-Chama water delivered by the Rio Grande: the City of Santa Fe, City of Española, Town of Taos, Santa Fe County, Los Alamos County, Village of Los Lunas, and the Village of Taos Ski Valley. At this time, none of the Pueblos have expressed an interest in pursuing similar projects. The City of Albuquerque and the USFS, on behalf of the City of Santa Fe, Santa Fe County, and Las Campanas Limited Liability Corporation (Las Campanas), are pursuing diversions on the Rio Grande to access San Juan-Chama surface water for community drinking water. Each project is described below.

E.5.1 City of Albuquerque Drinking Water Supply Project (CABQ and USBR 2004)

With the implementation of the San Juan-Chama Drinking Water Project, the City of Albuquerque projects the need for pumping groundwater would be substantially reduced to approximately 730,000 acre-feet per year by 2060 (CABQ and USBR 2004). For the 2006-2040 period, the USGS projects the overall annual aquifer recovery to range between 187,000 acre-feet per year to 242,000 acre-feet per year with the implementation of water conservation programs and the San Juan-Chama Drinking Water Project (USGS 2004). The San Juan-Chama, Drinking Water Project is projected to supply approximately 70-percent of the City of Albuquerque's future water use (CABQ 2008).

Several projects are necessary to complete the infrastructure requirement for the Drinking Water Supply Project. These projects, collectively referred to as the San Juan-Chama Drinking Water Project, are proposed to reduce the dependency on groundwater resources (CABQ 2005). The San Juan-Chama Drinking Water Project consists of four elements: diverting surface water from the Rio Grande; transporting the raw water to a new water treatment plant; treating the raw water to drinking water standards; and distributing the treated, potable water to the community. The construction of a diversion to utilize about 97,000 acre-feet per year of San Juan-Chama and Rio Grande surface water is in progress- scheduled for completion in 2007. Figure E.5-1 shows the diversion structure. The North I-25 Industrial Recycling and Northside Non-Potable Surface Water Reclamation Projects have been completed. The Southside Water Reclamation Plant is designed to provide safe use of surface water directly for municipal water supply and is scheduled to be completed in 2008.

With the implementation of the San Juan-Chama Drinking Water Project, the City of Albuquerque projects the need for pumping groundwater would be substantially reduced to approximately 730,000 acre-feet per year by 2060 (CABQ and USBR 2004), which would reduce aquifer drawdown from 3-5 feet per yr to 1-3 feet per year (Stomp 2006). For the period 1994 to 2020, the USGS projects the overall annual aquifer withdrawal for the City to range between 98,700 acre-feet per year to 177,000 acre-feet per year (32,178.37 – 57,705.89 million gallons per year) (USGS 1995). Implementation of the San Juan-Chama Drinking Water Project is projected to supply approximately 70-percent of the City of Albuquerque's future water use (CABQ 1997).



Source: CABQ and USBR 2004.

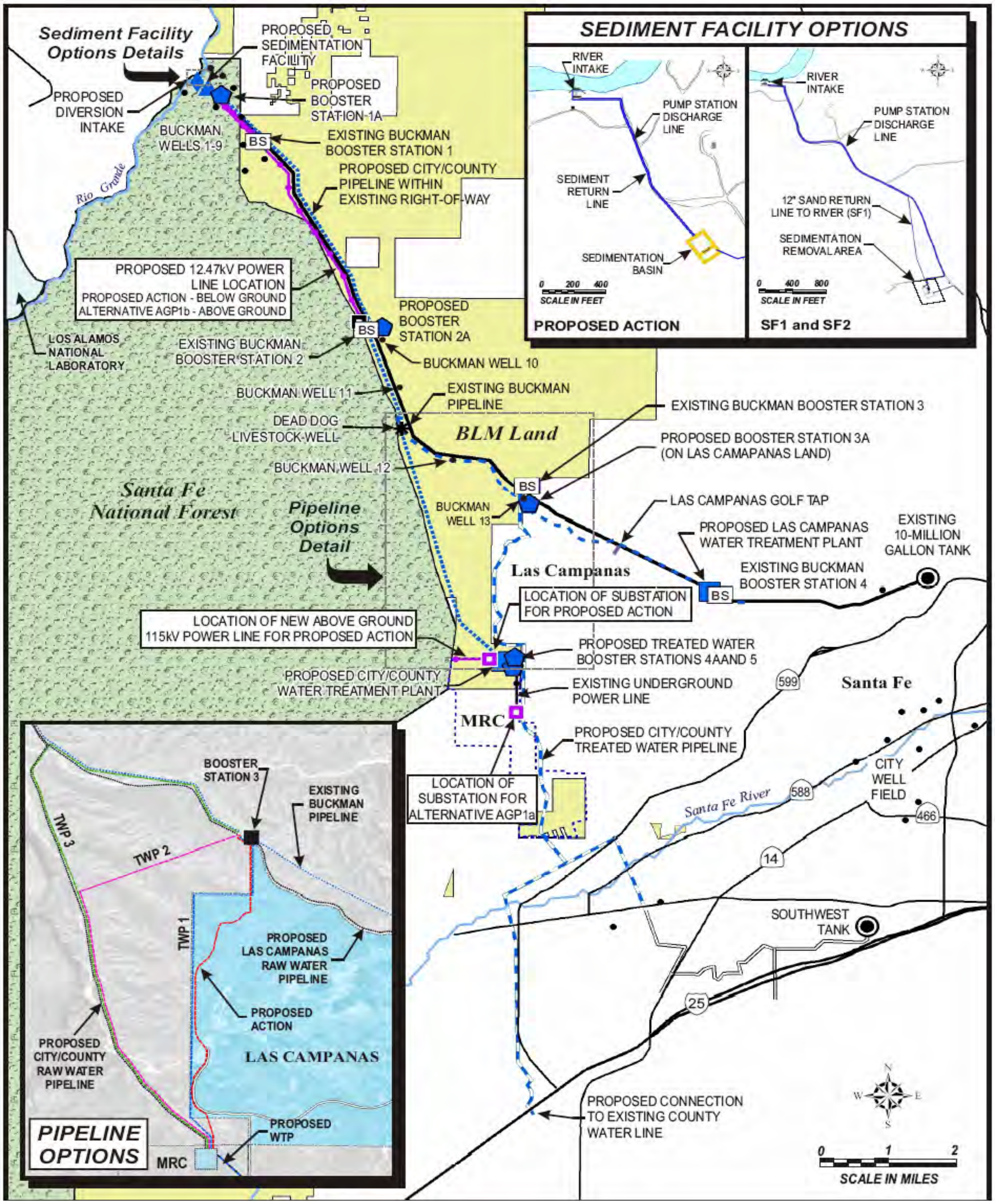
Figure E.5-1—Map of Paseo del Norte Diversion Structure for the CABQ Drinking Water Supply Project

E.5.2 U.S. Forest Service Buckman Water Diversion Project (USFS 2004)

As demonstrated by drought conditions in 1996, 2000, and 2002, continuing water shortages in the City of Santa Fe and Santa Fe County resulted in a critical and immediate need for water. Presently, the City and County utilize groundwater resources from the Buckman Well Field for community drinking water sources. However, the well field cannot provide a reliable and sustainable source of water. Well yields have been reduced; hydraulic heads in the confined ground water aquifer near the well field have undergone substantial declines; and depletions of nearby streams could cause limitations to pumping. At current well production levels, undesirable consequences to ground water levels and continued depletion of nearby streams are expected to occur unless an alternate reliable water supply is found. In addition to ground water concerns, storage levels in the City's two surface water reservoirs located on the Santa Fe River, a tributary of the Rio Grande, fluctuate widely depending on seasonal and annual runoff conditions and potable water demand. These reservoirs receive surface water runoff from the Santa Fe Canyon watershed above the City. Overall Santa Fe River reservoir capacities cannot provide the necessary dependability to provide the water quantities needed to sustain the Santa Fe region during drought conditions.

The proposed Buckman Water Diversion Project (Buckman Project) is designed to address the immediate need for a sustainable means of accessing water supplies for the applicants, the City of Santa Fe, New Mexico (City), Santa Fe County (County), and Las Campanas Limited Partnership (Las Campanas). Most of the water to be diverted would be derived from the San Juan-Chama Project, which is a U.S. Bureau of Reclamation (Reclamation) inter-basin water transfer project that supplies water from the greater Colorado River basin to the Rio Grande basin through a tunnel system. The remainder would be native water rights owned by the parties and diverted from the Rio Grande. The proposed point of diversion is located on the east bank of the Rio Grande in northern New Mexico, about 15 miles northwest of the City of Santa Fe. It is located about 3 miles downstream from where Route 4 crosses the Rio Grande at the Otowi Bridge, which is where streamflow data have been recorded by the U.S. Geological Survey (USGS) for more than a century. In addition to the diversion, the project would involve treatment and conveyance of water through pipelines that would generally follow roads and existing utility corridors.

The facilities necessary to implement the Buckman Project include a diversion structure on the eastern bank of the Rio Grande, sediment separation facilities, booster stations, storage and treatment facilities, water conveyance pipelines, Buckman Road improvements, and power upgrades. The locations of facilities associated with the Proposed Action and other alternatives are illustrated on Figure 7. Two new water treatment plants would be required, where the raw water would be processed to safe drinking water standards. The Las Campanas treatment plant would be located on Las Campanas land and operated by Las Campanas. The City and County treatment plant would be located on U.S. Bureau of Land Management land leased to the City, just west of Caja del Rio Road. New treated water pipelines would be installed from the treatment plants to convey water into the existing Las Campanas and City and County water distribution systems.



Source: USFS 2004.

Figure E.5-2—Map of Proposed Buckman Water Diversion Project

Estimated water diversion quantities are based on annual demand projections that extend to the year 2010 for the City and County, while the demand for Las Campanas is projected through community build out (1,717 homes). These projections translate to approximately 8,730 acre-feet per year, currently estimated to be 5,230 acre-feet per year for the City; 1,700 acre-feet per year for the County; and 1,800 ac-ft per yr for Las Campanas. The proposed diversion facility is sized for a combined net peak diversion of approximately 28.2 cubic feet per second, which meets the combined peak needs of the City, County, and Las Campanas.

The USFS is coordinating with Federal and state agencies to address environmental concerns. The final environmental impact statement will be released in 2007. Upon release, the public will be given an opportunity to provide comments on the document.

E.5.3 City of Española Drinking Water Project (BOR and CE 2002)

The City of Española is facing tremendous challenges in its ability to provide potable water with good groundwater resources in sufficient quantities to meet even basic demand requirements of the local communities. Since 1986, the City has been forced to abandon seven of the thirteen groundwater production wells, due to either contamination or well failure. The contaminants include solvents, fluoride, and nitrates wither naturally occurring or from on-site wastewater disposal systems (e.g., septic systems) located throughout the Española Valley. The City of Española is exploring alternative water resources, including surface water diversion of San Juan-Chama water from the Rio Grande. The City of Española is working with the BOR to develop a project description. Engineering planning documents are being developed to facilitate the discussion of a diversion as a viable solution to the drinking water source challenges facing the City of Española.

E.6 CONCLUSION

Contaminant pathways into the Rio Grande and onto public lands are still being studied and are poorly understood due to the complex geohydrology of northern New Mexico. Area studies and LANL have confirmed that radioactive and toxic wastes of LANL origin have reached the Rio Grande. While contamination from DOE activities has occurred, it has not caused exceedances of regulatory standards off-site. Both LANL and SNL have contamination from legacy wastes created during the Cold War era, prior to modern environmental laws and regulations. Contamination of surface water and groundwater has been documented at LANL and SNL. The results from ongoing environmental monitoring programs at LANL and SNL were consistent with historical measurements and did not exceed Federal or state standards.

Communities and Pueblos in the upper and middle Rio Grande basins traditionally use groundwater sources for community drinking water. Many Pueblos use surface waters for traditional and ceremonial uses. The three largest communities in the upper and middle Rio Grande basins are seeking alternative drinking water supply resources. Presently, they all utilize groundwater aquifers and the primary drinking water source. Challenges from drought conditions, contaminants (naturally occurring and human-caused), and land subsidence, has heightened the need for communities to provide a sustainable water supply. The City of Albuquerque has initiated construction on diversion structure and the necessary infrastructure to facilitate the use of surface water from the Rio Grande. The City of Albuquerque will use 48,200 acre-feet per year of San Juan-Chama water and approximately 47,000 acre-feet per year of native Rio Grande surface water. After the San Juan-Cham water is fully consumed, the native Rio Grande water, approximately 47,000 acre-feet per year, would be returned to the Rio Grande. The USFS is completing the environmental impact statement for the proposed Buckman Project, which would supply 3,500 acre-feet per year of surface water from the Rio Grande to the City of Santa Fe, Santa Fe County and Las Campanas subdivision in Santa Fe County. The USFS is expected to issue the final environmental impact statement in 2007. The City of Española has expressed an interest in developing a surface water diversion on the Rio Grande and is presently developing preliminary planning documents to further explore this option.

References specific to Appendix E

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Appendix F
PROJECT NOTICES

Appendix F
PROJECT NOTICES

This appendix includes project notices in relation to, or used as reference materials, in the preparation of the *Complex Transformation*[1] *Supplemental Programmatic Environmental Impact Statement*. These notices are not intended to be an all-inclusive list. Chapter 12 of this SPEIS provides an all-inclusive list of the references used to prepare this EIS.

The following are included as part of this appendix:

- *Notice of Intent to Prepare a Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement - Complex 2030*
- *Notice of Intent to Prepare a Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement - Complex 2030 (Correction)*
- *Change in Scoping Meeting Schedule for the Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement - Complex 2030*
- *Notice of Availability and Public Hearings for the* Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement
- *Extension of Comment Period for the* Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement

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[1] In the Notice of Intent (71 FR 61731, October 19, 2006), this vision was referred to as “Complex 2030” and the supplement was called the “Complex 2030 SPEIS”. NNSA thinks that the term “Complex Transformation” more accurately reflects the vision and has renamed the supplement as the “Complex Transformation SPEIS”.

DEPARTMENT OF ENERGY

Notice of Intent To Prepare a Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement—Complex 2030

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Notice of intent.

SUMMARY: The National Nuclear Security Administration (NNSA), an agency within the U.S. Department of Energy (DOE or Department), announces its intent to prepare a *Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement—Complex 2030* (Complex 2030 SEIS or SEIS, DOE/EIS–0236–S4), pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality's (CEQ's) and DOE's regulations implementing NEPA (40 CFR parts 1500–1508 and 10 CFR part 1021, respectively). The SEIS will analyze the environmental impacts from the continued transformation of the United States' nuclear weapons complex by implementing NNSA's vision of the complex as it would exist in 2030, which the Department refers to as Complex 2030, as well as alternatives. Since the end of the Cold War, there continue to be significant changes in the requirements for the nation's nuclear arsenal, including reductions in the number of nuclear weapons. To fulfill its responsibilities for certifying the safety and reliability of nuclear weapons without underground testing, DOE proposed and implemented the Stockpile Stewardship and Management (SSM) Program in the 1990s. Stockpile Stewardship includes activities required to maintain a high level of confidence in the safety and reliability of nuclear weapons in the absence of underground testing, and in the capability of the United States to resume nuclear testing if directed by the President. Stockpile Management activities include dismantlement, maintenance, evaluation, repair, and replacement of weapons and their components in the existing stockpile.

NNSA's proposed action is to continue currently planned modernization activities and select a site for a consolidated plutonium center for long-term research and development, surveillance, and pit[1] manufacturing; consolidate special nuclear materials throughout the complex; consolidate, relocate, or eliminate duplicative facilities and programs and improve operating efficiencies; identify one or more sites for conducting NNSA flight test operations; and accelerate nuclear weapons dismantlement activities. This Notice of Intent (NOI), the initial step in the NEPA process, informs the public of NNSA's intention to prepare the Complex 2030 SEIS, announces the schedule for public scoping meetings, and solicits public input. Following the scoping period, NNSA will prepare and issue a draft of the Complex 2030 SEIS that will describe the Complex 2030 proposal, the alternatives analyzed, and potential impacts of the proposal and the alternatives.

This NOI also announces that NNSA has cancelled the previously planned *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (DOE/EIS–0236–S2).

DATES: NNSA invites comments on the scope of the Complex 2030 SEIS. The public scoping period starts with the publication of this NOI in the **Federal Register** and will continue through January 17, 2006. Scoping comments received after this date will be considered to the extent practicable. NNSA will hold public scoping meetings to discuss issues and receive oral and written comments on the scope of the Complex 2030 SEIS. The locations, dates, and times for these public scoping meetings are listed below and will be announced by additional appropriate means. NNSA requests federal agencies that desire to be designated as cooperating agencies on the SEIS to contact NNSA's Office of Transformation at the address listed under **ADDRESSES** by the end of the scoping period.

North Augusta, South Carolina, North Augusta Community Center, 495 Brookside Avenue. November 9, 2006, 11 a.m.—3 p.m., 6 p.m.—10 p.m.
Oak Ridge, Tennessee, Oak Ridge City Center Club Room, 333 Main Street. November 13, 2006, 11 a.m.—3 p.m., 6 p.m.—10 p.m.
Amarillo, Texas, Amarillo Globe-News Center, Education Room, 401 S. Buchanan. November 15, 2006, 11 a.m.—3 p.m., 6 p.m.—10 p.m.
Las Vegas, Nevada, Cashman Center, 850 Las Vegas Boulevard North (at Washington). November 28, 2006. 11 a.m.—3 p.m., 6 p.m.—10 p.m.
Tonopah, Nevada, Tonopah Convention Center, 301 Brougher Avenue. November 29, 2006, 6 p.m.—10 p.m.
Socorro, New Mexico, Macey Center (at New Mexico Tech), 801 Leroy Place. December 4, 2006, 6 p.m.—10 p.m.
Albuquerque, New Mexico, Albuquerque Convention Center, 401 2nd St. NW. December 5, 2006, 11 a.m.—3 p.m., 6 p.m.—10 p.m.
Los Alamos, New Mexico, Mesa Public Library, 2400 Central Avenue. December 6, 2006, 10:30 a.m.—2:30 p.m.
Santa Fe, New Mexico, Genoveva Chavez Community Center, 3221 Rodeo Road. December 6, 2006, 6 p.m.—10 p.m.
Livermore, California, Robert Livermore Community Center, 4444 East Avenue. December 12, 2006, 11 a.m.—3 p.m.
Tracy, California, Tracy Community Center, 950 East Street. December 12, 2006, 6 p.m.—10 p.m.
U.S. Department of Energy, 1000 Independence Avenue, SW., Room 1E–245, Washington, DC. December 14, 2006, 1 p.m.—5 p.m.

NNSA officials will be available to informally discuss the Complex 2030 proposal during the first hour. Following this, NNSA intends to hold a plenary session at each scoping meeting in which officials will explain the Complex 2030 proposal and the SEIS, including preliminary alternatives. The meetings will provide the public with an opportunity to provide oral and written comments to NNSA on the scope of the SEIS. Input from the scoping meetings will assist NNSA in preparing the draft SEIS.

ADDRESSES: General questions concerning the NOI can be asked by calling toll-free 1–800–832–0885 (ext. 63519), e-mailing to *Complex2030@nnsa.doe.gov*, or writing to Theodore A. Wyka, Complex 2030 SEIS Document Manager, Office of Transformation, U.S. Department of Energy, NA–10.1, 1000 Independence Avenue, SW., Washington, DC 20585. Written comments on the scope of the SEIS or requests to be placed on the document distribution list can be sent to the Complex 2030 SEIS Document Manager. Additional information regarding Complex 2030 is available on Complex2030PEIS.com.

For general information on the DOE NEPA process, please contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–4600 or 1–800–472–2756. Additional information regarding DOE NEPA activities and access to many DOE NEPA documents are available on the Internet through the DOE NEPA Web site at *http://www.eh.doe.gov/nepa.*

SUPPLEMENTARY INFORMATION:

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[1] A pit is the central core of a nuclear weapon typically containing plutonium-239 that undergoes fission when compressed by high explosives.

Background: The early days of the nuclear weapons complex after World War II saw a rapid build-up of capability and capacity to support the growth of the stockpile to fight the Cold War. By the 1960s, the United States had built a large stockpile of nuclear weapons, and the nation began to focus on improving, rather than expanding, the stockpile. NNSA's predecessor agencies began to consolidate operations and close some production facilities. In the 1980s, facilities were shut down across the nuclear weapons complex, including certain facilities at the Savannah River Site in South Carolina; the Oak Ridge Reservation in Tennessee; the Rocky Flats Plant in Colorado; the Fernald Site in Ohio; the Hanford Reservation in Washington; and elsewhere.

Prior DOE NEPA Reviews: DOE completed a Nuclear Weapons Complex Reconfiguration (''Complex-21'') Study in January 1991, which identified significant cost savings that could be achieved by further downsizing of the nuclear weapons complex.

DOE then initiated a programmatic EIS (Reconfiguration PEIS) examining alternatives for reconfiguring the nuclear weapons complex. However, in December 1991, the Department decided to separate proposals for transforming non-nuclear production from the Reconfiguration PEIS because (1) proposals to consolidate non-nuclear facilities might not require preparation of an EIS, and (2) proposals and decisions regarding transformation of non-nuclear production would neither significantly affect nor be affected by proposals and decisions regarding transformation of nuclear production. On January 27, 1992, the Department issued an NOI (57 FR 3046) to prepare an environmental assessment (DOE/EA–0792) for the consolidation of non-nuclear production activities within the nuclear weapons complex. Following the collapse of the Soviet Union, the United States reduced the budget for the nuclear weapons program. President George H. W. Bush imposed a moratorium in 1992 on underground nuclear testing.

On September 14, 1993, DOE published a Finding of No Significant Impact (FONSI) regarding its proposal to consolidate non-nuclear component production (58 FR 48043). This proposal included termination of non-nuclear production missions at the Mound Plant in Ohio, the Pinellas Plant in Florida, and the Rocky Flats Plant in Colorado. The electrical and mechanical manufacturing functions were consolidated at the Kansas City Plant. Detonators and beryllium capabilities for technology and pit support were consolidated at Los Alamos National Laboratory (LANL) in New Mexico, and neutron generator production was relocated to Sandia National Laboratories in New Mexico.

In October 1993, President William J. Clinton issued Presidential Decision Directive 15 (PDD–15), which directed DOE to establish the Stockpile Stewardship Program. PDD–15 significantly redirected the nuclear weapons program. Throughout the Cold War, the Department of Defense (DOD) and DOE's nuclear weapons laboratories had based a portion of their confidence in the reliability of nuclear weapons on performance data from atmospheric and underground tests. To ensure weapons reliability during the moratorium on testing, DOE proposed to invest in new scientific tools to assess the complex phenomena involved in the detonation of nuclear weapons. DOE also began to develop sophisticated tools and computer-based simulation techniques to assess various aging phenomena as nuclear weapons continued to serve well beyond their originally anticipated lifetimes. These actions enhanced research and development (R&D) and deferred spending on the production complex.

DOE concluded in October 1994 that the alternatives described in the Reconfiguration PEIS no longer contained realistic proposals for reconfiguration of the nuclear weapons complex. That conclusion was based on several factors, including: comments offered at the September-October 1993 Reconfiguration PEIS scoping meetings; the anticipation that no production of new nuclear weapons types would be required for the foreseeable future; budget constraints; and the Department's decision to prepare a separate PEIS on Storage and Disposition of Weapons-Usable Fissile Materials (DOE/EIS–0229; NOI published June 21, 1994, 59 FR 17344).

Consequently, the Department separated the Reconfiguration PEIS into two new PEISs: (1) A Tritium Supply and Recycling PEIS (DOE/EIS–0161); and (2) the SSM PEIS (DOE/EIS–0236). The Final PEIS for Tritium Supply and Recycling was issued on October 27, 1995 (60 FR 55021). In its Record of Decision (ROD) on May 14, 1999 (64 FR 26369[2]), DOE decided it would produce the tritium needed to maintain the nuclear arsenal at commercial light water reactors owned and operated by the Tennessee Valley Authority and extract tritium at a new DOE-owned Tritium Extraction Facility at the Savannah River Site. With regard to the SSM PEIS, DOE issued an NOI on June 6, 1995 (60 FR 31291), a final SSM PEIS on November 19, 1996 (61 FR 58871), and a ROD on December 26, 1996 (61 FR 68014) announcing its decision to transform the weapons production complex by (1) reducing the weapon assembly capacity located at the Pantex Plant in Texas; (2) reducing the high-explosives fabrication capacity at Pantex; (3) reducing the uranium, secondary, and case fabrication capacity in the Y–12 National Security Complex in Tennessee; (4) reducing nonnuclear component fabrication capacity at the Kansas City Plant; and (5) reestablishing a modest interim pit fabrication capability at Los Alamos National Laboratory in New Mexico while evaluating the need for greater pit manufacturing capacity in the future.

In accordance with the decisions in the SSM PEIS, the *Non-nuclear Consolidation Environmental Assessment* (EA), and the Tritium Supply and Recycling PEIS, DOE began transforming the nuclear weapons complex to its present configuration. DOE has also prepared other EISs that facilitated the transformation of the complex. The relevant RODs for these site-wide and project-specific EISs are listed below:

- 1996 ROD for the *EIS for the Nevada Test Site and Off-Site Locations in the State of Nevada* (61 FR 65551, December 13, 1996).
- 1997 ROD for the *EIS for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (62 FR 3880, January 27, 1997).
- 1999 ROD for the Site-wide EIS for Continued Operation of the Los Alamos National Laboratory (64 FR 50797, September 20, 1999).
- 1999 ROD for the *EIS for Site-wide Operation of Sandia National Laboratories* (64 FR 69996, December 15, 1999).
- 2000 *Amended ROD for the Nevada Test Site EIS* (65 FR 10061, February 25, 2000).
- 2002 ROD for the *Site-wide EIS for the Oak Ridge Y–12 National Security Complex* (67 FR 11296, March 13, 2002).
- 2002 ROD for the *EIS for the Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (67 FR 79906, December 31, 2002).
- 2004 ROD for the *EIS for the Chemistry and Metallurgy Research Building Replacement Project, Los*

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[2] This ROD also contains decisions for the EIS for Construction and Operation of a Tritium Extraction Facility at the Savannah River Site (DOE/EIS–0271) and EIS for the Production of Tritium in a Commercial Light Water Reactor (DOE/EIS–0288).

Alamos National Laboratory (69 FR 6967, February 12, 2004).

- 2005 ROD for the *Site-wide EIS for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic EIS* (70 FR 71491, November 29, 2005).

Nuclear Weapons Complex: The current nuclear weapons complex consists of eight major facilities located in seven states. NNSA maintains a limited capability to design and manufacture nuclear weapons; provides surveillance of and maintains nuclear weapons currently in the stockpile; and dismantles retired nuclear weapons. Major facilities and their primary responsibilities within the nuclear weapons complex are listed below:

Savannah River Site (SRS) (Aiken, South Carolina)—Extracts tritium (when the Tritium Extraction Facility becomes operational in 2007); provides loading, unloading and surveillance of tritium reservoirs. SRS does not maintain Category I/II [3] quantities of special nuclear material (SNM) [4] associated with weapons activities, but does maintain Category I/II quantities of SNM associated with other Department activities (*e.g.*, environmental management).

Pantex Plant (PX) (Amarillo, Texas)—Dismantles retired weapons; fabricates high-explosives components; assembles high explosive, nuclear, and non-nuclear components into nuclear weapons; repairs and modifies weapons; and evaluates and performs non-nuclear testing of weapons. Maintains Category I/II quantities of SNM for the weapons program and material no longer needed by the weapons program.

Y–12 National Security Complex (Y–12) (Oak Ridge, Tennessee)—Manufactures nuclear weapons secondaries, cases, and other weapons components; evaluates and performs testing of weapon components; maintains Category I/II quantities of SNM; conducts dismantlement, storage, and disposition of nuclear weapons materials; and supplies SNM for use in naval reactors.

Kansas City Plant (KCP) (Kansas City, Missouri)—Manufactures and acquires non-nuclear weapons components; and evaluates and performs testing of weapon components. No Category I/II quantities of SNM are maintained at the KCP.

Lawrence Livermore National Laboratory (LLNL) (Livermore, California)—Conducts research and development of nuclear weapons; designs and tests advanced technology concepts; designs weapons; maintains a limited capability to fabricate plutonium components; and provides safety and reliability assessments of the stockpile. Maintains Category I/II quantities of SNM associated with the weapons program and material no longer needed by the weapons program.

Los Alamos National Laboratory (LANL) (Los Alamos, New Mexico)—Conducts research and development of nuclear weapons; designs and tests advanced technology concepts; designs weapons; provides safety and reliability assessments of the stockpile; maintains interim production capabilities for limited quantities of plutonium components (e.g., pits); and manufactures nuclear weapon detonators for the stockpile. Maintains Category I/II quantities of SNM associated with the nuclear weapons program and material no longer needed by the weapons program.

Sandia National Laboratories (SNL) (Albuquerque, New Mexico; Livermore, California)—Conducts system engineering of nuclear weapons; designs and develops non-nuclear components; conducts field and laboratory non-nuclear testing; conducts research and development in support of the nuclear weapon non-nuclear design; manufactures non-nuclear weapon components; provides safety and reliability assessments of the stockpile; and manufactures neutron generators for the stockpile. Maintains Category I/II quantities of SNM associated with the nuclear weapons program.

Nevada Test Site (NTS) (Las Vegas, Nevada)—Maintains capability to conduct underground nuclear testing; conducts experiments involving nuclear material and high explosives; provides capability to disposition a damaged nuclear weapon or improvised nuclear device; conducts non-nuclear experiments; and conducts research and training on nuclear safeguards, criticality safety and emergency response. Maintains Category I/II quantities of SNM associated with the nuclear weapons program.

Purpose and Need for the Stockpile Stewardship and Management Program: Under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.), DOE is responsible for providing nuclear weapons to support the United States' national security strategy. The National Nuclear Security Administration Act (Pub. L. 106–65, Title XXXII) assigned this responsibility to NNSA within DOE. One of the primary missions of NNSA is to provide the nation with safe and reliable nuclear weapons, components and capabilities, and to accomplish this in a way that protects the environment and the health and safety of workers and the public.

Changes in national security needs and budgets have necessitated changes in the way NNSA meets its responsibilities regarding the nation's nuclear stockpile. As a result of a changed security environment, unilateral decisions by the United States and international arms control agreements, the nation's stockpile is significantly smaller today and by 2012, it will be the smallest since the Eisenhower administration (1953–1961). The Treaty of Moscow will eventually lead to a level of 1,700–2,200 operationally-deployed strategic nuclear weapons.

However, nuclear deterrence will continue to be a cornerstone of United States national security policy, and NNSA must continue to meet its responsibilities for ensuring the safety and reliability of the nation's nuclear weapons stockpile. The current policy is contained in the Nuclear Posture Review, submitted to Congress in early 2002, which states that the United States will:

- Change the size, composition and character of the nuclear weapons stockpile in a way that reflects that the Cold War is over;
- Achieve a credible deterrent with the lowest possible number of nuclear warheads consistent with national security needs, including obligations to allies; and
- Transform the NNSA nuclear weapons complex into a responsive infrastructure that supports the specific stockpile requirements established by the President and maintains the essential United States nuclear capabilities needed for an uncertain global future.

Complex 2030 SEIS: NNSA has been evaluating how to establish a more responsive nuclear weapons complex infrastructure since the Nuclear Posture Review was transmitted to Congress in early 2002. The Stockpile Stewardship Conference in 2003, the Department of Defense Strategic Capabilities Assessment in 2004, the recommendations of the Secretary of Energy Advisory Board (SEAB) Task Force on the Nuclear Weapons Complex Infrastructure in 2005, and the Defense

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[3] Category I/II quantities of special nuclear material are determined by grouping materials by type, attractiveness level, and quantity. These grouping parameters are defined in DOE Manual 470.4–6, Nuclear Material Control and Accountability [see *https://www.directives.doe.gov*].

[4] As defined in section 11 of the Atomic Energy Act of 1954, special nuclear material are: (1) Plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the U.S. Nuclear Regulatory Commission determines to be special nuclear material; or (2) any material artificially enriched by plutonium or uranium 233 or 235.

Science Board Task Force on Nuclear Capabilities in 2006 have provided information for NNSA's evaluations.

In early 2006, NNSA developed a planning scenario for what the nuclear weapons complex would look like in 2030. See *http://www.nnsa.doe.gov* for more information regarding Complex 2030 planning. The Complex 2030 planning scenario incorporates many of the decisions NNSA has already made based on the evaluations in the SSM PEIS, Tritium Supply and Recycling PEIS, and other NEPA documents. See discussion in background above. The following table identifies which components of Complex 2030 are based on the existing SSM PEIS and Tritium PEIS RODs, including RODs for subsequent tiered EISs:

Components of Complex 2030 that reflect earlier decisions	SSM PEIS ROD	Tritium PEIS ROD
Maintain but reduce the existing weapon assembly capacity located at Pantex	X	
Maintain but reduce the high-explosives fabrication capacity at Pantex	X	
Maintain but reduce the existing uranium, secondary, and case fabrication capacity at the Y–12 Plant at Oak Ridge	X	
Reduce the non-nuclear component fabrication capacity at the Kansas City Plant	X	
Reestablish limited pit fabrication capability at Los Alamos National Laboratory while evaluating the need for a larger capability	X	
Irradiate tritium producing rods in commercial light water reactors; construct and operate a new Tritium Extraction Facility at DOE's Savannah River Site		X

Types of Decisions that Would Be Based on the Complex 2030 SEIS: The decisions set forth in the Complex 2030 ROD would:

- Identify the future missions of the SSM Program and the nuclear weapons complex; and
- Determine the configuration of the future weapons complex needed to accomplish the SSM Program.

For specific programs or facilities, NNSA may need to prepare additional NEPA documents to implement the decisions announced in the ROD. The baseline that will be used for the analyses of program and facility needs in the SEIS is 1,700–2,200 operationally-deployed strategic nuclear weapons, in addition to augmentation weapons, reliability-reserve weapons and weapons required to meet NATO commitments. The numbers are consistent with international arms-control agreements. Consistent with national security policy directives, replacement warhead design concepts may be pursued under the alternatives as a means of, for example, enhancing safety and security, improving manufacturing practices, reducing surveillance needs, and reducing need for underground tests.

The SEIS will evaluate reasonable alternatives for future transformation of the nuclear weapons complex. The Proposed Action and alternatives to the Proposed Action will assume continued implementation of the following prior siting decisions that DOE made in the SSM PEIS and Tritium PEIS RODs, including RODs for subsequent tiered EISs:

- Location of the weapon assembly/disassembly operations at the Pantex Plant in Texas.
- Location of uranium, secondary, and case fabrication at the Y–12 National Security Complex in Tennessee.
- Location of tritium extraction, loading and unloading, and support operations at the Savannah River Site in South Carolina.

NNSA does not believe it is necessary to identify additional alternatives beyond those present in the SSM PEIS. Regarding the uranium, secondary, and case fabrication at Y–12, NNSA is currently preparing a Y–12 Site-wide EIS to evaluate reasonable alternatives for the continued modernization of the Y–12 capabilities. The Complex 2030 SEIS will incorporate any decisions made pursuant to the Y–12 Site-wide EIS.

While the Complex 2030 planning scenario proposes to consolidate further non-nuclear production activities performed at the Kansas City Plant, this proposal will be evaluated in a separate NEPA analysis, as was done in the 1990s. NNSA believes that it is appropriate to separate the analyses of the transformation of non-nuclear production from the SEIS because decisions regarding those activities would neither significantly affect nor be affected by decisions regarding the transformation of nuclear production activities.

The SSM PEIS ROD announced NNSA's decision to establish a small interim pit production capacity at LANL. In the 1999 LANL Site-wide EIS ROD, NNSA announced it would achieve a pit production capacity at LANL of up to 20 pits per year. The 2006 draft LANL Site-wide EIS evaluates a proposal for a production capacity of 50 certified pits annually. This proposed capacity is based on an annual production rate of 80 pits per year in order to provide NNSA with sufficient flexibility to obtain 50 certified pits. Any decisions made pursuant to the LANL Site-wide EIS will be included in the Complex 2030 SEIS.

Based upon the studies[5] and analyses that led to NNSA's development of the Complex 2030 scenario, NNSA has developed alternatives that are intended to facilitate public comment on the scope of the SEIS. NNSA's decisions regarding implementation of Complex 2030 will be based on the following alternatives, or a combination of those alternatives.

The Proposed Action—Transform to a More Modern, Cost-Effective Nuclear Weapons Complex (Complex 2030). This alternative would undertake the following actions to continue the transformation of NNSA's nuclear weapons complex:

- Select a site to construct and operate a consolidated plutonium center for long-term R&D, surveillance, and manufacturing operations for a baseline capacity of 125 qualified pits per year at a site with existing Category I/II SNM.
- Reduce the number of sites with Category I/II SNM and consolidate SNM to fewer locations within each given site.
- Consolidate, relocate or eliminate duplicative facilities and programs and improve operating efficiencies, including at facilities for nuclear materials storage, tritium R&D, high explosives R&D, environmental testing, and hydrotesting facilities.
- Identify one or more sites for conducting NNSA flight test operations.

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[5] The Stockpile Stewardship Conference in 2003, the Department of Defense Strategic Capabilities Assessment in 2004, the recommendations of the Secretary of Energy Advisory Board (SEAB) Task Force on the Nuclear Weapons Complex Infrastructure in 2005, and the recommendations of the Defense Science Board Task Force on Nuclear Capabilities in 2006.

Existing DOD and DOE test ranges (*e.g.*, White Sands Missile Range in New Mexico and Nevada Test Site in Nevada) would be considered as alternatives to the continued operation of the Tonopah Test Range in Nevada.

- Accelerate dismantlement activities.

The DOE sites that will be considered as potential locations for the consolidated plutonium center and consolidation of Category I/II SNM include: Los Alamos, Nevada Test Site, Pantex Plant, Y–12 National Security Complex, and the Savannah River Site. Other DOE sites are not considered reasonable alternative locations because they do not satisfy certain criteria such as population encroachment, or mission compatibility or synergy with the site's existing mission.

Alternatives to the Proposed Action

No Action Alternative. The No Action Alternative represents the status quo as it exists today and is presently planned. It includes the continued implementation of decisions made pursuant to the SSM PEIS and the Tritium Supply and Recycling PEIS (as summarized above) and related site-specific EISs and EAs. These decisions are contained in RODs and Findings of No Significant Impact (FONSIs), including those discussed above, and copies can be located on the DOE NEPA Document Web page at *http://www.eh.doe.gov/nepa/documents.html.*

The No Action Alternative would also include any decisions made as a result of the new Y–12 Site-wide EIS and the LANL Site-wide EIS once these EISs are finished. NNSA expects to issue RODs on these EISs prior to publication of the draft Complex 2030 SEIS.

The No Action Alternative is illustrated in the following matrix:

Capability	Sites (no action alternative)							
	KCP	LANL	LLNL	NTS	Y–12	PX	SNL	SRS
Weapons assembly/Disassembly				X		X		
Nonnuclear components	X	X					X	
Nuclear components:								
—Pits		X						
—Secondaries and cases					X			
High explosives components						X		
Tritium Extraction, Loading and Unloading								X
High explosives R&D		X	X			X	X	
Tritium R&D		X	X					X
Large Scale Hydrotesting		X	X	X				
Category I/II SNM Storage		X	X	X	X	X	X	X

The No Action Alternative also includes continuation of environmental testing at current locations and flight-testing activities at the Tonopah Test Range in Nevada.

Reduced Operations and Capability-Based Complex Alternative

In this alternative, NNSA would maintain a basic capability for manufacturing technologies for all stockpile weapons, as well as laboratory and experimental capabilities to support stockpile decisions, but would reduce production facilities to a ''capability-based'' [6] capacity. This alternative would not have a production capacity sufficient to meet current national security objectives. This alternative would be defined as follows:

- Do not construct and operate a consolidated plutonium center for long-term R&D, surveillance, and manufacturing operations; and do not expand pit production at LANL beyond 50 certified pits per year.
- Reduce the number of sites with Category I/II SNM and consolidate SNM to fewer locations within a given site.
- Consolidate, relocate or eliminate duplicative facilities and programs and improve operating efficiencies, including at facilities for nuclear materials storage, tritium R&D, high explosives R&D, environmental testing facilities, and hydrotesting facilities.
- Identify one or more sites for conducting NNSA flight test operations. Existing DOD and DOE test ranges (*e.g.* White Sands Missile Range in New Mexico and Nevada Test Site in Nevada) would be considered as potential alternatives to the continued operation of the Tonopah Test Range in Nevada.
- Production capacities at Pantex, Y–12, and the Savannah River Site would be considered for further reductions limited by the capability-based capacity.
- NNSA would continue dismantlement activities.

Proposal Not Being Considered for Further Analysis. The SEAB Task Force on the Nuclear Weapons Complex Infrastructure recommended that NNSA pursue a consolidated nuclear production center (CNPC) as a single facility for all research, development, and production activities relating to nuclear weapons that involve significant amounts (*i.e.* Category I/II quantities) of SNM. The CNPC, as envisioned by the SEAB Task Force, would contain all the nuclear weapons manufacturing, production, assembly, and disassembly facilities and associated weapon surveillance and maintenance activities for the stockpile weapons. The CNPC would include the plutonium activities of the consolidated plutonium center proposed by NNSA in its Complex 2030 vision, as well as the consolidated activities of the uranium, tritium, and high explosive operations. DOE believes that creation of a CNPC is not a reasonable alternative and does not intend to analyze it as an alternative in the SEIS because of the technical and schedule issues involved in constructing a CNPC, as well as associated costs. NNSA invites and will consider comments on this matter during the scoping process.

The SEAB Task Force developed three business cases for transforming the nuclear weapons complex, two of which were characterized as high risk. Its preferred least-risk option was to establish a CNPC ''quickly'' by accelerating site selection, NEPA analyses, regulatory approvals, and construction. The Task Force assumed that NNSA could, under these circumstances, begin operating a CNPC in 2015, start consolidation of SNM shortly thereafter, accelerate dismantlements, and begin other major transformational activities. Until the CNPC was completed, NNSA would have to maintain, and in some cases improve, existing production and research facilities. According to the Task Force's estimates, this option would require an additional 1 billion dollars per year for weapons programs

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[6] The capability to manufacture and assemble nuclear weapons at a nominal level.

activities for the next 10 years, and lead to a net savings through 2030 of 15 billion dollars.

Accelerated construction of a CNPC would not allow NNSA to avoid immediate expenditures to restore and modernize interim production capabilities to meet essential Life Extension Program (LEP) schedules and support the existing stockpile during the next decade. LEP is the refurbishment of nuclear weapons parts and components to extend the weapon deployment life. NNSA has concluded that the SEAB Task Force underestimated the nonfinancial challenges of constructing a CNPC. A CNPC would require moving a unique and highly skilled workforce to a new location. It would require NNSA to obtain significant regulatory approvals rapidly, and to construct a unique and complex facility on a tight schedule. It would put many of the significant aspects of the weapons complex transformation into ''one basket''—until the CNPC began operations, all the other facilities and activities would be delayed. NNSA's Proposed Action would achieve many of the benefits of the CNPC approach—consolidation of SNM and facilities, integrated R&D and production involving SNM, and aggressive dismantlements—in a way that addresses immediate national security needs in a technically feasible and affordable manner.

Nuclear Materials Consolidation: DOE is pursuing SNM consolidation from all DOE sites including those that comprise the nuclear weapons complex. The SEIS will look at alternatives for the storage and consolidation of nuclear materials within the nuclear weapons complex including materials needed to maintain the United States' nuclear weapons arsenal. There is a potential overlap between the SEIS and the activities of the Department's other nuclear materials consolidation activities, and DOE will ensure that there is appropriate coordination between the two activities.

Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility: NNSA issued a *Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (MPF) on June 4, 2003 (68 FR 33487; also 68 FR 33934, June 6, 2003) that analyzed alternatives for producing the plutonium pits that are an essential component of nuclear weapons. On January 28, 2004, NNSA announced that it was indefinitely postponing any decision on how it would obtain a large capacity pit manufacturing facility. Because the Complex 2030 SEIS will analyze alternatives for plutonium-related activities that include pit production, DOE, effective upon publication of this NOI, cancels the MPF PEIS.

Public Scoping Process: The scoping process is an opportunity for the public to assist the NNSA in determining the issues for analysis. NNSA will hold public scoping meetings at locations identified in this NOI. The purpose of these meetings is to provide the public with an opportunity to present oral and written comments, ask questions, and discuss concerns regarding the transformation of the nuclear weapons complex and the SEIS with NNSA officials. Comments and recommendations can also be communicated to NNSA as discussed earlier in this notice.

Complex 2030 PEIS Supplement Preparation Process: The SEIS preparation process begins with the publication of this NOI in the **Federal Register**. NNSA will consider all public comments that it receives during the public comment period in preparing the draft SEIS. NNSA expects to issue the draft SEIS for public review during the summer of 2007. Public comments on the draft SEIS will be received during a comment period of at least 45 days following the U.S. Environmental Protection Agency's publication of the Notice of Availability in the **Federal Register**. Notices placed in local newspapers will specify dates and locations for public hearings on the draft SEIS and will establish a schedule for submitting comments on the draft SEIS, including a final date for submission of comments. Issuance of the final SEIS is scheduled for 2008.

Classified Material: NNSA will review classified material while preparing the SEIS. Within the limits of classification, NNSA will provide the public as much information as possible to assist its understanding and ability to comment. Any classified material needed to explain the purpose and need for the action, or the analyses in the SEIS, will be segregated into a classified appendix or supplement, which will not be available for public review. However, all unclassified information or results of calculations using classified data will be reported in the unclassified section of the SEIS, to the extent possible in accordance with federal classification requirements.

Issued in Washington, DC on October 11, 2006.

Linton F. Brooks,

Administrator, National Nuclear Security Administration.

[FR Doc. E6–17508 Filed 10–18–06; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. IC07–538–000; FERC–538]

Commission Information Collection Activities, Proposed Collection; Comment Request; Extension

October 13, 2006.

AGENCY: Federal Energy Regulatory Commission, DOE.

ACTION: Notice.

SUMMARY: In compliance with the requirements of Section 3506(c) (2) (a) of the Paperwork Reduction Act of 1995 (Pub. L. 104–13), the Federal Energy Regulatory Commission (Commission) is soliciting public comment on the specific aspects of the information collection described below.

DATES: Comments on the collection of information are due by December 21, 2006.

ADDRESSES: Copies of the proposed collection of information can be obtained from and written comments may be submitted to the Federal Energy Regulatory Commission, Attn: Michael Miller, Office of the Executive Director, ED–34, 888 First Street NE., Washington, DC 20426. Comments may be filed either in paper format or electronically. Those parties filing electronically do not need to make a paper filing. For paper filings, the original and 14 copies of such comments should be submitted to the Office of the Secretary, Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426 and refer to Docket No. IC07–538–000.

Documents filed electronically via the Internet must be prepared in WordPerfect, MS Word, Portable Document Format, or ASCII format. To file the document, access the Commission's Web site at *http://www.ferc.gov* and click on ''Make an E-filing,'' and then follow the instructions for each screen. First time users will have to establish a user name and password. The Commission will send an automatic acknowledgement to the sender's e-mail address upon receipt of comments.

All comments may be viewed, printed or downloaded remotely via the Internet

Corrections

Federal Register
Vol. 71, No. 205
Tuesday, October, 24, 2006

This section of the FEDERAL REGISTER contains editorial corrections of previously published Presidential, Rule, Proposed Rule, and Notice documents. These corrections are prepared by the Office of the Federal Register. Agency prepared corrections are issued as signed documents and appear in the appropriate document categories elsewhere in the issue.

DEPARTMENT OF ENERGY

Notice of Intent To Prepare a Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement—Complex 2030

Correction

In notice document E6–17508 beginning on page 61731 in the issue of Thursday, October 19, 2006, make the following correction:

On page 61731, in the second column, under the heading ‘‘**DATES**’’, in the sixth line, ‘‘January 17, 2006’’ should read ‘‘January 17, 2007’’.

[FR Doc. Z6–17508 Filed 10–23–06; 8:45 am]

BILLING CODE 1505–01–D

view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue, SW., Potomac Center, 9th Floor, Washington, DC 20202–4700. Requests may also be electronically mailed to *ICDocketMgr@ed.gov* or faxed to 202–245–6623. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be electronically mailed to *ICDocketMgr@ed.gov.* Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339.

[FR Doc. E6–19581 Filed 11–17–06; 8:45 am]

BILLING CODE 4000–01–P

ELECTION ASSISTANCE COMMISSION

Sunshine Act Notice

AGENCY: United States Election Assistance Commission.

ACTION: Notice of public meeting for the Technical Guidelines Development Committee.

DATE AND TIME: Monday, December 4, 2006, 9 a.m. to 5:30 p.m. EST. Tuesday, December 5, 2006, 8:30 a.m. to 2 p.m. EST.

PLACE: National Institute of Standards and Technology, 100 Bureau Drive, Building 101, Green Auditorium, Gaithersburg, Maryland 20899–8900.

STATUS: This meeting will be open to the public. There is no fee to attend, but, due to security requirements, advance registration is required. Registration information will be available at *http://www.vote.nist.gov* by November 4, 2006.

SUMMARY: The Technical Guidelines Development Committee (the ‘‘Development Committee’’) has scheduled a plenary meeting for December 4th & 5th, 2006. The Committee was established to act in the public interest to assist the Executive Director of the U.S. Election Assistance Commission (EAC) in the development of voluntary voting system guidelines. The Development Committee held previous meetings on July 9, 2004; January 18 and 19, 2005; March 9, 2005; April 20 and 21, 2005; September 29, 2005 and March 29, 2006. The purpose of the seventh meeting of the Development Committee will be to review and approve draft documents that will form the bases for recommendations for future voluntary voting system guidelines to the EAC. The draft documents respond to tasks defined in resolutions passed at previous Technical Guideline Development Committee meetings.

SUPPLEMENTARY INFORMATION: The Technical Guidelines Department Committee (the ‘‘Development Committee’’) has scheduled a plenary meeting for December 4th & 5th, 2006. The Committee was established pursuant to 42 U.S.C. 15361, to act in the public interest to assist the Executive Director of the Election Assistance Commission in the development of the voluntary voting system guidelines. The Technical Guidelines Development Committee held their first plenary meeting on July 9, 2004. At this meeting, the Development Committee agreed to a resolution forming three working groups: (1) Human Factors & Privacy; (2) Security & Transparency; and (3) Core Requirements & Testing to gather information and public input on relevant issues. The information gathered by the working groups was analyzed at the second meeting of the Development Committee January 18 & 19, 2005. Resolutions were debated and adopted by the TGDC at the January plenary session. The resolutions defined technical work tasks for NIST that will assist the TGDC in developing recommendations for voluntary voting system guidelines. At the March 9, 2005 meeting, NIST scientists presented preliminary reports on technical work tasks defined in resolutions adopted at the January plenary meeting and adopted one additional resolution. The Development Committee approved initial recommendations for voluntary voting system guidelines at the April 20th & 21st, 2005 meeting. The Development Committee began consideration of future recommendations for voluntary voting system guidelines at the September 29, 2005 meeting. At the March 29th, 2006 meeting, the Development Committee approved draft technical guidance documents that will form the bases for recommendations for future voluntary voting system guidelines and passed an additional resolution. The Committee will review additional technical guidance documents for recommendations for future voluntary voting system guidelines at the December 4th & 5th, 2006 meeting.

CONTACT INFORMATION: Allan Eustis 301–975–5099. If a member of the public would like to submit written comments concerning the Committee's affairs at any time before or after the meeting, written comments should be addressed to the contact person indicated above, or to *Voting@nist.gov.*

Thomas R. Wilkey,

Executive Director, U.S. Election Assistance Commission.

[FR Doc. 06–9310 Filed 11–16–06; 11:51 am]

BILLING CODE 6820–KF–M

ELECTION ASSISTANCE COMMISSION

Sunshine Act Notice

AGENCY: United States Election Assistance Commission.

ACTION: Notice of public meeting.

DATE AND TIME: Thursday, December 7, 2006, 10 a.m.–3p.m.

PLACE: U.S. Election Assistance Commission, 1225 New York Ave, NW., Suite 150, Washington, DC 20005. (Metro Stop: Metro Center).

AGENDA: The Commission will receive presentations on public comments received for the DRAFT Procedural Manual for Voting System Testing and Certification Program and the proposed final document will be considered for approval. The Commission will receive presentations from election officials, community interest groups, academicians and technology experts regarding the 2006 election. The Commission will elect officers for 2007 and consider other administrative matters.

This meeting will be open to the public.

FOR FURTHER INFORMATION CONTACT: Bryan Whitener, Telephone: (202) 566–3100.

Thomas R. Wilkey,

Executive Director, U.S. Election Assistance Commission.

[FR Doc. 06–9311 Filed 11–16–06; 11:51 am]

BILLING CODE 6820–KF–M

DEPARTMENT OF ENERGY

Change in Scoping Meeting Schedule for the Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement—Complex 2030

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Notice of Change in Scoping Meeting Schedule.

SUMMARY: On October 19, 2006, NNSA published a Notice of Intent (NOI) to Prepare a *Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement—Complex 2030* (Complex

2030 Supplemental PEIS; DOE/EIS–0236–S4; 71 FR 61731). NNSA has changed the location of the public scoping meeting scheduled for Los Alamos, New Mexico, and has extended the time for the public scoping meeting scheduled for Livermore, California.

DATES: The NOI identified the Mesa Public Library as the location of the public scoping meeting in Los Alamos, New Mexico. NNSA will instead hold the meeting at the Hilltop House Best Western, 400 Trinity Drive, Los Alamos, New Mexico. The meeting date and time, which are unchanged, are December 6, 2006, 10:30 a.m.–2:30 p.m.

The NOI listed the time of the meeting on December 12, 2006, in Livermore, California, as 11 a.m.–3 p.m. NNSA has extended the public comment portion of the meeting until 10 p.m. The meeting starting time of 11 a.m. is unchanged, and the meeting location is unchanged: Robert Livermore Community Center, 4444 East Avenue, Livermore, California.

NNSA is not changing the location or schedule for any other public scoping meeting announced in the NOI. This includes the meeting in Tracy, California, which still will be held on December 12, 2006, from 6 p.m.–10 p.m. at the Tracy Community Center, 950 East Street.

FOR FURTHER INFORMATION CONTACT: Please direct questions regarding these changes to Mr. Theodore A. Wyka, Complex 2030 Supplemental PEIS Document Manager, Office of Transformation, National Nuclear Security Administration (NA–10.1), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585. Questions also may be telephoned, toll free, to 1–800–832–0885 (ext. 63519) or e-mailed to *Complex2030@nnsa.doe.gov.* Written comments on the scope of the Complex 2030 Supplemental PEIS or requests to be placed on the document distribution list can be sent to the Document Manager. Additional information regarding Complex 2030 is available at *http://Complex2030PEIS.com.*

Issued in Washington, DC, on November 14, 2006.

Thomas P. D'Agostino,

Deputy Administrator for Defense Programs, National Nuclear Security Administration.

[FR Doc. E6–19590 Filed 11–17–06; 8:45 am]

BILLING CODE 6450–01–P

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OPPT–2006–0929; FRL–8103–1]

Forum on State and Tribal Toxics Action; Notice of Public Meeting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: EPA is announcing the meeting of the Forum on State and Tribal Toxics Action (FOSTTA) to enable state and tribal leaders to collaborate with EPA on environmental protection and pollution prevention issues. Representatives and invited guests of the Chemical Information and Management Project (CIMP), the Pollution Prevention (P2) Project, and the Tribal Affairs Project (TAP), components of FOSTTA, will be meeting December 11, 2006. The meeting is being held to provide participants an opportunity to have in-depth discussions on issues concerning the environment and human health. This notice announces the location and times for the meeting and sets forth some tentative agenda topics. EPA invites all interested parties to attend the public meeting.

DATES: The meeting will be held on December 11, 2006, from 8 a.m. to 5 p.m.

Requests to participate in the meeting, identified by docket identification (ID) number EPA–HQ–OPPT–2006–0929 must be received on or before December 7, 2006.

To request accommodation of a disability, please contact the technical contact person listed under **FOR FURTHER INFORMATON CONTACT**, preferably at least 10 days prior to the meeting, to give EPA as much time as possible to process your request.

ADDRESSES: The meeting will be held at the Radisson Hotel & Suites Austin, 111 E. Cesar Chavez St., Austin, TX 78701, telephone number: (800) 333–3333, fax number: (512) 473–8399.

Requests to participate in the meeting, identified by docket ID number HQ–OPPT–2006–0929, may be submitted to the technical person listed under **FOR FURTHER INFORMATION CONTACT**.

FOR FURTHER INFORMATION CONTACT: *For general information contact*: Colby Lintner, Regulatory Coordinator, Environmental Assistance Division (7408M), Office of Pollution Prevention and Toxics, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460–0001; telephone number: (202) 554–1404; e-mail address: *TSCA-Hotline@epa.gov*.

For technical information contact: Pam Buster, Environmental Assistance Division (7408M), Office of Pollution Prevention and Toxics, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460–0001; telephone number: (202) 564–8817; fax number: (202) 564–8813; e-mail address: *Buster.Pamela@epa.gov*.

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this Action Apply to Me?

This action is directed to the public in general. This action may, however, be of interest to all parties interested in FOSTTA and in hearing more about the perspectives of the States on EPA programs and the information exchange regarding important issues related to human health and environmental exposure to toxics. Since other entities may also be interested, the Agency has not attempted to describe all the specific entities that may be affected by this action. However, in the interest of time and efficiency, the meetings are structured to provide maximum opportunity for State and EPA participants to discuss items on the predetermined agenda. At the discretion of the chair, an effort will be made to accommodate participation by observers attending the proceedings. If you have any questions regarding the applicability of this action to a particular entity, consult the people listed under **FOR FURTHER INFORMATION CONTACT**.

B. How Can I Get Copies of this Document and Other Related Information?

1. *Docket*. EPA has established a docket for this action under docket ID number EPA–HQ–OPPT–2006–0929. Publicly available docket materials are available electronically at *http://www.regulations.gov* or, if only available in hard copy, at the OPPT Docket in the EPA Docket Center (EPA/DC). The EPA/DC suffered structural damage due to flooding in June 2006. Although the EPA/DC is continuing operations, there will be temporary changes to the EPA/DC during the clean-up. The EPA/DC Public Reading Room, which was temporarily closed due to flooding, has been relocated in the EPA Headquarters Library, Infoterra Room (Room Number 3334) in the EPA West Building, located at 1301 Constitution Ave., NW., Washington, DC. The EPA/DC Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the EPA/DC Public Reading Room is (202)

Commission's Rules of Practice and Procedure.

(G) The Secretary is directed to publish a copy of this order in the **Federal Register**.

(H) The refund effective date in Docket No. EL08–8–000 established pursuant to section 206(b) of the Federal Power Act is 5 months from the date of the filing of the complaint.

By the Commission.

Kimberly D. Bose,

Secretary.

[FR Doc. E8–301 Filed 1–10–08; 8:45 am]

BILLING CODE 6717–01–P

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Notice of Availability and Public Hearings.

SUMMARY: The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the U.S. Department of Energy (DOE), announces the availability of the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement (Draft Complex Transformation SPEIS, DOE/EIS–0236–S4). The Draft Complex Transformation SPEIS analyzes the potential environmental impacts of reasonable alternatives to continue the transformation of the U.S. nuclear weapons complex to one that is smaller, more efficient, more secure, and better able to respond to changes in national security requirements. While NNSA has revised the document title from that indicated in the Notice of Intent, it remains a supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement. NNSA has prepared this document in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations that implement the procedural provisions of NEPA (40 CFR Parts 1500–1508), and DOE procedures implementing NEPA (10 CFR Part 1021).

DATES: NNSA invites comments on the Draft Complex Transformation SPEIS during the 90-day public comment period, which ends on April 10, 2008. NNSA will consider comments received after this date to the extent practicable as it prepares the Final Complex Transformation SPEIS. NNSA will hold 19 public hearings on the Draft Complex Transformation SPEIS. The locations, dates, and times are listed in the **SUPPLEMENTARY INFORMATION** section.

ADDRESSES: Requests for additional information on the Draft Complex Transformation SPEIS, including requests for copies of the document, should be directed to: Mr. Theodore A. Wyka, Complex Transformation SPEIS Document Manager, Office of Transformation, NA–10.1, Department of Energy/NNSA, 1000 Independence Avenue, SW., Washington, DC 20585, toll free 1–800–832–0885 ext. 63519. Written comments on the Draft Complex Transformation SPEIS should be submitted to the above address, by facsimile to 1–703–931–9222, or by e-mail to *complextransformation@nnsa.doe.gov.* Please mark correspondence ''Draft Complex Transformation SPEIS Comments.''

For general information regarding the DOE NEPA process contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, GC–20, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, telephone 202–586–4600, or leave a message at 1–800–472–2756. Additional information regarding DOE NEPA activities and access to many of DOE's NEPA documents are available on the Internet through the DOE NEPA Web site at *http://www.eh.doe.gov/nepa.*

SUPPLEMENTARY INFORMATION: *Public Hearings and Invitation to Comment.* NNSA will hold 19 public hearings on the Draft Complex Transformation SPEIS. The hearings will be held at the following locations, dates, and times:

North Augusta, South Carolina, North Augusta Community Center, 495 Brookside Avenue, North Augusta, SC, Thursday, February 21, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Oak Ridge, Tennessee, New Hope Center, 602 Scarboro Road (Corner of New Hope and Scarboro Roads), Oak Ridge, TN, Tuesday, February 26, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Amarillo, Texas, Amarillo Globe-News Center, Education Room, 401 S. Buchanan, Amarillo, TX, Thursday, February 28, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Tonopah, Nevada, Tonopah Convention Center, 301 Brougher Avenue, Tonopah, NV, Tuesday, March 4, 2008 (6 p.m.–10 p.m.)
Las Vegas, Nevada, Atomic Testing Museum, 755 E. Flamingo Road, Las Vegas, NV, Thursday, March 6, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Socorro, New Mexico, Macey Center (at New Mexico Tech), 801 Leroy Place, Socorro, NM, Monday, March 10, 2008 (6 p.m.–10 p.m.)
Albuquerque, New Mexico, Albuquerque Convention Center, 401 2nd Street NW, Albuquerque, NM, Tuesday, March 11, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Los Alamos, New Mexico, Hilltop House, 400 Trinity Drive at Central, Los Alamos, NM, Wednesday, March 12, 2008 (6 p.m.–10 p.m.)
Los Alamos, New Mexico, Hilltop House, 400 Trinity Drive at Central, Los Alamos, NM, Thursday, March 13, 2008 (11 a.m.–3 p.m.)
Santa Fe, New Mexico, Genoveva Chavez Community Center, 3221 Rodeo Road, Santa Fe, NM, Thursday, March 13, 2008 (6 p.m.–10 p.m.)
Tracy, California, Holiday Inn Express, 3751 N. Tracy Blvd., Tracy, CA, Tuesday, March 18, 2008 (6 p.m.–10 p.m.)
Livermore, California, Robert Livermore Community Center, 4444 East Avenue, Livermore, CA, Wednesday, March 19, 2008 (11 a.m.–3 p.m. and 6 p.m.–10 p.m.)
Washington, DC, Forrestal Building, 1000 Independence Ave, SW., Washington, DC, Tuesday, March 25, 2008 (11 a.m.–3 p.m.)

Individuals who would like to present comments orally at these hearings must register upon arrival at the hearing. NNSA will allot three to five minutes, depending upon the number of speakers, to each individual wishing to speak so as to ensure that as many people as possible have the opportunity to speak. More time may be allotted by the hearing moderator as circumstances allow. NNSA officials will be available to discuss the Draft Complex Transformation SPEIS and answer questions during the first hour. NNSA will then hold a plenary session at each public hearing in which officials will explain the Draft Complex Transformation SPEIS and the analyses in it. Following the plenary session, the public will have an opportunity to provide oral and written comments. Oral comments from the hearings and written comments submitted during the comment period will be considered by NNSA in preparing the Final Complex Transformation SPEIS.

The Draft Complex Transformation SPEIS and additional information regarding complex transformation are available on the Internet at *http://www.ComplexTransformationSPEIS.com* and *http://www.nnsa.doe.gov.* The Draft

Complex Transformation SPEIS and referenced documents are available to the public at the DOE Reading Rooms and public libraries listed below:

California

Lawrence Livermore National Laboratory, NNSA/LSO Public Reading Room, LLNL Discovery Center (Visitors Center), Building 651, East Gate Entrance, Greenville Road, Livermore, CA 94550, Phone: (925) 422–4599.
Livermore Public Library, 1188 S. Livermore Avenue, Livermore, CA 94550, Phone: (925) 373–5500.
Tracy Public Library, 20 East Eaton Avenue, Tracy, CA 95376, Phone: (209) 937–8221.

Georgia

Southeastern Power Administration, Technical Library, 1166 Athens Tech Road, Elberton, GA 30635, Phone: (706) 213–3815.

Missouri

Kansas City Public Library, 14 West 10th Street, Kansas City, MO 64105, Phone: (816) 701–3400.
North-East Branch of the Kansas City Library, 6000 Wilson Road, Kansas City, MO 64123, Phone: (816) 701–3485.

Nevada

NNSA Nevada Site Office, Public Reading Room, 755 E. Flamingo Road, Las Vegas, NV 89119, Phone (702) 295–3521.
Tonopah Public Library, 167 S. Central Street, Tonopah, NV 89049, Phone: (775) 482–3374.

New Mexico

Los Alamos National Laboratory, Research Library, West Jemez Road, Los Alamos, NM 87545, Phone: (505) 667–5809.
NNSA Service Center, Zimmerman Library, Government Documents, University of New Mexico, Albuquerque, NM 87131, Phone: (505) 277–5441.
Mesa Public Library, 2400 Central Avenue, Los Alamos, NM 87544, Phone: (505) 662–8240.
Santa Fe Public Library, 145 Washington Avenue, Santa Fe, NM 87501, Phone: (505) 955–6780.
Socorro Public Library, 401 Park Street, Socorro, NM 87801, Phone: (505) 835–1114.

South Carolina

U.S. Department of Energy, Public Reading Room, University of South Carolina, 471 University Parkway, Aiken, SC 29801, Phone: (803) 641–3320.

Tennessee

Oak Ridge Site Operations Office, DOE Information Center, 475 Oak Ridge Turnpike, Oak Ridge, TN 37830, Phone: (865) 241–4780.

Texas

Amarillo Central Library, 413 E. 4th, Amarillo, TX 79101, Phone: (806) 378–3054.
Amarillo North Branch Library, 1500 NE 24th, Amarillo, TX 79107, Phone: (806) 381–7931.

Washington, DC

U.S. Department of Energy, Public Reading Room, 1000 Independence Avenue, SW., Washington, DC 20585, Phone: (202) 586–3142.

Background. The national security of the United States requires NNSA to maintain a safe, secure, and reliable nuclear weapons stockpile and core competencies in nuclear weapons. The Nation's national security requirements are established by the President and funded by the Congress, which have assigned to NNSA the responsibility of maintaining a nuclear arsenal and a complex of nuclear facilities capable of supporting this highly technical mission. The Draft Complex Transformation SPEIS is a Supplement to the 1996 Stockpile Stewardship and Management Programmatic Environmental Impact Statement, which analyzed programmatic alternatives for the weapons complex in the absence of nuclear testing. NNSA maintains the safety, security, and reliability of nuclear weapons through the Stockpile Stewardship Program. This program currently involves integrated activities at three NNSA national laboratories, four industrial plants, and a nuclear weapons test site. The effects of old facilities, aging weapons, and evolving national security requirements have led NNSA to propose further changes to the Complex in order to create a smaller and more responsive, efficient, and secure infrastructure, especially with regards to special nuclear materials (SNM).[1]

Today's Complex consists of eight major sites located in seven states, and the Tonopah Test Range (TTR). It enables NNSA to design, develop, manufacture, and maintain nuclear weapons; certify their safety, security, and reliability; conduct surveillance on them; store Category I/II[2] quantities of SNM; and dismantle and disposition retired weapons. The major sites within the Complex are the Y–12 National Security Complex (Y–12), Oak Ridge, Tennessee; Savannah River Site (SRS), Aiken, South Carolina; Pantex Plant (Pantex), Amarillo, Texas; Los Alamos National Laboratory (LANL), Los Alamos, New Mexico; Lawrence Livermore National Laboratory (LLNL), Livermore, California; Sandia National Laboratories (SNL), Albuquerque, New Mexico, and other locations; Nevada Test Site (NTS), 65 miles northwest of Las Vegas, Nevada; and the Kansas City Plant (KCP), Kansas City, Missouri.

NNSA conducted a public scoping process that began with the publication of a Notice of Intent (NOI) in the **Federal Register** on October 19, 2006 (71 FR 61731), in which NNSA announced it intended to prepare a SPEIS and invited public comment on the scope of the environmental review. In the NOI, NNSA's proposed action was referred to as Complex 2030. NNSA now believes that the term Complex Transformation better reflects the proposed action and alternatives evaluated because NNSA anticipates that it would be able to accomplish much of the proposed transformation in the next decade (i.e., well before 2030). The NOI also announced the schedule for public scoping meetings that were held in November and December 2006, near sites that might be affected by continued transformation of the Complex and in Washington, DC. In addition to the meetings, the public was encouraged to provide comments via mail, e-mail, and fax. More than 33,000 comment documents were received from individuals, interested groups, Federal, state, and local officials, and Tribes during the scoping period. All comments received during the 90-day public scoping period were considered by NNSA in preparing the Draft Complex Transformation SPEIS. All late comments received were also reviewed and, in general, determined to be similar to comments submitted within the 90-day period. NNSA's development and analysis of alternatives for the SPEIS reflect consideration of these comments.

The Draft Complex Transformation SPEIS analyzes two proposed actions. The first proposed action would restructure SNM facilities (facilities that use plutonium and highly enriched uranium to produce components for the nuclear weapons stockpile). The second

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[1] As defined in Section 11 of the *Atomic Energy Act* of 1954, SNM is: (1) Plutonium, uranium enriched in the isotope 233 or in the isotope 235; or (2) any material artificially enriched by any of the foregoing and any other material which the U.S. Nuclear Regulatory Commission determines to be special nuclear material.

[2] Special nuclear materials are grouped into Security Categories I, II, III, and IV based on the type, attractiveness level, and quantity of the materials. Categories I and II require the highest level of security.

proposed action would restructure research and development (R&D) and testing facilities. These two proposed actions differ in their magnitude and timing. The alternatives for restructuring SNM facilities, which would take 10 years or more, are necessarily broad and address issues such as where to locate these facilities and whether to construct new facilities or renovate existing ones for these functions. As such, the Draft Complex Transformation SPEIS analysis is ''programmatic'' for the proposed action of restructuring SNM facilities. Tiered, project-specific NEPA documents would likely be needed to inform decisions unless existing site-wide EIS's or other NEPA documents were sufficient.

In comparison, NNSA proposes to pursue restructuring of R&D and testing facilities in the near-term, independent of decisions it may make as to restructuring of SNM facilities. The proposed action to restructure R&D and testing facilities would likely not require further NEPA documentation to implement decisions after NNSA issues the Final Complex Transformation SPEIS and Record of Decision.

The alternatives for restructuring SNM facilities are: (1) No Action; (2) Distributed Centers of Excellence; (3) Consolidated Centers of Excellence; and (4) Capability-Based. Common to each of these are alternatives to consolidate storage of certain SNM. The No Action Alternative represents continuation of the status quo including implementation of decisions already made on the basis of prior NEPA analyses. Under the No Action Alternative, NNSA would not make major changes to the missions assigned to NNSA sites.

The Distributed Centers of Excellence Alternative retains the three major SNM functions (plutonium, uranium, and weapon assembly/disassembly) involving Category I/II quantities of SNM at up to three sites. This alternative would create a consolidated plutonium center for R&D, storage, processing, and manufacture of plutonium parts for nuclear weapons. The following sites are evaluated for the consolidated plutonium center: Los Alamos, NTS, Pantex, SRS, and Y–12. Uranium storage and operations (including the storage and use of highly enriched uranium) would remain at Y–12. Weapons assembly, disassembly, and high explosive fabrication would remain at Pantex.

The Consolidated Centers of Excellence Alternative consolidates the three major SNM functions (plutonium, uranium, and weapon assembly/disassembly) involving Category I/II quantities of SNM at one or two sites. The single site option is referred to as the Consolidated Nuclear Production Center option and the two site option is referred to as the Consolidated Nuclear Center option. Three major facilities are involved in this alternative: a Consolidated Plutonium Center, a Consolidated Uranium Center, and an assembly/disassembly/high explosives facility, which would assemble and disassemble nuclear weapons, and fabricate high explosives. The following sites are evaluated for these facilities: Los Alamos, NTS, Pantex, SRS, and Y–12.

Under the Capability-Based Alternative, NNSA would maintain basic capabilities for manufacturing components for all stockpile weapons, as well as laboratory and experimental capabilities to support stockpile decisions, but would reduce production capabilities at existing or planned facilities. Under this alternative, pit production at LANL would not be expanded beyond a capability to provide 50 pits[3] per year. Production capacities at Pantex, Y–12, and SRS (tritium production) would be reduced to capability-based levels.

To consolidate Category I/II quantities of SNM, NNSA proposes to remove Category I/II SNM from LLNL by approximately 2012, and phase-out operations at LLNL involving Category I/II quantities of SNM.[4] NNSA is also proposing to transfer more than 10,000 pits currently stored at Pantex in Zone 4 to Zone 12, enabling all Category I/II quantities of SNM at Pantex to be consolidated into a central location, close to assembly, modification, and disassembly operations.

For the proposed action to restructure R&D and testing facilities, the alternatives focus on immediate options to consolidate, relocate, or eliminate duplicative facilities and programs and to improve operating efficiencies. The following five functional capabilities are evaluated for this proposed action: tritium R&D; high explosives R&D; hydrodynamic testing; major environmental testing; and flight test operations. The sites potentially affected by decisions regarding these alternatives are: LANL, LLNL, SNL, NTS, Pantex, TTR, SRS, Y–12, and the White Sands Missile Range (WSMR). The WSMR, located in south-central New Mexico, is the largest installation in the Department of Defense. WSMR is being considered as a location for NNSA's flight test operations that are now conducted at TTR. Alternatives to relocate the current non-nuclear component design and engineering work at SNL/California also are being evaluated in this proposed action.

While NNSA has proposed to modernize its facilities that produce non-nuclear components in Kansas City, Missouri, this proposal is evaluated in a separate NEPA analysis. The General Services Administration (GSA), as the lead agency, and NNSA, as a cooperating agency, announced the availability of a draft Environmental Assessment on December 10, 2007 (72 FR 69690) that evaluates the potential environmental impacts of a proposal for GSA to procure the construction of a new facility to house NNSA's procurement and manufacturing operations for non-nuclear components. A recent analysis demonstrates that transferring non-nuclear operations outside of the Kansas City area is not cost effective. Whether non-nuclear operations remain at the current Kansas City Plant or move to a new facility in the vicinity of Kansas City would not affect nor be affected by decisions NNSA makes regarding alternatives evaluated in the Draft Complex Transformation SPEIS.

Other Federal Agency Involvement. The Department of the Air Force and U.S. Army Garrison White Sands are cooperating agencies in the preparation of the Draft Complex Transformation SPEIS.

Issued in Washington, DC, on January 7, 2008.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. E8–365 Filed 1–10–08; 8:45 am]

BILLING CODE 6450–01–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–6694–9]

Environmental Impact Statements and Regulations; Availability of EPA Comments

Availability of EPA comments prepared pursuant to the Environmental Review Process (ERP), under section 309 of the Clean Air Act and section 102(2)(c) of the National Environmental Policy Act as amended. Requests for

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[3] A pit is the central core of a nuclear weapon, typically containing plutonium-239, that undergoes fission when compressed by high explosives.

[4] The LLNL Site-wide EIS (DOE/EIS–0348 and DOE/EIS–0236–S3, March 2005) assesses the environmental impacts of transporting SNM to and from LLNL and other sites as part of the proposed action, which NNSA decided to implement (70 FR 71491, November 29, 2005). That analysis includes consideration of transportation actions involving greater quantities of SNM and more shipments than are identified in this draft SPEIS.

long-range spectrum planning and policy reforms for expediting the American public's access to broadband services, public safety, and digital television. The Committee functions solely as an advisory body in compliance with the FACA.

Matters to Be Considered: The Committee will receive recommendations and reports from working groups of its Technical Sharing Efficiencies subcommittee and Operational Sharing Efficiencies subcommittees. It will consider matters to be taken up at its next meeting. It will also provide an opportunity for public comment on these matters.

Time and Date: The meeting will be held on April 30, 2008, from 1:30 p.m. to 3:30 p.m. Eastern Daylight Time. These times and the agenda topics are subject to change. Please refer to NTIA's web site, http://www.ntia.doc.gov, for the most up-to-date meeting agenda.

Place: U.S. Department of Commerce Herbert C. Hoover Building, 1401 Constitution Avenue N.W., Room 1412, Washington, DC 20230. The meeting will be open to the public and press on a first-come, first-served basis. Space is limited. When arriving for the meeting, attendees must present photo or passport identification and/or a U.S. Government building pass, if applicable, and should arrive at least one-half hour prior to the start time of the meeting. The public meeting is physically accessible to people with disabilities. Individuals requiring special services, such as sign language interpretation or other ancillary aids, are asked to notify Mr. Gattuso, at (202) 482–0977 or jgattuso@ntia.doc.gov, at least five (5) business days before the meeting.

Status: Interested parties are invited to attend and to submit written comments. Interested parties may file written comments with the Committee at any time before or after a meeting. If interested parties wish to submit written comments for consideration by the Committee in advance of this meeting, comments should be sent to the above-listed address and must be received by close of business on April 23, 2008, to provide sufficient time for review. Comments received after April 23, 2008, will be distributed to the Committee but may not be reviewed prior to the meeting. It would be helpful if paper submissions also include a three and one-half inch computer diskette in HTML, ASCII, Word or WordPerfect format (please specify version). Diskettes should be labeled with the name and organizational affiliation of the filer, and the name of the word processing program used to create the document. Alternatively, comments may be submitted electronically to spectrumadvisory@ntia.doc.gov. Comments provided via electronic mail may also be submitted in one or more of the formats specified above.

Records: NTIA is keeping records of all Committee proceedings. Committee records are available for public inspection at NTIA's office at the address above. Documents including the Committee's charter, membership list, agendas, minutes, and any reports are or will be available on NTIA's Committee web site at http://www.ntia.doc.gov/advisory/spectrum.

Dated: April 8, 2008.

Kathy D. Smith,

Chief Counsel, National Telecommunications and Information Administration.

[FR Doc. E8–7809 Filed 4–10–08; 8:45 am]

BILLING CODE 3510–60–S

DEPARTMENT OF ENERGY

Extension of Comment Period for the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Extension of Comment Period for the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement.

SUMMARY: On January 11, 2008, NNSA published a Notice of Availability and Public Hearings for the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement (Draft Complex Transformation SPEIS, DOE/EIS–0236–S4; 73 FR 2023). That notice invited public comment on the Draft Complex Transformation SPEIS through April 10, 2008. NNSA has extended the public comment period through April 30, 2008.

DATES: NNSA invites comments on the Draft Complex Transformation SPEIS through April 30, 2008. NNSA will consider comments received after this date to the extent practicable as it prepares the Final Complex Transformation SPEIS.

ADDRESSES: Written comments on the Draft Complex Transformation SPEIS, as well as requests for additional information and requests for copies of the Draft Complex Transformation SPEIS, should be directed to Mr. Theodore A. Wyka, Complex Transformation Supplemental PEIS Document Manager, Office of Transformation (NA–10.1), National Nuclear Security Administration, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585. Comments also may be submitted by facsimile to 1–703–931–9222, or by e-mail to *complex transformation@nnsa.doe.gov.* Please mark correspondence ''Draft Complex Transformation SPEIS Comments.''

SUPPLEMENTARY INFORMATION: On January 11, 2008, NNSA published a Notice of Availability and Public Hearings for the Draft Complex Transformation Supplemental Programmatic Environmental Impact Statement (Draft Complex Transformation SPEIS, DOE/EIS–0236–S4; 73 FR 2023). That notice invited public comment on the Draft Complex Transformation SPEIS through April 10, 2008. In response to public requests, NNSA has extended the public comment period through April 30, 2008. NNSA will consider comments received after this date to the extent practicable as it prepares the Final Complex Transformation SPEIS.

The Draft Complex Transformation SPEIS and additional information regarding complex transformation are available on the Internet at *http://www.ComplexTransformationSPEIS.com* and *http://www.nnsa.doe.gov.*

Issued in Washington, DC, on April 9, 2008.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. E8–7869 Filed 4–10–08; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. EL02–129–005]

Southern California Water Company; Notice of Compliance Filing

April 4, 2008.

Take notice that on March 24, 2008, formerly named Southern California Water Company tendered for filing in compliance with Commission's Order on Remand, issued February 21, 2008, to recalculate the cost-based rate ceiling applicable to the sale and compare it to the amount of the sale revenues.

Any person desiring to intervene or to protest this filing must file in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 CFR 385.211, 385.214). Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to

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Appendix G
NEPA DISCLOSURE STATEMENT

APPENDIX G

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *COMPLEX TRANSFORMATION SUPPLEMENTAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT*

CEQ Regulations at 40 CFR 1506.5(c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981 guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 8026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)." 46 FR 18026-18038 at 18031.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b) to assure consideration of your proposal).

(a) __X__ Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

<u>Financial or Other Interests</u>

1.

2.

3.

Certified by

____
Signature

Mark E. Smith, Vice President
Printed Name and Title

Tetra Tech, Inc.
Company

August 17, 2007
Date

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