Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AADT	annual average daily traffic
ACL	alternate concentration limit
ADT	average daily traffic
ANSI	American National Standards Institute
AWQC	ambient water quality criteria
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
cm/s	centimeters per second
dBA	A-weighted sound level (decibels)
dBV	velocity of decibels
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ECDC	East Carbon Development Corporation
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESC	Electric Systems Consultants
ft	feet
ft^2	square feet
ft^3	cubic feet
FLPMA	Federal Land Policy and Management Act
FR	*Federal Register*
FY	fiscal year
g/m^2	grams per square meter
gpm	gallons per minute
HEW	U.S. Department of Health, Education, and Welfare
ISV	in situ vitrification
IUC	International Uranium (USA) Corporation
K_d	distribution coefficient
kVA	kilovolt-amperes
LCF	latent cancer fatality
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
MBTA	Migratory Bird Treaty Act
MCL	maximum concentration limit
MEI	maximally exposed individual
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
$\mu g/m^3$	micrograms per cubic meter
µR/h	microroentgens per hour
mph	miles per hour
mrem/yr	millirem per year
mR/h	milliroentgens per hour
mV	millivolt

NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
PCBs	polychlorinated biphenyls
pCi/g	picocuries per gram
pCi/L	picocuries per liter
pCi/m^2-s	picocuries per square meter per second
PEIS	Programmatic Environmental Impact Statement (for the UMTRA Ground Water Project)
PM_{10}	particles less than 10 micrometers in aerodynamic diameter
PMF	probable maximum flood
ppm	parts per million
PSD	prevention of significant deterioration
Qal	Quaternary alluvium
RAA	remedial action agreement
RAP	remedial action plan
RCRA	Resource Conservation and Recovery Act
R_d	distribution ratio
REA	radiological and engineering assessment
RIMS II	Regional Input-Output Modeling System II
RME	reasonable maximum exposure
rms	root mean square
ROD	Record of Decision
RRM	residual radioactive materials
SCADA	Supervisory Control and Data Acquisition
SITLA	School and Institutional Trust Lands Administration
SOWP	site observational work plan
SPA	specially planned area
TDS	total dissolved solids
TEEL	Temporary Emergency Exposure Limit
TSCA	Toxic Substances Control Act
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality
UDOT	Utah Department of Transportation
UDWR	Utah Division of Wildlife Resources
UMTRA	Uranium Mill Tailings Remedial Action (Project)
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.C.	*United States Code*
USFS	U.S. Forest Service
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VPMIM	Vicinity Properties Management and Implementation Manual
yd^3	cubic yards

Measurements and Conversions

The following information is provided to assist the reader in understanding certain concepts in this document.

Units of Measurement

Most measurements in this report are presented in English units. Metric units are also used for measurements that are too small to be defined by English units or with data that were intended to be presented in metric units. Many metric measurements in this volume include prefixes that denote a multiplication factor that is applied to the base standard (for example, 1 centimeter = 0.01 meter). Table MC-1 presents these metric prefixes. Table MC-2 lists the mathematical values or formulas needed for conversion between metric and English units.

Table MC–1. Metric Prefixes

Prefix	Symbol	Multiplication Factor
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	$0.000\ 000\ 000\ 001 = 10^{-12}$

Table MC–2. Metric Conversion Chart

To Convert To Metric			To Convert From Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	0.3048	meters	meters	3.281	feet
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square feet	0.092903	square meters	square meters	10.7639	square feet
square miles	2.58999	square kilometers	square kilometers	0.3861	square miles
Volume					
gallons	3.7854	liters	liters	0.26417	gallons
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths then add 32	Fahrenheit
Mass					
tons (U.S.)	0.907	metric tons	metric tons	1.10	tons (U.S.)

Rounding

Some numbers have been rounded; therefore, sums and products throughout the document may not be consistent. A number was rounded only after all calculations using that number had been made. Numbers that are actual measurements were not rounded.

Scientific Notation

Scientific notation is based on the use of positive and negative powers of 10. A number written in scientific notation is expressed as the product of a number between 1 and 10 and a positive or negative power of 10.

Examples: 5,000 would be written as 5×10^{3} or 5E+3
0.005 would be written as 5×10^{-3} or 5E-3

Numbering Conventions

The following conventions were used for presenting numbers in the EIS text and tables:

- Numbers larger than 1 are expressed as whole numbers.
- Numbers between 10^{-1} and 10^{-2} are expressed in decimal form.

  Examples: 5×10^{-1} is expressed as 0.5
  5×10^{-2} is expressed as 0.05

- Numbers smaller than 10^{-3} are expressed in scientific notation.

1.0 Introduction

This chapter introduces the U.S. Department of Energy's (DOE's) proposal to remediate residual radioactive materials (RRM) at the Moab Uranium Mill Tailings Radiation Control Act (UMTRCA) site and nearby properties (known as vicinity properties) located in and near the city of Moab, Utah. It summarizes the alternatives being considered and the types and categories of materials and other waste that would be managed under the alternatives. This chapter also introduces background information, including the regulatory basis for the action, contaminants of potential concern, history of the site, and goals and standards.

DOE is proposing to clean up surface contamination and develop and implement a ground water compliance strategy to address contamination that resulted from historical uranium-ore processing at the Moab uranium mill tailings site (Moab site), Grand County, Utah. Pursuant to the National Environmental Policy Act (NEPA), 42 *United States Code* (U.S.C.) §§ 4321 et seq., DOE prepared this environmental impact statement (EIS) to assess the potential environmental impacts of remediating the Moab site and vicinity properties (properties where uranium mill tailings were used as construction or fill material before the hazard associated with this material was known). As described in more detail in subsequent chapters, DOE analyzed the potential environmental impacts of both on-site and off-site remediation and disposal alternatives involving both surface materials and ground water contamination. DOE also analyzed the No Action alternative as required by NEPA implementing regulations promulgated by the Council on Environmental Quality (Title 40 *Code of Federal Regulations* [CFR] Part 1502.14[d]).[†]

1.1 Regulatory Requirements

In 1978, Congress passed UMTRCA, 42 U.S.C. §§ 7901 et seq., in response to public concern regarding potential health hazards of long-term exposure to radiation from uranium mill tailings. Title I of UMTRCA requires DOE to establish a remedial action program and authorizes DOE to stabilize, dispose of, and control uranium mill tailings and other contaminated material at 24 uranium-ore processing sites and associated vicinity properties. UMTRCA also directed the U.S. Environmental Protection Agency (EPA) to promulgate cleanup standards (now codified at 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings") and assigned the U.S. Nuclear Regulatory Commission (NRC) to oversee the cleanup and license the completed disposal cells. Chapter 7.0 contains additional information regarding UMTRCA requirements.

In October 2000, the Floyd D. Spence National Defense Authorization Act (Floyd D. Spence Act) for fiscal year (FY) 2001 (Public Law 106-398) amended UMTRCA Title I (which expired in 1998 for all other sites except for ground water remediation and long-term radon management), giving DOE responsibility for remediation of the Moab site. That act also mandates that the Moab site be remediated in accordance with UMTRCA Title I "subject to the availability of appropriations for this purpose" and requires that DOE prepare a remediation plan to evaluate the costs, benefits, and risks associated with various remediation alternatives. The act further stipulates that the draft plan be presented to the National Academy of Sciences (NAS) for

Substantive changes made to the text of the EIS between draft and final have been marked with sidebars in the margins.

[†]In this EIS, "contaminant" or "contamination" refers to RRM, unless specified otherwise. RRM is defined by UMTRCA and the implementing regulations in 40 CFR 192 as (1) waste that DOE determines to be radioactive in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores and (2) other wastes that DOE determines to be radioactive at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials. Contaminated materials include soils, tailings, facility components, buildings or building materials, equipment, and other wastes. Contaminated ground water is ground water in the uppermost aquifer contaminated with RRM.

review. NAS is directed to provide "technical advice, assistance, and recommendations" for remediation of the Moab site. Under the act, the Secretary of Energy is required to consider NAS comments before making a final recommendation on the selected remedy. If the Secretary prepares a remediation plan that is not consistent with NAS recommendations, the Secretary must submit a report to Congress explaining the reasons for deviating from those recommendations.

DOE's *Preliminary Plan for Remediation* (DOE 2001) for the Moab site was completed in October 2001 and forwarded to NAS. After reviewing the draft plan, NAS provided a list of recommendations on June 11, 2002, for DOE to consider during its assessment of remediation alternatives for the Moab site. DOE has addressed the NAS recommendations in its internal scoping, in this EIS, and in supporting documents. Section 2.7.2 summarizes the NAS comments and provides a cross reference to sections of the EIS that address the issues raised by NAS. As published in the Notice of Intent, this EIS takes the place of a final plan for remediation for the purpose of supporting decision-making for remediation of the Moab site.

1.2 Background

As shown on Figure 1–1, the Moab site lies approximately 30 miles south of Interstate 70 (I-70) on U.S. Highway 191 (US-191) in Grand County, Utah. The 439-acre site is located about 3 miles northwest of the city of Moab (Figure 1–2) on the west bank of the Colorado River at the confluence with Moab Wash. The site is bordered on the north and southwest by steep sandstone cliffs. The Colorado River forms the eastern boundary of the site. US-191 parallels the northern site boundary, and State Road 279 (SR-279) transects the west and southwest portion of the property. The Union Pacific Railroad traverses a small section of the site just west of SR-279, then enters a tunnel and emerges about 1.5 miles to the southwest. Arches National Park has a common property boundary with the Moab site on the north side of US-191, and the park entrance is located less than 1 mile northwest of the site. Canyonlands National Park is located about 12 miles to the southwest.

1.2.1 History of the Site

The Moab site is the site of a former uranium-ore processing facility that was owned and operated by the Uranium Reduction Company and later the Atlas Minerals Corporation (Atlas) under a license issued by NRC. The mill ceased operations in 1984 and has been dismantled except for one building that DOE currently uses for maintenance and storage space. During its years of operation, the facility accumulated approximately 10.5 million tons of uranium mill tailings that are present on the site as a 130-acre tailings pile. Uranium mill tailings are naturally radioactive residue from the processing of uranium ore. Although the milling process recovered about 95 percent of the uranium, the residues, or tailings, contain several naturally occurring radioactive elements, including uranium, thorium, radium, polonium, and radon. The unreclaimed tailings at the Moab site contain contaminants at levels above the EPA standards in 40 CFR 192.

Decommissioning of the mill began in 1988, and an interim cover was placed on the tailings pile between 1989 and 1995. In 1996, Atlas submitted a reclamation plan and an application to NRC for an amendment to its existing NRC license (No. SUA-917) to allow for reclamation of the site. Under the license amendment, Atlas was required to reclaim the tailings impoundment in accordance with the October 1996 submittal to NRC titled *Final Reclamation Plan, Atlas Corporation Uranium Mill and Tailings Disposal Area* (Smith 1996).

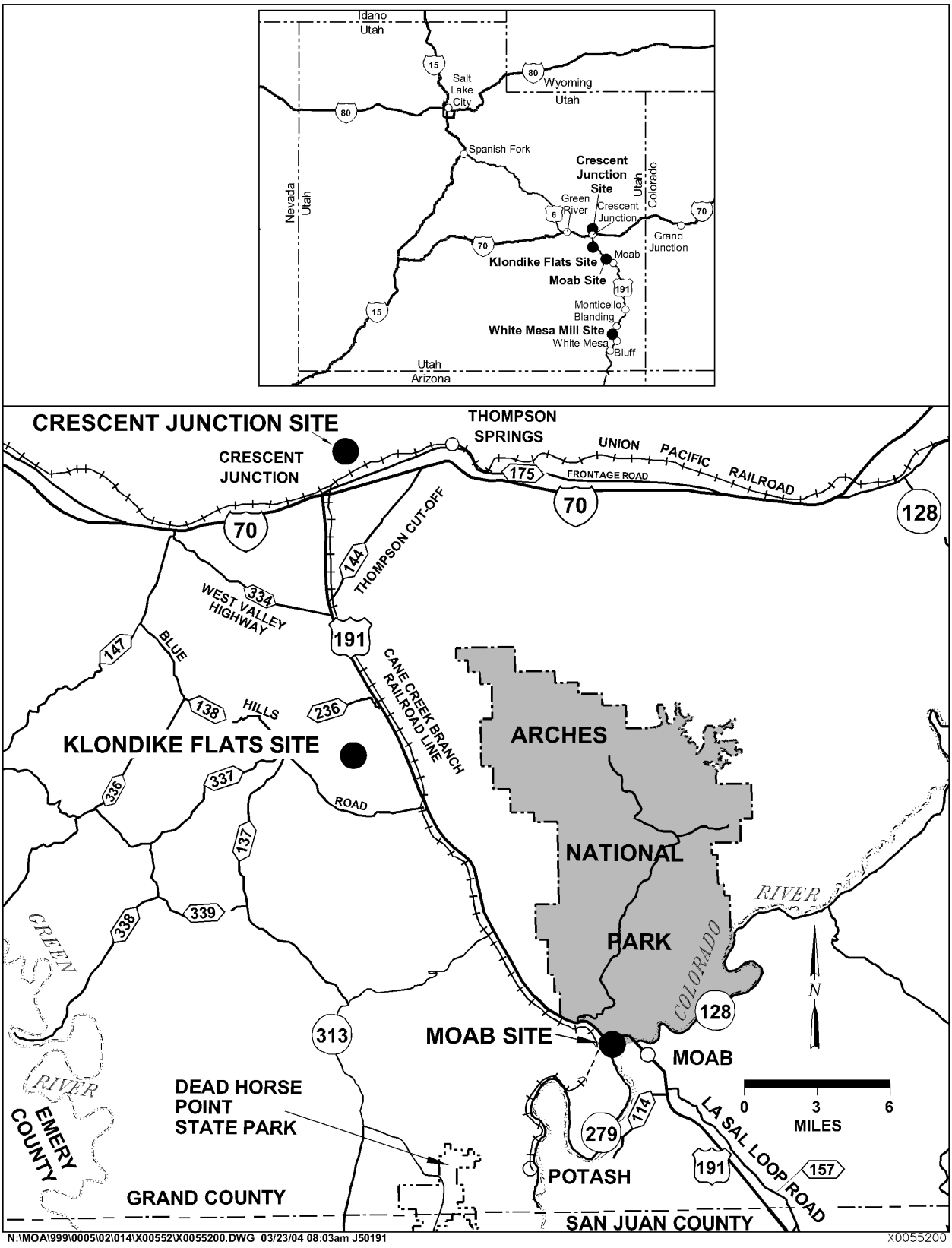

Figure 1–1. Location of the Moab Site in Grand County, Utah

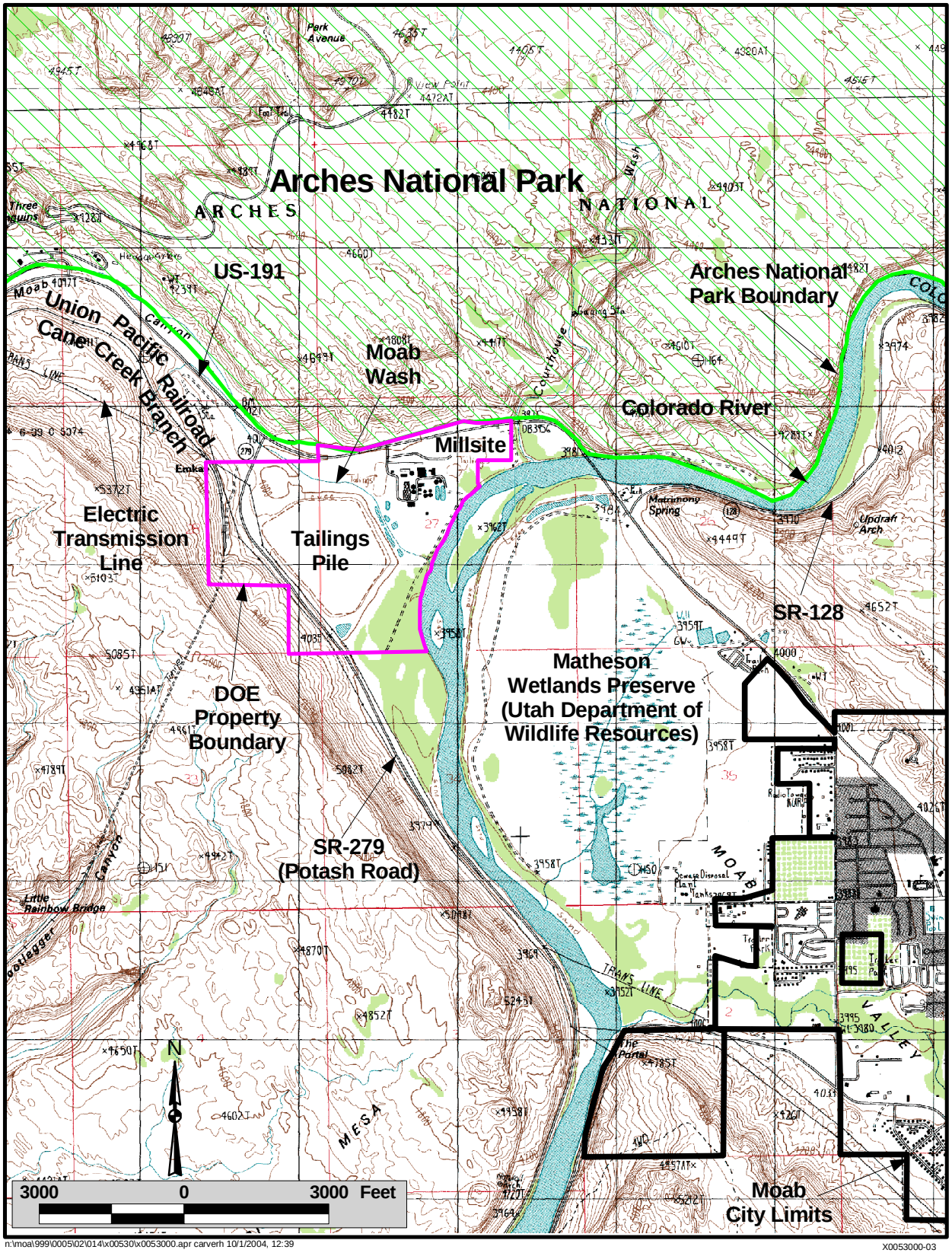

Figure 1–2. Location of the Moab Site in Relation to the City of Moab

The amendment to the NRC license also required preparation of an EIS to assess potential impacts from the 1996 reclamation plan. However, Atlas filed for bankruptcy in September 1998, prior to completing the EIS. In March 1999, a trust was created to fund future reclamation and site closure. Atlas was released from all future liability with respect to the uranium mill facilities and tailings impoundment at the Moab site. The bankruptcy court appointed NRC and the Utah Department of Environmental Quality (UDEQ) beneficiaries of the Atlas bankruptcy trust. Later, the beneficiaries selected PricewaterhouseCoopers to serve as trustee.

In 1999, NRC completed the *Final Environmental Impact Statement Related to Reclamation of the Uranium Mill Tailings at the Atlas Site, Moab, Utah* (NRC 1999), which proposed stabilizing the tailings pile in place. The final EIS received numerous comments both in favor of and opposed to the proposed action. However, the EIS did not address ground water compliance or remediation of vicinity properties. NRC documented U.S. Fish and Wildlife Service (USF&WS) concerns regarding the effects of contaminants reaching the Colorado River; specifically, the effects on four endangered fish species and critical habitat (in 1998, USF&WS had concluded in a Final Biological Opinion that continued leaching of existing concentrations of ammonia and other constituents into the Colorado River would jeopardize the razorback sucker and Colorado pikeminnow [USF&WS 1998]).

To minimize potential adverse effects to human health and the environment in the short term, former site operators, custodians, and DOE instituted environmental controls and interim actions at the Moab site. Controls have included storm water management, dust suppression, pile dewatering activities, and placement of an interim cover on the tailings to prevent movement of contaminated windblown materials from the pile. Interim actions have included restricting site access, monitoring ground water and surface water, and managing and disposing of legacy chemicals to minimize the potential for releases to the environment. A pilot-scale ground water extraction system was implemented in summer 2003, which continues to reduce the mass of ground water contaminants discharging to the Colorado River and thereby reduce ammonia and uranium concentrations discharging to the river.

Federal and state regulatory agencies have expressed concerns about the effects of disposing of contaminated materials at the site and the effects of contaminated ground water entering the Colorado River. Stakeholders, including local and state governments, environmental interest groups, and downstream users of Colorado River water, have also expressed concerns.

1.2.2 Current Status of the Site

The tailings are located in a 130-acre unlined tailings impoundment (pile) that occupies much of the western portion of the site. The tailings pile averages 94 feet (ft) above the Colorado River floodplain (4,076 ft above mean sea level) and is about 750 ft from the Colorado River. The pile was constructed with five terraces and consists of an outer compact embankment of coarse tailings, an inner impoundment of both coarse and fine tailings, and an interim cover of soils taken from the site outside the pile area. Debris from dismantling the mill buildings and associated structures was placed in an area at the south end of the pile and covered with contaminated soils and fill. Radiation surveys indicate that some soils outside the pile also contain radioactive contaminants at concentrations above the EPA standards in 40 CFR 192.

Besides tailings and contaminated soils, other contaminated materials requiring cleanup include ponds used during ore-processing activities, disposal trenches, and other locations used for waste management during mill operations. DOE estimates the contaminated material at the Moab site and vicinity properties has a total mass of approximately 11.9 million tons and a volume of approximately 8.9 million cubic yards (yd^3). Evidence indicates that historical building materials may contain asbestos.

Ground water in the shallow alluvium at the site was also contaminated by milling operations. The Colorado River adjacent to the site has been negatively affected by site-related contamination, mostly because of ground water discharge. Concentrations of several site contaminants in ground water at the Moab site are above appropriate standards or benchmarks for aquatic organisms and may be affecting fish species protected under the Endangered Species Act. A Biological Assessment, which evaluates the effects of these contaminants and the proposed actions on protected species, and a thorough screening of contaminants are provided in Appendixes A1 and A2, respectively. Through the screening process, five contaminants of potential concern have been identified: ammonia, copper, manganese, sulfate, and uranium. However, ammonia is the key contaminant driving the proposed ground water action because of its high concentrations in the tailings seepage and ground water and its toxicity to aquatic organisms (EPA 1999). The USF&WS Biological Opinion, Appendix A3, concurred with DOE's determination that endangered species would not be jeopardized if the preferred alternative is selected in the Record of Decision (ROD).

In addition to the contaminated material at the Moab site, approximately 39,700 tons of contaminated materials are estimated to have been used as construction material or fill at homes, businesses, public buildings, and vacant lots in and near Moab (see Section 2.1.2). As a result, these vicinity properties have elevated levels of radiation. On the basis of past surveys that identified 130 potential sites, and for purposes of analysis in this EIS, DOE has assumed that 98 vicinity properties would need to be remediated. However, additional characterization would be necessary to identify the current number and locations of vicinity properties. In accordance with the requirements of UMTRCA, DOE is obligated to remediate those properties where contaminant concentrations exceed the limits in 40 CFR 192, along with the Moab site.

1.3 Purpose and Need for Agency Action

The Moab site and vicinity properties near Moab, for which DOE has been given responsibility, contain contaminated materials in concentrations that exceed 40 CFR 192 concentration limits and present a current and long-term potential source of risk to human health and the environment. DOE needs to take action to remediate the Moab site in accordance with UMTRCA Title I to fulfill its responsibilities under Public Law 106-398. Accordingly, DOE, with the assistance of its cooperating agencies (see Section 1.6), prepared this EIS to analyze the existing risks and compare and analyze reasonable alternatives available to control, reduce, or eliminate risks to the extent practicable. This EIS will be used to inform decision makers and the public prior to deciding upon a final course of action or taking any action that may represent an irreversible commitment of resources.

1.4 Alternatives

DOE is proposing (1) to remediate approximately 11.9 million tons of contaminated materials located on the Moab site and approximately 39,700 tons located on vicinity properties and (2) to develop a ground water compliance strategy for the Moab site using the framework of the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996). The range of reasonable surface remediation alternatives includes both on-site and off-site disposal of the contaminated materials.

For both the on-site and off-site disposal alternatives, DOE must demonstrate that the combination of engineered controls (e.g., disposal cell cover and liner systems), institutional controls, and custodial care performed as part of the long-term surveillance and maintenance activities required under UMTRCA would ensure long-term protection of public health and the environment.

Institutional Controls are used to limit or eliminate access to, or uses of, land, facilities, and other real and personal property to prevent inadvertent human and environmental exposure to residual contamination and other hazards. These controls maintain the safety and security of human health and the environment and of the site itself. Institutional controls may include legal controls such as zoning restrictions and deed annotations and physical barriers such as fences and markers. Also included are methods to preserve information and data and to inform current and future generations of the hazards and risks.

DOE Policy 454.1 (DOE 2003)

1.4.1 On-Site Disposal Alternative

The on-site disposal alternative would involve placing contaminated site materials and materials from vicinity properties on the existing tailings pile and stabilizing and capping the tailings pile in place. DOE would design the cap to meet EPA standards in 40 CFR 192 for longevity and radon releases, using DOE's experience with disposal cell covers at other uranium mill tailings disposal sites. Final design and construction would meet the requirements of disposal cells under all applicable EPA and NRC standards. Flood protection would be constructed along the base of the pile, and cover materials for radon attenuation and erosion protection would be brought to the site from suitable borrow areas.

Following completion of the on-site disposal cell, the area outside the cell would be recontoured, reclaimed, and revegetated. The disposal cell would be enclosed and protected by a security chain-link fence around its perimeter to discourage access.

Remediation of contaminated materials on the site and at vicinity properties is estimated to take 7 to 10 years to complete and to cost approximately $166 million. This cost and time estimate does not include the long-term operations and maintenance associated with ground water remediation (see Section 1.4.3). Section 2.7.3 and Table 2–35 provide a detailed characterization of the estimated costs of each alternative and transportation mode.

1.4.2 Off-Site Disposal Alternative

For this alternative, DOE would remove contaminated materials from the Moab site and transport them to another location for disposal. Approximately 11.9 million tons of contaminated material would be removed from the site. This total consists of the estimated 10.5-million-ton tailings pile; an estimated 600,000 tons of soil that was placed on top of the pile; 566,000 tons of subpile soil (assumed to be 2 ft thick); 234,000 tons of off-pile contaminated site soil; and 39,700 tons of vicinity property material that would be brought to the Moab site before shipment to an off-site location.

DOE has identified three sites in Utah as alternative off-site disposal sites: Klondike Flats site, near Moab; Crescent Junction site, near the town of Crescent Junction and 30 miles east of Green River; and the White Mesa Mill site south of Blanding and north of the town of White Mesa (see Figure 1–1 inset). The Klondike Flats and Crescent Junction sites are location alternatives where new disposal cells could be constructed; the White Mesa Mill site is an existing facility that could receive the contaminated materials.

Klondike Flats—Klondike Flats is a low-lying plateau about 18 miles northwest of the Moab site, just northwest of the Canyonlands Field Airport and south-southeast of the Grand County landfill. The Klondike Flats site consists of undeveloped lands administered by the Bureau of Land Management (BLM) and the State of Utah School and Institutional Trust Lands Administration (SITLA).

Crescent Junction—The Crescent Junction site is approximately 30 miles northwest of the Moab site and 30 miles east of Green River, just northeast of Crescent Junction. The site also consists of undeveloped land administered by BLM and interspersed with lands owned by the State of Utah.

White Mesa Mill—The White Mesa Mill site is approximately 85 miles south of the Moab site, 4 miles from the community of White Mesa and the Ute Mountain Ute Reservation and 6 miles from the city of Blanding in San Juan County, Utah. This commercial mill is owned by the International Uranium (USA) Corporation (IUC) and disposes of uranium-bearing materials on site in lined ponds. It has been in operation since 1980. Although the facility has an NRC-issued license to receive, process, and permanently dispose of uranium-bearing material, it would need a license amendment from the State of Utah before it could accept material from the Moab site. (Effective August 16, 2004, NRC transferred to the State of Utah the responsibility for licensing, including inspection, enforcement, and rule-making activities for commercial uranium and thorium milling operations, mill tailings, and other wastes at the milling sites). Also, expansion of the existing facility would be necessary. The mill has the potential to process materials from the Moab site to extract valuable constituents and then dispose of the residues on the site or to dispose of the material without processing. At this time, IUC has indicated that it may process water used for slurry transport (one of the potential transportation modes) but would not reprocess tailings. However, because the potential for wastewater processing is uncertain and the quantity and value of recoverable materials is unknown, no potentially offsetting costs were assumed for this alternative.

Under the off-site disposal alternative, three transportation modes are evaluated: truck, rail, and slurry pipeline for some or all of the off-site disposal locations.

Truck Transport—Trucks would use US-191 as the primary transportation route for hauling contaminated materials to the selected disposal site. Trucks would be used exclusively for hauling borrow materials to the selected disposal site. Construction of highway entrance and exit facilities could be required to safely accommodate the high volume of traffic currently using this highway.

Rail Transport—An existing rail line (Cane Creek Branch) runs from the Moab site north along US-191 and connects with the main east-west Union Pacific Railroad line near I-70. The Klondike Flats and Crescent Junction sites could be served with this rail line with upgrades and additional rail sidings. There is no rail access from the Moab site to the White Mesa Mill site.

Construction of a rail line from the Moab site to White Mesa Mill was not analyzed because of technical difficulties, potential impacts, and high cost.

Slurry Pipeline—This transportation mode would require the construction of a new pipeline from the Moab site to the selected disposal site and a water line to recycle the slurry water back to Moab for reuse in the pipeline.

As with the on-site disposal alternative, an off-site disposal cell would be enclosed and protected by a security chain-link fence around its perimeter to discourage access. Potential for future use outside the security fence would be evaluated after completion of remedial actions. Once the tailings were removed, the Moab site would be reclaimed by recontouring and revegetating. Future use of the site would be evaluated after completion of remedial action.

The off-site disposal of contaminated materials, including those from vicinity properties, is estimated to take up to 8 years to complete and to cost $329 million to $393 million for the closest site (Klondike Flats) and $418 million to $464 million for the farthest site (White Mesa Mill), depending upon the transportation mode selected. These cost and time estimates do not include the long-term operations and maintenance associated with ground water remediation (see Section 1.4.3). Section 2.7.3 and Table 2–35 provide a detailed characterization of the estimated costs of each alternative and transportation mode.

1.4.3 Ground Water Remediation

As part of its UMTRCA responsibilities, DOE established a Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project and prepared the UMTRA Ground Water PEIS (DOE 1996) and ROD (62 *Federal Register* [FR] 22913 [1997]). The PEIS described and the ROD adopted a ground water remediation framework that takes into consideration human health and environmental risk, stakeholder input, and cost. In applying the framework, DOE assesses ground water compliance in a step-by-step approach, beginning with consideration of a no-remediation strategy and proceeding, if necessary, to consideration of passive strategies, such as natural flushing with compliance monitoring and institutional controls, and finally to consideration of more complex, active ground water remediation methods or a combination of strategies (such as pump and treat), if needed.

Ground Water Compliance Strategies

Supplemental Standards are essentially a narrative exemption from remediating ground water to prescriptive numeric standards (background concentrations, maximum concentration limits [MCLs], or alternate concentration limits [ACLs]), if one or more of the eight criteria in 40 CFR 192.21 are met. At the Moab site, the applicable criterion is limited-use ground water, (40 CFR 192.21[g]), which means that ground water has naturally occurring total dissolved solids (TDS) concentrations greater than 10,000 milligrams per liter (mg/L), and widespread TDS contamination is not related to past milling activities at the site. The PEIS (DOE 1996) also discusses supplemental standards within the context of "no ground water remediation." However, guidance in 40 CFR 192.22 directs that where the designation of limited-use ground water applies, remediation shall "assure, at a minimum, protection of human health and the environment."

No Remediation means that no ground water remediation is necessary because ground water concentrations meet acceptable standards. No remediation under the PEIS is not the same as No Action under NEPA, because actions such as site characterization would be required to demonstrate that no remediation is warranted.

Natural Flushing means allowing the natural ground water movement and geochemical processes to decrease contaminant concentrations.

Active Remediation means the use of active ground water remediation methods such as gradient manipulation, ground water extraction and treatment, or in situ ground water treatment to restore ground water quality to acceptable levels.

On the basis of this methodology and site-specific modeling, DOE's proposed action for ground water at the Moab site would involve the application of ground water supplemental standards and implementation of an active remediation system to intercept and control discharge of contaminated ground water to the Colorado River. Because of its naturally high salt content, the uppermost aquifer at the Moab site does not represent a potential source of drinking water. However, discharge of contaminated ground water has resulted in elevated concentrations of ammonia and other site-related constituents in a portion of the Colorado River near the Moab site. These concentrations pose no risk to humans, but ammonia concentrations exceed ammonia levels considered to be protective of aquatic life. Therefore, the cleanup objective of the proposed ground water action is to protect the environment, particularly endangered species of fish, which are known to use that portion of the river. Active remediation would be necessary to meet this goal.

The active remediation system would extract and treat ground water while natural processes act on the ground water system to decrease contaminant concentrations to the long-term protective goals. Active remediation would cease after long-term goals were achieved. Conceptually, the same system would be installed and operated at the Moab site regardless of whether the on-site or off-site disposal alternative was implemented. An extraction well system developed as an interim ground water remedial action in 2003 could become a part of the extraction system envisioned under the proposed ground water action.

Section 2.3.1.3 provides additional background on the ground water compliance strategy selection process and more specific cleanup objectives for the ground water. Uncertainties affecting the ability of the proposed ground water remediation to meet specific cleanup objectives are discussed in Section 2.3.3. Section 2.3.2.3 provides further details regarding construction and operation of the proposed ground water action.

It would cost approximately $10.75 million to design and construct a ground water remediation system under either the on-site or off-site disposal alternative and approximately $906,000 annually to operate and maintain it. Construction would be completed approximately 5 years after issuance of a ROD. The system would operate for 75 to 80 years. The cost and schedule for designing and constructing a ground water remediation system under an off-site disposal alternative would be the same as for the on-site disposal alternative. Section 2.7.3 and Table 2–35 provide a detailed characterization of the estimated costs of each alternative and transportation mode.

1.4.4 No Action Alternative

This alternative is analyzed to provide a basis for comparison to the action alternatives and is required by NEPA regulations (40 CFR 1502.14[d]).

Under the No Action alternative, DOE would not remediate contaminated materials either on the site or at vicinity properties. The existing tailings pile would not be covered and managed in accordance with UMTRCA standards. No short-term or long-term site controls or activities to protect human health and the environment would be continued or implemented. Public access to the site is assumed to be unrestricted. All site activities, including operation and maintenance, would cease.

Initial and interim ground water actions would not be continued or implemented. The No Action alternative would include stopping all ongoing and planned activities designed to protect endangered species and control discharge of contaminated ground water to the Colorado River. No further media sampling or characterization of the site would take place.

A compliance strategy for contaminated ground water beneath the site would not be developed in accordance with UMTRCA standards. No institutional controls would be implemented to restrict use of ground water, and no long-term stewardship and maintenance would take place. Because no activities would be budgeted or scheduled at the site, no further initial, interim, or remedial action costs would be incurred. DOE recognizes that this scenario would be highly unlikely; however, it has been included as part of the EIS analyses to provide a basis for comparison to the action alternatives in the EIS. Section 2.7.3 and Table 2–35 provide a detailed characterization of the estimated costs of each alternative and transportation mode.

1.4.5 Preferred Alternatives

On the basis of the analysis documented in the EIS, the comments received during the public comment period on the draft EIS, and other factors, DOE has determined that its preferred alternatives are the off-site disposal of the Moab uranium mill tailings pile, combined with active ground water remediation at the Moab site. The preferred off-site disposal location is the Crescent Junction site, and the preferred method of transportation is rail. The following discussion provides additional details regarding the basis for the identification of the preferred alternatives. The identification of the preferred alternatives, required by NEPA regulations in 40 CFR 1502.14(e), is not the agency's decision. Rather, DOE's decision will be reported in a ROD that will state the final decision, identify the alternatives considered by DOE in reaching its decision, specify the alternative or alternatives that were considered to be environmentally preferable, and state whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted (40 CFR 1505.2). The ROD will be issued no sooner than 30 days following publication of the EPA Notice of Availability of the final EIS.

1.4.5.1 Off-Site Disposal

DOE identified off-site disposal as one of its preferred alternatives for disposal of mill tailings primarily because of the uncertainties related to long-term performance of a capped pile at the Moab site. Issues such as the potential for river migration and severe flooding contributed to this uncertainty. Although DOE has concluded that the Colorado River will generally migrate southeastward away from the pile, DOE also acknowledges the uncertainty in this interpretation and recognizes that the State of Utah and other commentors disagree with this position. A Colorado River 100- or 500-year flood could also release additional contamination to ground water and surface water under the on-site disposal alternative, although DOE believes this contaminant release mechanism would be minimal and would not create an unacceptable risk to receptors in the Colorado River adjacent to the site. In addition, it is known that under the on-site disposal alternative, natural basin subsidence would result in permanent tailings contact with the ground water in 7,000 to 10,000 years; at that time, surface water concentrations could revert to levels that are not protective of aquatic species in the Colorado River.

Under the off-site disposal alternatives, contaminant concentrations in ground water under the Moab site would, under natural conditions, return to protective levels in approximately 75 years and to background levels after 150 years. By comparison, under the on-site disposal alternative, the tailings pile could be a continuing source of contamination that would maintain contaminant concentrations above background concentrations in the ground water.

Crescent Junction Site

The Crescent Junction site was identified as the preferred off-site disposal location because it has the longest isolation period (time in which contaminants could reach the ground water); the lowest land-use conflict potential (although DOE would need to work with holders of existing mineral leases to mitigate any possible impacts); the shortest haul distance from the rail rotary dump into the disposal cell, reducing the size of the radiological control area; and flat terrain, making operations easier and safer. In comparison, the Klondike Flats location would require the construction of a new public access road parallel to Blue Hills Road and a 1- to 4-mile truck haul road that would traverse the steep bluffs (20- to 30-percent grade) north of Blue Hills Road. The truck haul road would require radiological controls from a rail spur to the disposal cell site. These actions would be adjacent and visible to public access, could temporarily adversely affect recreational use of the local area, and could cause visual impacts to users of the northern areas of Arches National Park.

Of the three alternative off-site locations, the White Mesa Mill alternative would require the greatest distance for transportation; would have the greatest potential for adversely affecting cultural resources and traditional cultural properties at the site and along a slurry pipeline corridor; and would have the shortest isolation period. Implementation of that alternative using truck transportation would cause extensive adverse traffic impacts in the cities of Moab, Monticello, and Blanding. This off-site alternative would also be the most expensive because of its greater distance from the Moab site.

Rail Transportation

DOE identified rail as the preferred mode of transportation because compared to truck transportation, rail has a lower accident rate, lower potential impacts to wildlife (including threatened and endangered species), and lower fuel consumption. Compared to a slurry pipeline, rail transportation would have a much lower water demand and would avoid landscape scars caused by pipeline construction, which could create moderate contrasts in form, line, color, and texture with the surrounding landscape.

1.4.5.2 Active Ground Water Remediation

An active ground water remediation system would extract and dispose of contaminated ground water while natural processes act on ground water to decrease contaminant concentrations to meet long-term protective ground water cleanup goals. Active remediation would cease after long-term goals were achieved. Active ground water remediation was identified as a preferred alternative because the No Action alternative would not meet compliance goals for human health and safety and protection of the environment.

1.4.6 DOE Decision-Making

DOE will consider the results of analyses provided in this EIS; the uncertainties in those analyses, including the responsible opposing views; the relative costs of the alternatives; and other factors, such as public and agency comments on the draft EIS, in its final decision-making for remediation of the Moab site and vicinity properties. DOE's ROD will be based on these considerations and will be formally announced by DOE, published in the *Federal Register*, and distributed to all interested parties.

DOE is planning on a tiered decision-making process based on this EIS. It is anticipated that in the ROD that will be issued after publication of the final EIS, DOE will determine whether it will propose that Congress appropriate funds (1) to consolidate the mill tailings and other contaminated materials on-site and close the site with an NRC-approved cap or (2) to move the pile (including contaminated material from vicinity properties) to an off-site location for final capping and disposal. If the selected remedy is off-site disposal of contaminated material, DOE would identify the specific off-site location and the transportation mode that would be used to move the contamination to that location. As a part of its decision, DOE would also identify a strategy for remediation of the contaminated ground water under the Moab site but would defer selection of the specific remediation technologies until after a decision regarding the remediation of the Moab site.

Upon completion of this EIS and the ROD, DOE will develop a remedial action plan for remediation of contaminated materials. The remedial action plan will provide the detailed engineering reclamation design and incorporate a ground water compliance strategy and corrective actions. NRC would need to approve the remedial action plan; no additional NEPA analysis or documentation would be required for that approval.

DOE possesses sufficient information for an understanding of the potential environmental impacts of each alternative. With respect to off-site disposal sites, however, additional site-specific testing and evaluation may be required to provide data relevant to final design, although additional NEPA documentation is not expected. For example, final selection of a disposal cell location within the large areas assessed at the Klondike Flats or Crescent Junction sites would require more detailed study of geology, hydrology, engineering logistics, and other environmental factors. These evaluations could involve intrusive investigation of surface and subsurface conditions and could include site-specific cultural or archaeological surveys and other sampling. Similarly, a final selection of the soil borrow areas would require confirmatory sampling of borrow material characteristics and could also entail other site-specific environmental sampling. Should DOE select a pipeline for its transportation mode for off-site disposal, final alignment of a pipeline within the corridors assessed in this EIS would also require further route-specific characterization.

Decisions on future uses of the Moab site and a slurry pipeline (should it be selected) will not be a part of DOE's near-term decisions. For a determination on the future uses of the Moab site, a final decision on surface and subsurface remediation must be made and implemented and its success evaluated before the feasibility of future uses can be reasonably evaluated. Similarly, future uses of a slurry pipeline for water transportation would be predicated first on a decision to use a slurry pipeline and a determination, after tailings shipment was completed, that a radiological release of the pipeline for such a use would be acceptable. DOE has determined that these decisions are several years in the future and are, therefore, too speculative at this time to allow for meaningful assessment in this EIS. DOE would conduct NEPA reviews for these future decisions at the appropriate time.

In accordance with the implementing regulations for NEPA (40 CFR 1502.9[c][1] and 10 CFR 1021.314), DOE would reassess the adequacy of this EIS to support future decisions on a case-by-case basis and complete a Supplement Analysis if warranted. Because several of these future decisions would involve actions on land currently administered by BLM, a cooperating agency in the preparation of this EIS, DOE would work closely with BLM to ensure that any future NEPA documentation would meet the needs of both agencies.

1.5 Public and Agency Involvement

DOE's NEPA process includes multiple opportunities for public involvement in agency decision-making. The public scoping process allowed members of the public to suggest alternatives and issues to be analyzed in the EIS. Following issuance of the draft EIS, DOE provided a 90-day public comment period during which members of the public and agencies submitted comments regarding the EIS.

Section 1.5.1 describes the scoping process. Section 1.5.2 identifies the issues raised during scoping that helped shape the analyses of the draft EIS. Section 1.5.3 describes the process used to solicit and respond to comments on the draft EIS. Section 1.5.4 discusses the major issues raised by commentors and addressed by DOE in finalizing the EIS.

1.5.1 Scoping

In a Notice of Intent published in the *Federal Register* on December 20, 2002 (67 FR 77969), DOE sought public comment on the scope of the EIS. The public scoping process, conducted in winter of 2003, was an opportunity for the public to assist DOE in determining the alternatives and issues for analysis. As part of this process, DOE held six public scoping meetings to facilitate dialogue between DOE and the public and to provide an opportunity for individuals to provide written or oral statements, ask questions, and discuss concerns regarding the EIS with DOE officials.

DOE received 175 public scoping comment documents in the form of letters, electronic mail (e-mail) messages, facsimiles, and oral statements. Copies of the scoping presentations, scoping comments, and other project documents are available on the Internet at http://gj.em.doe.gov/moab/. In addition, copies of written comments and transcripts of oral comments are available at the following locations:

Grand County Library
25 South 100 East
Moab, UT 84532
Phone (435) 259-5421
Hours: 9–9, Mon–Fri

White Mesa Ute
Administrative Building
(off US-191)
White Mesa, UT 84511
Phone (435) 678-3397
Hours: 12–7, Mon–Thurs; 2–6, Fri

Blanding Branch Library
25 West 300 South
Blanding, UT 84511
Phone (435) 678-2355
Hours: 8–4:30, Mon–Fri

U.S. Department of Energy
Technical Library
2597 B ¾ Road
Grand Junction, CO 81503
Phone (970) 248-6089
Hours: 8–4, Mon–Fri

Public participation during the scoping period is summarized below:

- Oral comments at six public meetings (251 people signed the attendance sheets).
  - Green River, January 21, 2003 (12 people)
  - Moab, January 22, 2003 (49 people)
  - Blanding, January 23, 2003 (60 people)
  - Blanding meeting with the members of the Navajo Nation, January 23, 2003 (32 people)
  - White Mesa, January 23, 2003 (50 people)
  - East Carbon, Utah, January 28, 2003 (48 people)
- Written comments (letters, postcards, e-mail) received from 175 individuals, groups, and state, local, and tribal agencies.
- Oral comments (by telephone) received from 50 individuals, groups, and state, local, and tribal agencies.

1.5.2 Issues/Concerns Raised During Scoping

DOE has considered all the comments received during the public scoping process and has addressed the issues and concerns raised to the fullest extent possible in this EIS. The following is a summary of the scoping comments received. The reader is referred to Table 1–1 following this summary for the specific locations within the EIS where issues relevant to the scope of the EIS have been addressed.

1. DOE Decision-Making Process

Commentors stated that DOE's decision regarding the uranium mill tailings pile in Moab should be based on science and sound and impartial evidence, not emotion. Other commentors wondered what decision would be made on the basis of this EIS and whether a subsequent NEPA document would be prepared if an off-site location were selected. Some commentors questioned the value of public comments and asked how DOE would use the public comments received. Commentors also encouraged DOE to evaluate long-term effects and solutions. One commentor asked if a cleanup contract had already been signed.

2. Public Scoping Process

Commentors stated that there were problems with the scoping process, including lack of notice, lack of information, problems with the website and the toll-free telephone line, absence of a court reporter to transcribe comments, and absence of translators for meetings attended by members of the Ute Mountain Ute Tribe and the Navajo Nation. Commentors asked for additional reading rooms in White Mesa, Green River, Blanding, and East Carbon and asked that additional information be made available in the reading rooms and on the website (for example, regulations cited, the White Mesa Mill proposal, and NAS comments). Commentors also asked that the public scoping period be extended beyond February 14, 2003, and that DOE work with Tribal Councils. The Ute Mountain Ute Tribe requested that another informational meeting be held in White Mesa, Utah.

3. Cooperating Agencies

Commentors stated that Grand County and other affected local communities should be asked to be cooperating agencies. EPA, Grand County, and San Juan County also indicated interest in or asked to be cooperating agencies. One commentor disagreed with the Navajo Nation's decision not to be a cooperating agency, and another commentor asked for a list of cooperating agencies and contacts.

4. Moab Site/On-Site Disposal Alternative

a. Commentors stated that materials other than mill tailings (barrels, acid, and debris) may have been put on the tailings pile and that DOE needed to discuss the presence of such materials in the EIS. Some commentors stated that existing studies were not acceptable, that monitoring information should be made available, and that DOE should make a concerted effort to locate historical information about wells and quicksand. Commentors stated that the interim cover was not effective.

b. The No Action and on-site disposal alternatives were criticized for being contrary to the requirements of the Floyd D. Spence Act and were opposed because of potential impacts to the Colorado River and its users and because of the site's proximity to Arches National Park.

c. Commentors stated that the pile should remain in place because Moab had the benefits of the mill and should bear the burdens and because moving the pile would only cause additional environmental damage elsewhere.

5. Klondike Flats and Crescent Junction Sites/Alternatives

a. The Klondike Flats site was opposed because of its current use by mountain bikers. Other commentors stated that the Klondike Flats site might be used for other waste types, in addition to the uranium mill tailings.

b. Other commentors supported the use of the Klondike Flats site or the Crescent Junction site because these sites involved the shortest travel distance, were not near population areas, could provide jobs, or did not involve surface or ground water problems. Commentors also noted the proposed Williams Company's Crescent Junction Terminal project and its potential proximity to the Crescent Junction site.

6. East Carbon Development Corporation Site/Alternative

a. Commentors asked whether allowing the East Carbon Development Corporation (ECDC), an existing solid waste disposal facility in Carbon County, Utah, to dispose of the uranium mill tailings would open up the facility to the storage or disposal of other types of nuclear material or other hazardous wastes. Commentors noted that ECDC was accepted by the community for solid, nonhazardous waste disposal and presented several signed agreements between ECDC and its predecessors and the City of East Carbon documenting ECDC's plans to accept only nonhazardous waste.

b. The ECDC site was opposed primarily because of its proximity to people, potential adverse impacts to air and water quality, effect on property values, travel distance and associated traffic and dust impacts, and the contractual commitment to prohibit disposal of hazardous or radioactive materials at the site.

c. After scoping, ECDC formally requested that DOE remove its site from further consideration for Moab mill tailings (see Section 2.5.2.1).

7. White Mesa Mill Site/Alternative

a. Commentors stated that there was not enough information about the site, including how IUC would manage or handle the uranium mill tailings. This issue was not addressed in the EIS prepared by NRC for the White Mesa Mill (NRC 1979), which some commentors said did not accurately address the operations of the mill and overlooked the Ute Reservation and the community of White Mesa. Commentors identified potential impacts from current mill operations with alternative feed materials that have not been addressed. Commentors wanted a determination of the feasibility of remilling Moab tailings at White Mesa Mill and assurances that White Mesa Mill would bear the costs of remilling and paying DOE a percentage as required by UMTRCA Title I (Section 108 [b]). Commentors stated that because it was a Canadian company, IUC does not care about the local community; others complained that they could smell the chemicals used at the White Mesa Mill when the wind blew, that the ponds at the site were supposed to be capped but were not, that the cells leak, and that the fencing around the ponds was not adequate. Commentors stated that the cumulative effects of the mill operations and a uranium mill tailings pile should be addressed in the EIS. Commentors also asked that an epidemiological study be done for the White Mesa Mill.

b. The White Mesa Mill site was opposed primarily because of its potential impact to the Native American communities (Navajo and Ute Reservations) located near the site. Other reasons were potential adverse impacts to air and water quality, potential contamination of the San Juan River, potential impacts to tourism, and the absence of railroad access to the site.

c. Some commentors supporting the use of the White Mesa Mill site stated that any potential human health impacts could be adequately managed.

d. With respect to the White Mesa Mill site, some commentors stated that people were being asked to choose between, or balance risks to, jobs and human health.

e. Other commentors supported the use of the White Mesa Mill site because of its current use as a uranium mill, with mill tailings already on the site, and because it would provide jobs in the area.

8. Cost of Alternatives/Funding

Commentors asked what each of the alternatives would cost and whether DOE had or could obtain the funds for cleanup of the Moab site. One commentor stated that the cost of moving the Moab tailings pile could be more than $2 billion. Another commentor stated that the cost and duration of ground water cleanup would not be the same whether the tailings pile were left in place or moved, contrary to DOE's assertion. Other commentors noted the cost differential between constructing a railroad or railroad spur and a slurry pipeline for access to particular sites. Some commentors were concerned that the owner of a privately owned disposal site could go bankrupt and leave the problem for the Federal Government to clean up. Commentors also stated that the costs of legal action should be included in any cost estimate. One commentor asked if the construction contract would be a fixed-price contract.

9. Other Alternatives

Several alternatives were suggested:

- Move the pile back from the river and place in a lined bed.
- Use the Lisbon Copper Mine in San Juan County, Utah.
- Make a golf course out of the tailings pile.
- Move the tailings to old mines in the La Sal area.
- Move the tailings to an unpopulated site under DOE's control (not privately owned).
- Move the tailings to the former uranium mill tailings site near Green River, Utah.
- Move the tailings to Envirocare in Clive, Utah.
- Move the tailings to the already contaminated testing ground in Utah.
- Use the Grand County landfill.
- Allow Grand County to own and/or direct operations of the cleanup area.
- Consider in situ stabilization, perhaps using new chemical techniques for stabilization.
- Reroute the section of the Colorado River away from the Moab site.
- Use contaminated water for the slurry.

10. NRC Involvement

Commentors asked about the extent of NRC involvement with the Moab site. Commentors also stated that NRC's failure to regulate the site adequately has led to current problems there. With respect to the White Mesa Mill site, commentors stated that NRC was uncooperative and had not considered all the impacts of or alternatives to the White Mesa Mill site when it licensed that facility.

11. Extent and Impact of Contamination in the Colorado River

Commentors questioned the source and extent of contamination, including ammonia, in the Colorado River and on sandbars in the river. Commentors also questioned the impact of existing contamination on endangered species. Other commentors stated that there were 3 million downstream users, including Lake Havasu, Lake Powell, and Lake Mead. One commentor asked if any studies had been conducted regarding other wastes along the Colorado River downstream from Moab. Another commentor stated a concern that the Colorado River could migrate in the future. Commentors stated that the potential for catastrophic floods because of ice damming on the Colorado River should be addressed in the EIS.

12. Human Health Impacts

a. Commentors were concerned about possible impacts of uranium mill tailings on human (and animal) health. Commentors stated that radioactive and chemical contamination could be spread through the air (dust blowing off the pile, off-gases emanating from evaporation ponds) and through surface and ground water pathways and that radioactive contamination would be hazardous for a long time. Cancer was the primary health concern, although asthma was also noted. Some commentors stated that fears regarding the tailings material were exaggerated.
b. Some commentors noted that everyone was affected regardless of where the mill tailings were left or sent.

13. Ground Water Impacts

Commentors stated that ground water was a critical issue and that complete studies needed to be conducted; one commentor stated that earlier wells to study ground water were not deep enough. Commentors questioned whether contamination from a mill tailings pile could seep into ground water that is used as a drinking water source, thus increasing the risk of cancer. Commentors also asked, regardless of its location, what would happen if the tailings pile leaked.

14. Water Quality, Availability, and Use

Commentors stated that Colorado River water quality would be improved if the tailings pile were moved and that future river migration could threaten the pile in its current location. Commentors also noted that moving the pile to an off-site location could adversely affect other water bodies such as the San Juan River, Recapture Reservoir, Icelander Creek, Price River, Green River, Navajo Sandstone aquifer, and springs, as well as lakes downstream of Moab on the Colorado River. Commentors stated that the pile should not be located near water sources in order to protect water quality and human health. With respect to a slurry pipeline, commentors asked where the water for the slurry would come from, noting that there were water shortages in the area and could be droughts in the future. Commentors also asked how water contaminated by the tailings would be disposed of. Some stated that use of water for slurry could adversely affect Native American economic development endeavors.

15. Transportation (including slurry pipeline)

a. Commentors asked how many tons of tailings would be moved, what the time interval would be between trucks on the highways, who would drive them, and who would pay if there were an accident. Commentors also stated that truck traffic would be bad for existing roads. Commentors were concerned about the volume of truck traffic and the potential for traffic accidents and fatalities, in addition to dust. Commentors also wanted information regarding potential impacts of a loaded truck spilling on a highway. With respect to a slurry pipeline, commentors asked how such a system would operate, how much water would be required, where the water would come from, what the effect of the pipeline would be on natural and cultural resources, what the consequences would be if the pipeline carrying the uranium mill tailings slurry broke, and who would own or lease the pipeline. Commentors stated that the rail option would be the cheapest.
b. Some commentors opposed the slurry pipeline method of transporting the tailings to any site because of cost, impracticality, impacts to natural and cultural resources, and water quality and quantity issues.
c. Others supported using a slurry pipeline to avoid trucking and to minimize dust and because the pipeline could be used later to pump water to the area.

16. Socioeconomic Impacts (jobs and tourism)

Commentors stated that employment, tourism, and property values could all be affected, depending on the alternative disposal site selected.

17. Environmental Justice and Cultural Resource Considerations (impacts to Native American communities)

Many commentors noted the proximity of the White Mesa Mill site to Ute and Navajo tribal lands and stated that these Native American communities would be adversely affected by the selection of that site for the disposal of the Moab mill tailings pile and material from vicinity properties. Commentors stated that the land in that area was sacred to them and that they hunted animals and gathered herbs and willows, supporting subsistence living and medicinal uses, on the land that could become contaminated. Several commentors stated that the White Mesa Mill site was on a Ute sacred burial ground. Native American burial grounds were also said to be near the ECDC site.

18. Long-Term Surveillance and Maintenance

Commentors asked for information about long-term surveillance and maintenance activities at the sites, including whether such activities would occur at privately owned sites. Commentors asked how DOE could design a cell to last 200 to 1,000 years and whether DOE would own the land or enter into use agreements with landowners. Commentors also stated that the EIS should evaluate the potential for future human intrusion, long-term maintenance, and institutional management and controls.

19. Cumulative Effects

Commentors stated that reprocessing of uranium mill tailings and increased production at the White Mesa Mill site were reasonably foreseeable future actions that should be analyzed in the EIS. In addition, commentors stated that DOE should consider the cumulative effects of all the uranium mills and mill tailings sites in southeastern Utah. Commentors also stated that DOE should look at the cumulative effects of the disposal of the mill tailings at the White Mesa Mill site and the operations of the mill. Commentors noted that the Navajos are also affected by oil wells and electric power plants.

20. Other Issues To Be Addressed in the EIS

Commentors asked that the following issues be addressed in the EIS:

- Geologic conditions;
- Impacts to surface water (loss of surface flow, wetlands, riparian areas, and sedimentation in streambeds, seeps, and springs);
- Impacts to ground water (dewatering, process water wells, current water quality, and impacts of past and current activities);
- Impacts to cultural and historic sites, including impacts to cultural values because of the loss of pine nut gathering, and damage to springs, damage to native people's ability to use the area for cultural properties (includes nonconcrete items such as traditional cultural practices, ceremonies, and customs) or uses;
- Impacts to biological resources (native flora, threatened and endangered species, and potential for invasive species);
- Influence of tamarisk on ground water and river migration;
- Impacts to air quality (all sources of air pollution, release of dust and airborne contaminants into the atmosphere, and subsequent ground deposition);
- Noise impacts, including to visitors and employees of Arches National Park;
- Impacts to night sky (light pollution);
- Details regarding the design, construction, and operation of a slurry pipeline;
- Proposed closure and reclamation plans;
- Financial warranties and bonds;
- Short-term and long-term uses of lands and resources that could be affected by the proposed action and alternatives;
- Potential uses after pile removal, such as a restored wetland;
- A detailed economic analysis (impacts to local economy, and recreation);
- Demolition and restoration of the Moab site;
- Cleanup of areas of Arches National Park that were contaminated by windblown tailings;
- All applicable statutes, regulations, orders, policies, and guidance; and
- Homeland security.

Table 1–1 identifies specific locations in the EIS that address the scoping issues summarized in this section.

Table 1–1. Locations in the EIS That Address Public Scoping Comments

Comment	Location in Draft EIS Where Comment Is Addressed
1. DOE Decision-Making Process	Chapter 1.0, Section 1.4.5, "DOE Decision-Making"
2. Public Scoping Process	Chapter 1.0, Section 1.5, "Public and Agency Involvement"
3. Cooperating Agencies	Chapter 1.0, Section 1.6, "Cooperating Agencies"
4. Moab Site/On-Site Disposal Alternative	(a) Chapter 3.0, Section 3.1.3, "Description of Contaminated Materials at the Moab Site." (b) Potential impacts of the on-site disposal alternative are discussed in Chapter 4.0, Section 4.1, "On-Site Disposal (Moab Site)," and DOE's requirements under the Floyd D. Spence Act are described in Section 1.1, "Regulatory Requirements." (c) Impacts of off-site disposal are discussed in Chapter 4.0, Sections 4.2, 4.3, and 4.4.
5. Klondike Flats and Crescent Junction Sites/Alternatives	The Klondike Flats site is described in Chapter 3, Section 3.2, "Klondike Flats Site," and evaluated in Chapter 4.0, Section 4.2, "Off-Site Disposal (Klondike Flats Site)." The Crescent Junction site is described in Chapter 3, Section 3.3, "Crescent Junction Site," and evaluated in Chapter 4.0, Section 4.3, "Off-Site Disposal (Crescent Junction Site)." The Williams Petroleum Pipeline Project is discussed in Chapter 5, Section 5.3.
6. ECDC Site/Alternative	Chapter 2.0, Section 2.5, "Alternatives Considered But Not Analyzed," describes elimination of the ECDC from the proposed alternatives.
7. White Mesa Mill Site/Alternative	Chapter 4.0, Section 4.4, evaluates the White Mesa Mill site disposal alternative. Impacts to Native Americans are addressed in Section 4.4.18, "Environmental Justice"; other concerns are addressed in Sections 4.4.2, "Air Quality," 4.4.4, "Surface Water," and 4.4.15, "Human Health."
8. Cost of Alternatives/Funding	Costs of the proposed alternatives are discussed in Chapter 2, Section 2.7.3, "Costs," and Chapter 4.0, Sections 4.1.14, 4.2.14, 4.3.14, and 4.4.14, "Socioeconomics."
9. Other Alternatives	Chapter 2.0, Section 2.5, "Alternatives Considered But Not Analyzed," describes other alternatives.
10. NRC Involvement	NRC's involvement in cleanup at the Moab site is described in Chapter 7.0, Section 7.1, "Federal Regulatory Requirements," especially Section 7.1.2, which describes NRC's role in UMTRCA.
11. Extent and Impact of Contamination in the Colorado River	Chapter 4.0, Section 4.1.4 describes short-term and long-term effects to the Colorado River that would result from the on-site disposal alternative, and Section 4.6.4 describes the effects of the No Action alternative.
12. Human Health Impacts	Human health impacts are described in Chapter 4.0, Sections 4.1.15, 4.2.15, 4.3.15, and 4.4.15.
13. Ground Water Impacts	Ground water impacts are described in Chapter 4.0, Sections 4.1.3, 4.2.3, 4.3.3, and 4.4.3.
14. Water Quality, Availability, and Use	These resources are discussed in "Ground Water," Chapter 3.0, Section 3.1.6, Chapter 4.0, Sections 4.1.3, 4.2.3, 4.3.3, 4.4.3, 4.6.3; and "Surface Water," Chapter 3.0, Section 3.1.7, Chapter 4, Sections 4.1.4, 4.2.4, 4.3.4, 4.4.4, 4.6.4.
15. Transportation (including slurry pipeline)	Chapter 2.0, Section 2.2.4, "Transportation of Tailings Pile and Other Contaminated Material"; Chapter 3.0, Sections 3.1.17, 3.2.14, 3.3.15, 3.4.15, "Transportation"; Section 3.3.19, "Pipeline Corridor"; Chapter 4, Sections 4.1.16, 4.2.16, 4.3.16, 4.4.16, "Traffic."
16. Socioeconomic Impacts (jobs and tourism)	Chapter 4.0, Sections 4.1.14, 4.2.14, 4.3.14, 4.4.14, "Socioeconomics," and Chapter 5.0, Section 5.1, "Seasonal Tourism."
17. Environmental Justice and Cultural Resource Considerations (impacts to Native American communities)	Environmental justice is discussed in Chapter 3.0, Sections 3.1.20, 3.2.17, 3.3.18, 3.4.18; and Chapter 4.0, Sections 4.1.18, 4.2.18, 4.3.18, 4.4.18, 4.6.18. Cultural resources are discussed in Chapter 3.0, Sections 3.1.13, 3.2.10, 3.3.11, 3.4.11; and Chapter 4.0, Sections 4.1.9, 4.2.9, 4.3.9, 4.4.9, 4.6.9.
18. Long-Term Surveillance and Maintenance	Institutional controls are described in Chapter 1.0, Section 1.4, "Alternatives." Disposal cell material requirements are described in Chapter 2.0, Section 2.1.3.1, "Borrow Material Standards and Requirements." Long-term management is described in Chapter 2.0, Sections 2.1.4 and 2.2.6, "Monitoring and Maintenance."
19. Cumulative Effects	Chapter 5.0, "Cumulative Impacts."
20. Other Issues To Be Addressed in the EIS	Except for "financial warranties and bonds" and "homeland security," all issues listed in item 20 of this section appear under the same or similar section titles in Chapter 3.0, "Affected Environment" and Chapter 4.0, "Environmental Consequences." The proposed alternatives are not associated with homeland security or financial warranties and bonds and are not discussed in this EIS.

1.5.3 Public and Agency Review of the Draft Environmental Impact Statement—Process and Results

Section 1.5.3.1 documents the process DOE used to solicit public and agency comments on the draft EIS and shows the number and types of comment documents received, and Section 1.5.3.2 summarizes key issues identified in the comment documents.

1.5.3.1 Overview of Review Process

The comment period on the draft EIS began with the issuance of EPA's Notice of Availability on November 12, 2004 (69 FR 65427), and ended on February 18, 2005. DOE also issued a Notice of Availability of the EIS on December 3, 2004 (69 FR 70256). Copies of the draft EIS were distributed to members of Congress; to federal, state, and tribal agencies and governments; to local officials; and to persons and organizations who expressed an interest in the EIS. The draft EIS was made available electronically on the DOE Grand Junction website and on the DOE NEPA website. Copies of the draft EIS were also placed in the Grand County Public Library, Blanding Branch Library, the White Mesa Ute Administrative Building, and the DOE Public Reading Room in Grand Junction, Colorado.

During the public comment period, DOE held four public hearings in Utah to present information and receive oral and written comments on the draft EIS. These meetings were held in Green River (January 25, 2005), 7 attendees; Moab (January 26, 2005), 93 attendees; White Mesa (January 27, 2005), 21 attendees; and Blanding (January 27, 2005), 19 attendees. Information about the meetings was published in DOE's Notice of Availability in the *Federal Register* and in local Utah newspapers.

DOE received approximately 1,600 comment documents on the draft EIS. Comment documents were submitted by electronic mail (e-mail), voice mail, facsimile, and regular mail. Oral comments given at the public hearings were transcribed and entered into a relational database. Most comment documents were brief, raising a single issue pertaining to the draft EIS. Other comment documents were lengthy, raising multiple issues; in these cases, individual comments were extracted and a separate response was prepared for each comment.

All comment documents and their responses were tracked using a relational database. Table 1-2 shows the number of comment documents received, broken out by type of submittal.

Table 1–2. Number of Comment Documents Received

Type of Submittal	Number
Orally at Public Hearings	
Moab	30
White Mesa	13
Green River	4
Blanding	2
E-Mail	1,289
Voice Mail	146
Fax and U.S. Mail	103

1.5.3.2 Major Issues Raised in Comment Documents

DOE analyzed all comment documents to identify the major issues raised in them. About 90 percent of the approximately 1,600 comment documents shared a common sentiment: *the tailings pile should be moved from its present location adjacent to the Colorado River.* The many comment documents supporting relocation included a wide range of reasons for doing so. Among the comments that strongly supported moving the pile "somewhere," many were equally adamant about where the pile should not be moved—specifically, that it should not be moved to the White Mesa Mill alternative location. However, a few comment documents did support relocation to White Mesa Mill, especially by slurry pipeline. This section summarizes the thirteen major issues raised in the comment documents and gives a synopsis of DOE's response or position.

Catastrophic Failure—The pile should be relocated because a major earthquake or 500-year flood could result in a catastrophic failure of the disposal cell. Many comments expressed concern that a catastrophic failure of the disposal cell caused by an earthquake or a 500-year flood could spill the contents of the pile into the Colorado River and thereby pose an unacceptable downstream risk to human health, the environment, and the recreational use and value of the river.

DOE does not agree that seismic issues are a significant concern at the Moab site. The seismic characteristics of the Moab site are addressed in Section 3.1.1.4 of the EIS. In the vicinity of the site, the Moab Fault consists of two branches—the main Moab Fault and the west branch of the Moab Fault. No historical macroseismicity has been noted along the Moab Fault, and microseismicity studies have not revealed any earthquakes associated with the fault. The site area is in Uniform Building Code 1, indicating lowest potential for earthquake damage. For geologic and geophysical reasons, the Moab Fault system is not a capable fault and does not pose a significant earthquake or surface-rupture threat to the present tailings pile.

The EIS assumes that a catastrophic flood (300,000 cubic feet per second [cfs], the type of flood specified by NRC as a Probable Maximum Flood [PMF]) will occur no more than once in 500 years—twice during the 1,000-year regulatory period. The possibility of a catastrophic flood cannot be eliminated because part of the Moab site tailings impoundment is located within the 100-year floodplain of the Colorado River and within the floodplain of the PMF of both the Colorado River and Moab Wash. The 100-year floodplains for Moab Wash and the Colorado River occupy over one-third of the Moab site. However, during floods that exceed bankfull flow (that is, when water just begins to flow over a streambank's inside bend) in the Colorado River, most of the flow and flow energy are dissipated in the Matheson Wetlands Preserve away from the tailings pile.

Section 4.1.17 in the EIS addresses impacts from a catastrophic disposal cell failure. Although the likelihood of a catastrophic event would be very small over the design life of an on-site disposal cell, this type of failure was assumed to occur in order to evaluate the potential consequences, because they would differ between on-site and off-site disposal alternatives. The EIS acknowledges that if 20 to 80 percent of the tailings pile were washed into the river, it would have serious adverse impacts on riparian plant and animal life and would affect the health and safety of residents along the river and of river guides. The flood mitigation factors described in Section 2.2.2 for periodic, less severe flooding would also mitigate the impacts of a catastrophic flood.

Flooding—The pile should be relocated because episodic flooding of the site has occurred in the past, will occur in the future, and will wash contaminants into the river. DOE agrees that episodic flooding of the site has occurred in the past and will occur in the future. In Section 4.1.3.1, the EIS acknowledges the potential for episodic flooding of the tailings pile under the on-site disposal alternative, such as occurred in 1984, and quantifies the impacts that could result from such inundation. The floodplain area for the Colorado River extends the length of the eastern site boundary from the river's edge to distances ranging from 500 to 1,200 ft west and is approximately 10 ft above the average river level. On the basis of analyses in the EIS, DOE estimates that during a 100-year flood, the water level would be 3 to 4 ft above the base of the tailings pile. These impacts include additional leaching of contaminants into the ground water and subsequent migration to the river. Very conservative model results suggest that near the bank of the Colorado River, the maximum ammonia (as nitrogen) concentration in ground water could increase by just over 2 milligrams per liter (mg/L) in approximately 10 years after a 100-year flood. However, effects of the tailings inundation would decline rapidly over a period of approximately 20 years after the flood. As required in 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements," a floodplain and wetlands assessment of the proposed alternative actions is provided in Appendix F of the EIS.

The on-site disposal alternative includes measures to mitigate floodwater impacts. If on-site disposal were selected, an on-site disposal cell would include side slopes armored with riprap (Section 2.1.3.1) of sufficient size to mitigate erosion from floodwaters and a barrier wall (Section 2.1.4) between the river and the capped pile to deflect river encroachment. These engineered designs would further reduce the already low probability of a catastrophic failure of the disposal cell should river migration (see Section 2.2.3) begin to occur unexpectedly. The descriptions of the conceptual cell cover and barrier wall design have been expanded in the EIS (Sections 2.1.1.3 and 2.1.1.4) to state that riprap materials would be sized to withstand the maximum river forces recently identified by the U.S. Geological Survey (USGS) and that the barrier wall would be of sufficient length to deflect river encroachment. The final design specifications for the wall (including, for example, its dimensions) would be developed in a remedial action plan if the on-site alternative were selected. The estimated cost range for remediation shown in Table 2-33, item #9, of the EIS would accommodate materials consistent with the recent USGS report.

River Migration—The pile should be relocated because the river is migrating toward the pile, which will exacerbate flooding. There are responsible opposing views on the question of whether the Colorado River is migrating toward the tailings pile, which would tend to exacerbate flooding impacts, or away from the tailings pile, which would tend to mitigate flooding impacts. A new section has been added to the EIS (Section 2.6.4) to present these opposing views on river migration (and other topics) and to summarize their technical basis and implications. DOE's view is that, although a conclusive prediction of future river movement is not possible, evidence suggests that the river is migrating, and will continue to migrate, to the south and east, away from the existing tailings pile, during the 200- to 1,000-year regulatory performance period (see Section 2.6.4). The responsible opposing view is that the river channel has not migrated away from the Moab millsite in the past 80 years, and that there is no reason to suppose that it will start to do so in the immediate future.

The overall concern expressed by commentors is that the EIS has mischaracterized the available data and that the dynamic and often unpredictable nature of the river system, the site-specific conditions, and the inevitable migration of the river toward the site over geologic time make the

on-site disposal alternative unacceptable because the potential impacts of river migration would pose unacceptable risks to local and downstream users and to ecological receptors of the Colorado River corridor.

Endangered Fish—The pile should be relocated because it is leaching contaminated ground water into the river, which poses a threat to endangered fish. Underlying the many comments that expressed support for relocation is the view that the on-site disposal alternative would be unable to achieve surface water quality in the Colorado River adjacent to the tailings pile that would be protective of the endangered fish species known to inhabit those waters. DOE and UDEQ have responsible opposing views regarding the ammonia surface water standard (protective criteria) for a ground water cleanup goal that was used in the EIS. The EIS has been expanded to present and discuss these views (Section 2.6.4). The basis for the ammonia surface water standard for a ground water cleanup goal is discussed in Section 2.3.1 and was developed in consultation with the USF&WS as specified in the Endangered Species Act. The USF&WS states in its Biological Opinion (Appendix A3 of the EIS):

"The FWS has considered all of UDEQ's comments in our analysis of the effects to listed species associated with ground water remediation and we agree that many warrant further study (see Incidental Take Statement). Based on our review of the available information, and with recognition that there are uncertainties in both DOE's and UDEQ's analyses, the Service has determined that DOE's premise that 3 milligrams per liter (mg/L) ammonia in ground water will result in protective concentrations in all surface water habitats presents a reasonable approach to the problem."

DOE's estimates of the duration and cost of ground water remediation are predicated on the assumption that 3 mg/L ammonia in ground water will result in protective concentrations in all surface water habitats. However, new Section 2.6.4 addresses, to the extent possible, the potential implications if the DOE and USF&WS view on this issue is in error and the UDEQ position is correct. If applicable protective criteria could not be achieved or would require longer than DOE estimates, DOE recognizes that the duration of ground water remediation, especially under the on-site disposal alternative, would be substantially longer (200 years or more) than estimated in the EIS, and that the estimated $906,000 per year cost of ground water remediation would continue beyond the currently estimated 75 to 80 years.

Subsidence—The pile should be relocated because it has no liner and will eventually come into permanent contact with ground water. Under the on-site disposal alternative, the pile would remain unlined. Over geologic time, the process of subsidence, which is caused by ground water dissolving the salt formations under the tailings pile (Section 3.1.1.4 of the EIS), will eventually cause the bottom of the tailings pile to converge with the underlying ground water at an estimated rate of approximately 1.4 ft per 1,000 years. At this rate, DOE estimates that the tailings in the disposal cell would come into permanent contact with ground water in approximately 7,000 to 10,000 years, assuming the minimum depth to ground water ranges from 5 to 7 ft.

As described in Section 2.3.2 of the EIS, active ground water remediation would result in protective levels in surface water approximately 10 years after the issuance of a ROD and implementation of active remediation. Based on the analyses in the EIS, active ground water remediation could be terminated in 75 to 80 years, when ammonia concentrations in ground water reached the target goal. DOE acknowledges uncertainties in its ground water model

assumptions and responsible opposing views regarding the applicable compliance standard and recognizes that these factors could result in longer active ground water remediation. Regardless of the duration of active ground water remediation, DOE believes that under the on-site disposal alternative, protective levels in surface water could be achieved and sustained for the 200- to 1,000-year regulatory time frame despite the absence of a liner. However, DOE acknowledges that because of subsidence, under the on-site disposal alternative surface water concentrations could revert to levels that are not protective in 7,000 to 10,000 years.

Matheson Wetlands Preserve—The pile should be relocated because contamination is migrating under the river and affecting the Matheson Wetlands Preserve. DOE's position is that contamination is not migrating under the river and affecting the Matheson Wetlands Preserve. DOE's conceptual model of ground water flow at and near the project site considers the Colorado River and perhaps a limited area just southeast of the river to be a site of both regional and local discharge for ground water. Ground water discharges to this area because the elevation of the river surface and shallow ground water to the immediate southeast is less than the flow potentials measured in ground water at the project site, in areas lying farther to the east and closer to the city of Moab, and in brine located below the river. Accordingly, ground water flow converges toward the river from all of these zones, and a ground water divide occurs either in the river itself or slightly east of the river. This flow pattern prevents water from migrating beneath the river to the Matheson Wetlands Preserve.

However, there is a responsible opposing view of the fate and transport of site-derived contaminants in ground water. This view, which was expressed in many comments, states that these contaminants have migrated, and continue to migrate, under the Colorado River toward the Matheson Wetlands Preserve and that they pose a potential hazard to public health and the environment. This view is based primarily on the interpretation of three types of information: (1) a potentiometric surface map (water table) based on calculated hydraulic heads that account for the effects of salinity on flow potential, (2) measured uranium concentrations in ground water on both sides of the Colorado River, and (3) analysis of stable isotopes of dissolved oxygen and hydrogen in ground water.

Both views on the question of contaminant migration under the river are based on differing interpretations of technical data. A new section on responsible opposing views (Section 2.6.4) has been added to the EIS. The section presents both views in detail and also discusses the implications of these opposing views.

Uncertainties with On-site Disposal—The pile should be relocated because the numerous uncertainties, especially about long-term questions, could adversely affect the cost and reliability of on-site disposal. It is possible that on-site disposal would cost much more than DOE estimates. These uncertainties could be largely eliminated if the pile were moved to a newly constructed disposal cell with better geologic confinement. DOE agrees that there are numerous uncertainties and assumptions, including long-term ones, that could increase the duration of remedial action under the on-site disposal alternative and therefore could increase the lifetime cost of the on-site disposal alternative. In the EIS, DOE described each recognized area of uncertainty and the potential consequence, including cost, where applicable (see Table 2-33 of the EIS). In addition, new Section 2.6.4 addresses areas of uncertainty about which there are responsible opposing views.

In some instances, it is not possible to quantify the potential impacts of uncertainties on cost estimates. For example, one area of uncertainty frequently cited as potentially affecting the cost of the on-site disposal alternative is the applicable compliance standard for surface water ammonia and, by extension, the length of time required for ground water treatment to achieve protective concentrations in surface water. The EIS assumes that the lower end of the range of acute criteria (3 mg/L ammonia) applies. But if the more stringent lower end of the range of chronic criteria (0.6 mg/L ammonia) applies, it could significantly extend the duration of ground water remediation. Uncertainties associated with the cost, duration, and ability to achieve protective criteria in surface water depend on multiple and potentially additive or offsetting factors. Such factors include variations in the composition of the tailings pore water, geochemical changes that occur over time, transport of contaminants to the surface water, changing regulatory criteria, and the evolving configuration of the near-bank river system. Accurately quantifying the individual and collective uncertainty of these factors would be an extremely complex exercise, and the value of the results in the decision-making process would likely be disproportionate with the required effort. Consequently, DOE acknowledges in the EIS that the estimated annual cost of ground water treatment ($906,000) and the cost of disposing of the resultant residual radioactive material could extend beyond the 80 years that DOE currently estimates for the on-site disposal alternative.

Other areas of uncertainty where DOE acknowledges the potential to increase the lifetime cost of the on-site disposal alternative include the ground water and site conceptual model assumptions and the postulated, but as yet unconfirmed, presence of a salt layer in the tailings pile. These uncertainties are discussed in Table 2–33 of the EIS.

Finally, there are also areas of short-term uncertainty that apply solely or primarily to off-site disposal and that could increase the estimated cost of this alternative. Examples include (1) the final mass and volume of contaminated material in, under, and adjacent to the tailings pile that would need to be excavated and transported, and (2) worker radiation dose rates and exposure times. These uncertainties are also discussed in Table 2–33 of the EIS.

Downstream Impacts—The pile should be relocated because of the potentially harmful impacts it poses to downstream recreational users, residents, and businesses. The public based its support for relocating the pile on a wide range of reasons, many of which reflected concerns over harmful impacts to downstream recreational users, residents, and businesses. DOE carefully considered the analyses provided in the EIS, the consequences of the uncertainties characterized in the EIS, all responsible opposing views, and the numerous public comments received on the draft EIS, including about 1,400 comment documents that supported relocating the tailings pile. Based on these considerations, in the final EIS DOE identifies off-site disposal at the Crescent Junction site using rail transportation and active ground water remediation as its preferred alternatives for the remediation of the Moab mill tailings, vicinity properties, and contaminated ground water. Section 1.4.5 further discusses the basis for DOE's identification of these preferred alternatives.

However, it is DOE's position that any of the proposed actions described in the EIS would provide long-term protection of human health and the environment within the regulatory time frame of 200 to 1,000 years. Moreover, DOE emphasizes that the final decision on which alternative will ultimately be selected and implemented will be identified in and promulgated through the ROD, which DOE expects will be issued in late 2005.

Even though our studies indicate that the on-site disposal alternative can be protective, none of the studies can eliminate all of the public concern. Further, under the on-site alternative, there is potential for additional risk to public health and safety due to the long-term disposal performance uncertainties and exposure pathways. These potential future scenarios for the Moab milling site would not exist under the off-site alternative. DOE believes that the final design of either an on-site or an off-site disposal cell would meet the requirements in 40 CFR 192 and would receive full review and concurrence from the NRC. A final disposal cell design would be developed in a remedial action plan after DOE issues its ROD.

Aesthetics and the Local Economy—The pile should be relocated because it is unattractive and discourages tourism in the Moab area. DOE agrees, and the EIS acknowledges, that the on-site disposal alternative would likely have unavoidable adverse impacts on visual resources (see Section 4.1.11.5). From key observational points, the predominantly smooth horizontal lines created by an on-site disposal cell would continue to produce a strong to moderate contrast with the adjacent sandstone cliffs. The visual contrasts that would occur under this alternative would not be compatible with the Class II objectives that the Bureau of Land Management (BLM) has assigned to the nearby landscapes. Although DOE is not required to meet the objectives of BLM's visual resource management system on the DOE-owned Moab site, the system provides a useful way to measure the effects of a proposed action on visual resources.

Since 1995, tourism-recreation employment has grown by some 20 percent and now accounts for at least 45 percent of Grand County's total employment (see Section 3.1.18.1 of the EIS). This implies that visual impacts from the tailings pile are not significantly discouraging tourism.

Public Health and Radon Risks—The pile should be relocated because it emits radon gas and poses a public health risk. For each of the proposed alternative actions, human health risks, including risks from exposure to radiation expressed as latent cancer fatalities, are analyzed and compared in the EIS (see Appendix D; Sections 4.1.15, 4.2.15, 4.3.15, 4.4.15; and the Summary). DOE agrees with the basic premise that relocating the tailings pile to a new isolated location would minimize long-term public exposure to tailings-related radiation. Based on the analyses in the EIS, while the greatest short-term risk to the public from radiation exposure at the Moab site, excluding vicinity property exposure, would be associated with the No Action alternative, there are other long-term risks that would me mitigated under the off-site alternatives.

Under any of the off-site disposal alternatives, during the period of surface remediation, there would be some increased public risk stemming from the need to disturb the existing tailings pile cover and transport the tailings. This temporary increase in public exposure and risk would not occur under the on-site disposal alternative because a fortified cap would be applied without disturbing the existing cap. Contaminated vicinity property material, which may be the greatest source of public exposure to mill-related radiation, would be removed and isolated under either the on-site or off-site disposal alternative. DOE considered public exposure in identifying an off-site location as its preferred surface remediation alternative and will continue to consider public exposure in its final decision.

Land Use—The pile should be relocated to make better use of the prime location it occupies. Several commentors expressed opinions that seemed to be based on a belief that relocating the tailings pile would quickly free up all or most of the Moab site for other uses. DOE recognizes the strategic location and potential value of the Moab site real estate. However, DOE believes

that exercising caution is preferable to speculating on future land uses. Even under the off-site alternative, the land area required for ground water remediation, which could exceed 40 acres, would be unavailable for an estimated 75 years. Under any of the off-site alternatives, it would be DOE's goal to have as much as possible of the 439-acre Moab site available for unrestricted use upon completion of surface remediation. However, as stated in the EIS, it is possible that even after completion of remediation, the entire 439-acre site would remain under federal control in perpetuity. Under any action alternative, final decisions on allowable future land use at the Moab site could be made only after the success of surface and ground water remediation was determined.

Cultural Impacts to Native American Communities—The pile should not be relocated to White Mesa Mill because doing so under either of the two transportation modes proposed for the White Mesa Mill alternative, truck or slurry pipeline, would seriously (and, in some cases, irreversibly) disturb many Native American cultural sites and traditional cultural properties. The EIS analyzed the potential adverse impacts to both cultural sites and traditional cultural properties. Traditional cultural properties are those associated with traditional cultural practices, ceremonies, and customs. Although only the Moab site and the White Mesa Mill site have been field surveyed for cultural sites, some cultural sites would probably be adversely affected under any of the proposed action alternatives, including on-site disposal. Under any of the action alternatives, 4 to 11 cultural sites at the Moab site could be adversely affected. Under the off-site disposal alternative, the number of additional cultural sites potentially adversely affected varies widely among the alternative locations and modes of transportation.

Because of the proximity of the Ute Mountain Ute Tribe to the White Mesa Mill site, the White Mesa Mill disposal alternative would present unique and unavoidable potential adverse impacts to at least 10 traditional cultural properties. Based on preliminary Class I surveys to date, DOE expects that impacts to traditional cultural properties are anticipated to be far less likely at the Klondike Flats or Crescent Junction locations. Moreover, any mitigation to traditional cultural property impacts at White Mesa Mill would be extremely difficult or impossible and would involve numerous tribal entities. DOE considered adverse impacts to the Ute Mountain Ute Tribe in its identification of Crescent Junction as its preferred disposal location and will continue to consider these impacts in its final decision.

Traffic through Moab—The pile should not be relocated to White Mesa Mill by truck due to the major traffic impact on highly congested areas, especially in Moab. DOE agrees that relocating the tailings pile by truck to White Mesa Mill would necessitate traveling through the city of Moab on US-191. As seen in Figure 2-63 of the EIS, transporting the tailings to the White Mesa Mill site by truck would result in an estimated 127-percent increase in average annual daily truck traffic through Moab—a severe and unavoidable adverse impact. Moreover, the Utah Department of Transportation considers this area to be highly congested. Trucking the tailings to White Mesa Mill would also mean traveling through Monticello and Blanding.

In contrast, if the tailings were trucked to either Klondike Flats or Crescent Junction, the trucks would not have to pass through any cities or towns; however, the trucks would have to pass the entrance to Arches National Park.

1.5.4 Major Revisions to the EIS

This section lists the major revisions to the EIS. DOE made 10 major, substantive revisions and numerous minor or editorial revisions in response to comment documents received on the draft EIS. Substantive revisions to the text are marked by a sidebar in the margin. The following paragraphs summarize the 10 major revisions to the EIS and note where the revision occurs.

Preferred Alternatives. In the draft EIS, DOE did not identify a preferred alternative. In Section 1.4.5 and the Summary of the EIS, DOE identifies the combination of off-site disposal at the Crescent Junction site using rail transportation and ground water remediation at the Moab site as its preferred alternatives. DOE's bases for identifying these preferred alternatives are also discussed in Section 1.4.5.

Responsible Opposing Views. Based on continuing consultations with cooperating agencies and comment documents received on the draft EIS, DOE has identified three issues about which there are responsible opposing views: (1) river migration, (2) transport of contaminated ground water beneath the Colorado River to the Matheson Wetlands Preserve, and (3) the applicable surface water compliance standard. These opposing views, and their ramifications, are discussed in new Section 2.6.4 of the EIS.

USGS Maximum River Force Study. The descriptions of the conceptual cell cover and barrier wall design have been expanded in Sections 2.1.1.3 and 2.1.1.4 to state that riprap materials would be sized to withstand the maximum river forces recently identified by USGS and that the barrier wall would be of sufficient length to deflect river encroachment.

USF&WS Biological Opinion. Appendix A3, the USF&WS Biological Opinion, has been added. The USF&WS concurred with DOE's determination that off-site disposal at the Crescent Junction site (preferred alternative) would not jeopardize the continued existence of plant species; nor would avian or terrestrial animal species be jeopardized. USF&WS also concurred with DOE's determination that off-site disposal and active ground water remediation at Moab (preferred alternative) would not jeopardize endangered aquatic species and critical habitat in the Colorado River at Moab, subject to the provisions, terms and conditions, and conservation recommendations included in the final Biological Opinion. The USF&WS will allow the incidental take of varying numbers of the four endangered fish species in this segment of the Colorado River for a maximum 10-year period following the ROD, provided DOE

- Pays a one-time water depletion fee of approximately $3,800.
- Monitors backwater habitats near the Moab site and effects on fish.
- Evaluates the effectiveness of "initial actions."
- Addresses uncertainties by developing a surface water monitoring plan.
- Monitors and addresses potential effects on the south side of the Colorado River.

In addition, DOE would consult with the USF&WS regularly and reinitiate formal consultation if required. DOE would also consider implementing conservation recommendations as necessary.

Floodplain and Wetlands Statement of Findings. A Statement of Findings to Appendix F, "Floodplain and Wetlands Assessment for Remedial Action at the Moab Site" has been added.

Worker Radiation Dose. In the draft EIS, DOE applied an overly conservative assumption for identifying the source term of radiation to which workers would be exposed under the on-site disposal alternative (Section 4.1.15). This analysis has been revised.

State of Utah Regulatory Authority. Sections 2.2.5.2 and 7.3.4 have been revised to recognize the State's regulatory authority at the White Mesa Mill/International Uranium Corporation site.

Flood Protection at the Moab Site. Section 2.1.1.1 has been revised to state that the storm water management infrastructure at the Moab site would be designed and constructed to control a reference 100-year flood rather than a 25-year flood.

10-Fold Dilution Factor. Section 2.3.1.2 has been revised and a new reference was added to address the appropriateness of an assumed 10-fold dilution factor for ammonia as it migrates from ground water and enters surface water in the Colorado River.

Contaminants of Potential Concern. Section 2.3.1.2 has been updated with an expanded discussion of the screening process for contaminants of potential concern.

1.6 Cooperating Agencies

NEPA implementing regulations state that a federal agency with jurisdiction by law over the proposed action or alternatives must be a cooperating agency, participating in the NEPA process as requested by the lead agency (40 CFR 1501.6). In addition, an [other] agency with special expertise with respect to any environmental issue to be addressed in the EIS should be a cooperating agency. DOE has entered into agreements with 12 federal, state, tribal, county, and local agencies to be cooperating agencies in the development and preparation of this EIS:

Federal

- Bureau of Land Management
- National Park Service
- U.S. Army Corps of Engineers (Corps of Engineers)
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Nuclear Regulatory Commission

State

- State of Utah

Tribal

- Ute Mountain Ute Tribe

County

- Grand County
- San Juan County

Local

- City of Blanding
- Community of Bluff

BLM and the National Park Service (NPS) are participating as cooperating agencies because lands managed by those agencies could be affected, directly or indirectly, by the on-site and off-site disposal alternatives under consideration. As the land steward of the proposed Klondike Flats and Crescent Junction disposal sites and many of the proposed borrow areas, BLM will use this EIS to support any needed land transfers or issue permits. USF&WS is responsible for protecting threatened and endangered species and is specifically participating in this EIS process through the review and acceptance of the Biological Assessment (Appendix A1) and has provided a Biological Opinion (Appendix A3). The Corps of Engineers has regulatory authority over proposed actions within floodplains and wetlands. The purpose and need for actions by these agencies is to ensure that the alternative selected is consistent with national and local land and resource management plans and goals, floodplain and wetland regulations, and the Endangered Species Act. This EIS is intended to meet the NEPA requirements of these federal agencies and of DOE.

UMTRCA authorized NRC to be the federal regulatory oversight agency for UMTRCA Title I and II sites. Under this authority at Title I sites such as Moab, NRC provides technical and regulatory review of project documents, including remedial action plans, completion reports, long-term surveillance plans, and certification reports. Ultimately, the general license for Title I uranium mill tailings disposal sites will include the disposal site for uranium mill tailings from the Moab site and vicinity properties.

As specified in UMTRCA, EPA has established generally applicable standards for remediating and disposing of contaminated material from all uranium-ore processing sites. EPA's regulations in 40 CFR 192 establish the standards for protection of human health and the environment that form the basis for most of the impact analyses generated for this EIS.

In accordance with Section 274 of the Atomic Energy Act of 1954, as amended, NRC has recently authorized the State of Utah to regulate radioactive materials at UMTRCA Title II sites within Utah. White Mesa Mill is a Title II site now under State regulatory oversight that is being considered as an alternative off-site disposal site for contaminated materials from the Moab site. The State is also interested in ensuring that this EIS complements and satisfies environmental reporting requirements that would apply to the license amendment that would be needed should DOE select the White Mesa Mill site for off-site disposal.

The other cooperating agencies are agencies with expertise relevant to potential environmental, social, or economic impacts within their geographic regions. They provided information as requested and reviewed portions of the document as it was prepared.

1.7 EIS Contents

The remainder of this EIS consists of the following chapters and appendixes:

- *Chapter 2, Description of Proposed Alternative Actions:* This chapter describes the proposed alternatives analyzed in this EIS and those that were considered but are not analyzed in detail. It also presents summaries of the potential impacts associated with each proposed alternative and compares the potential impacts between the alternatives.
- *Chapter 3, Affected Environment:* This chapter describes the affected environment at the Moab site, at the proposed off-site disposal locations (Klondike Flats, Crescent Junction, and White Mesa Mill), at the borrow areas, and along the proposed pipeline corridors.

- *Chapter 4, Environmental Consequences:* This chapter describes the potential environmental impacts at the Moab site and off-site locations that could occur as the result of each proposed alternative. Potential environmental justice impacts associated with the proposed alternatives are also presented.
- *Chapter 5, Cumulative Impacts:* This chapter describes the cumulative impacts that would result from the proposed alternatives.
- *Chapter 6, Unavoidable Impacts, Short-Term Uses and Long-Term Productivity, and Irreversible and Irretrievable Commitment of Resources:* This chapter describes some of the additional considerations that must be analyzed as part of the NEPA EIS process.
- *Chapter 7, Regulatory Requirements:* This chapter describes the key statutory and regulatory framework and requirements that are applicable to the proposed alternatives.
- *Chapter 8, List of Preparers and Disclosure Statements:* This chapter lists the individuals who prepared the EIS and their credentials. It also provides the certification by the contractors that assisted DOE in the preparation of this EIS that they have no financial or other interest in the outcome of the project as required by the Council on Environmental Quality (40 CFR 1506.5[c]) and DOE (10 CFR 1021).
- *Chapter 9, List of Agencies, Organizations, and Individuals Receiving Copies of the EIS:* This chapter lists federal, state, local, and tribal government agencies, various organizations, and members of the public who will receive copies of the draft EIS.
- *Chapter 10, Glossary:* This chapter defines many of the technical terms used in this EIS.
- *Chapter 11, Index:* This chapter provides an index of key terms used in this EIS.
- *Appendixes:* The appendixes provide additional information to support the EIS analyses.
- *Comments and Responses:* This volume provides public and agency comments on the draft EIS and DOE's responses.

1.8 References

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End of current text