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Office of Civilian Radioactive Waste Management

***Draft Environmental Assessment for the
Proposed Infrastructure Improvements
for the Yucca Mountain Project, Nevada***

DOE/EA-1566

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Abstract:

The proposed action, addressed in this environmental assessment, is to repair, replace, or improve certain facilities, structures, roads, and utilities (collectively referred to as *infrastructure*) for the Yucca Mountain Project to enhance safety at the project and to enable DOE to safely continue ongoing operations, scientific testing, and routine maintenance until such time as the Nuclear Regulatory Commission decides whether to authorize construction of a repository. Some parts of the infrastructure are nearing or, in some instances, have exceeded their design and operational life. To maintain safety and the protection of workers, regulators, and visitors, DOE has mandated operational restrictions. In turn, these restrictions have resulted in a decrease in operational efficiency while increasing the cost of operating the infrastructure. Infrastructure improvements are needed to eliminate these restrictions and to return operations to full efficiency and reduce the costs of mitigation and maintenance. Collectively, these actions would help ensure, with an enhanced margin of safety, the continued protection of workers, regulators, and visitors during ongoing operations, scientific testing, and routine maintenance until such time as the Nuclear Regulatory Commission decides whether to authorize construction of a repository. The proposed action would also better support scientific activities and testing necessary to confirm the long-term performance of a repository at Yucca Mountain. This environmental assessment examines the environmental impacts of the proposed action and the no-action alternative.

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SUMMARY

This environmental assessment examines the impacts of a proposal by the Department of Energy to repair, replace, or improve certain facilities, structures, roads, and utilities (collectively referred to as *infrastructure*) for the Yucca Mountain Project to enhance the safety margin at the project and to continue conducting scientific activities, testing, and maintenance until such time as the Nuclear Regulatory Commission decides whether to authorize construction of a repository. Some parts of the infrastructure at Yucca Mountain are nearing or, in some instances, have exceeded their design and operational life. To maintain safety and the protection of workers, regulators, and visitors the Department of Energy has mandated operational restrictions. In turn, these restrictions have resulted in a decrease in operational efficiency while increasing the cost of operating the infrastructure. The Department has identified the proposed improvements through assessments of the condition of the existing infrastructure. In the future, additional assessments may result in the identification of other improvements necessary to enhance safety for workers, regulators, and visitors. If so, these activities will be subject to separate National Environmental Policy Act reviews, as appropriate. Infrastructure improvements are needed to eliminate these restrictions and to return operations to full efficiency and reduce the costs of mitigation and maintenance. Some of the replacement facilities and structures will not be replacements-in-kind, but rather improved facilities and structures. The proposed action would ensure, with an enhanced margin of safety, the continued protection of workers, regulators, and visitors until such time as the Nuclear Regulatory Commission decides whether to authorize construction of a repository. The proposed action would also better support the safe conduct of scientific activities and testing necessary to confirm the long-term performance of a repository at Yucca Mountain. The proposed action incorporates all elements of the no-action alternative discussed in the next paragraph.

Under the *no-action alternative*, the Department would continue ongoing operations, scientific testing, and routine maintenance at Yucca Mountain using the infrastructure that now exists. This infrastructure, including safety and security facilities, communication systems, roads, buildings, and the infrastructure in the Exploratory Studies Facility, would be maintained and replaced as needed; but the construction projects under the proposed action would not occur. Because only minor infrastructure improvements would occur under the *no-action alternative*, there would be no additional impacts to any resources under this alternative beyond the baseline conditions associated with ongoing operations, scientific testing, and routine maintenance.

The environmental impacts from the proposed action would be small. Under the proposed action, the impacts from operating and maintaining Yucca Mountain would be beneficial because the margin of operational safety for workers, regulators, and visitors would increase. For example, all new infrastructure at Yucca Mountain would meet applicable construction codes and operating standards, structures that are in disrepair would be replaced, the indoor work environment would be improved, and the safety of the road system would be substantially enhanced. These beneficial impacts would not occur under the *no-action alternative*.

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ACRONYM AND ABBREVIATIONS

BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESF	Exploratory Studies Facility
NAC	Nevada Administrative Code
NEPA	National Environmental Policy Act of 1969
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NWPA	Nuclear Waste Policy Act of 1982
U.S.C.	United States Code

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1. INTRODUCTION

This environmental assessment (EA) examines the potential environmental impacts from a group of actions proposed by the U.S. Department of Energy (the Department or DOE) at and near Yucca Mountain in southern Nevada. The Department has prepared this EA to satisfy the requirements of the National Environmental Policy Act of 1969 (NEPA) [42 United States Code (U.S.C.) 4321-4347], as amended; the Council on Environmental Quality's regulations that implement the procedural provisions of NEPA [40 Code of Federal Regulations (CFR) Parts 1500-1508]; and the Department's NEPA regulations (10 CFR Part 1021).

1.1 BACKGROUND

In 1982, Congress enacted the Nuclear Waste Policy Act (NWPA; Public Law 97-425; 96 Stat. 2201). The NWPA specified that spent nuclear fuel and high-level radioactive waste will be disposed of underground in deep geologic repositories. In 1987, the NWPA was amended to direct the Department to characterize only Yucca Mountain in Nevada as a potential geologic repository, and that the Secretary of Energy make a recommendation to the President as to its suitability to safely isolate spent nuclear fuel and high-level radioactive waste from the human environment (42 U.S.C. 10101 *et seq.*).

On February 14, 2002, the Secretary of Energy submitted a comprehensive statement to the President recommending the Yucca Mountain site as suitable for a geologic repository. This recommendation was made after more than two decades of scientific investigations by the Department to determine the suitability of Yucca Mountain to isolate spent nuclear fuel and high-level radioactive waste far into the future. As required by the NWPA of 1982, as amended, the recommendation also included a final Environmental Impact Statement (EIS), *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002; referred to hereafter as the "repository EIS"). The President approved the Secretary's recommendation on February 15, 2002, and forwarded it to Congress. On July 23, 2002, the President signed into law a Congressional Joint Resolution designating Yucca Mountain as the site for the Nation's first geologic repository per Section 115(c) of the NWPA (the Yucca Mountain Development Act, Public Law 107-200). Pursuant to the NWPA, the Department is now preparing an application for an authorization from the Nuclear Regulatory Commission (NRC) to construct the repository.

Yucca Mountain is in Nye County, Nevada, about 100 miles northwest of Las Vegas. Figure 1-1 shows the regional setting of the area. Figure 1-2 shows the detailed setting of the area as it now exists.

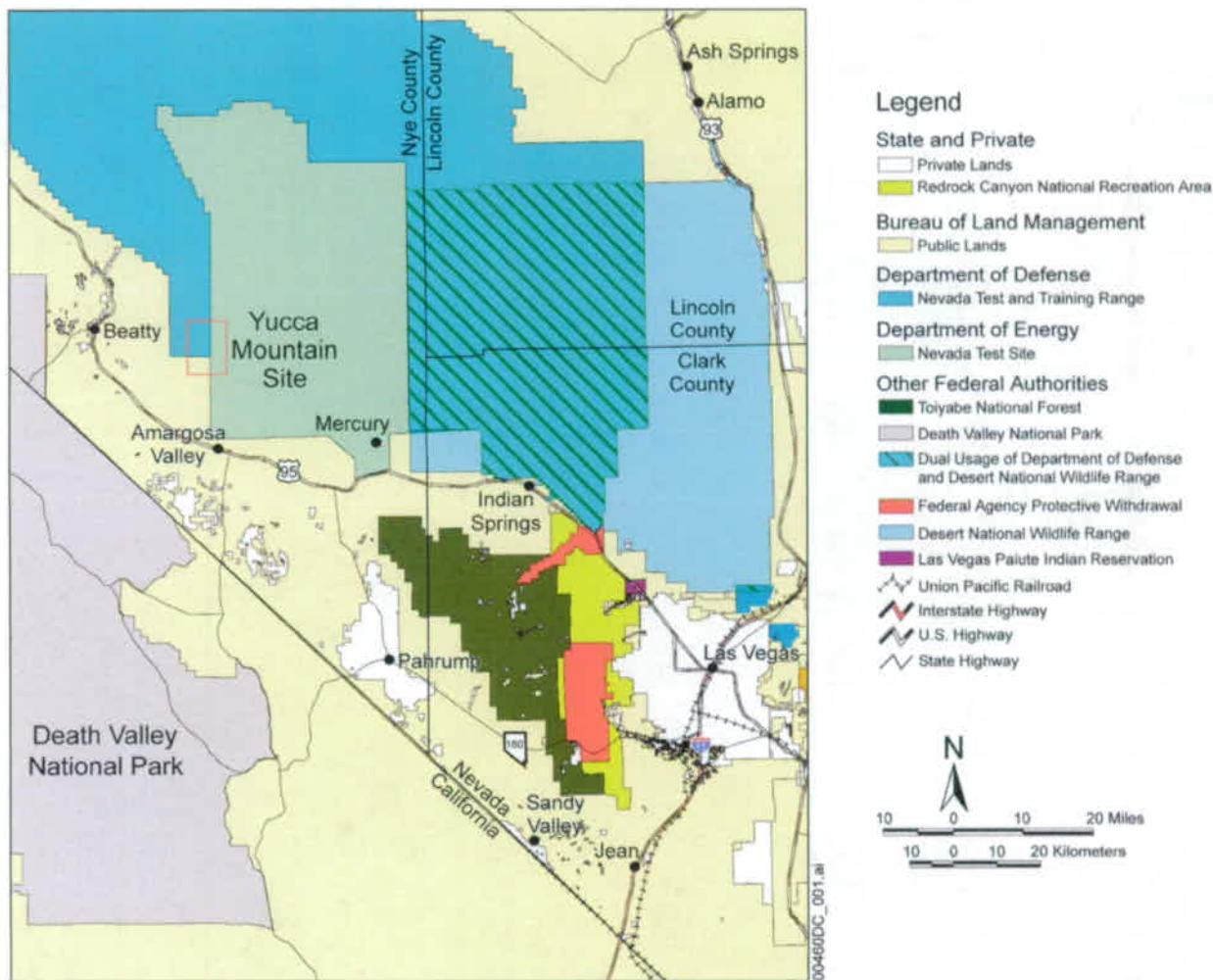


Figure 1-1. Regional Setting of the Yucca Mountain Site

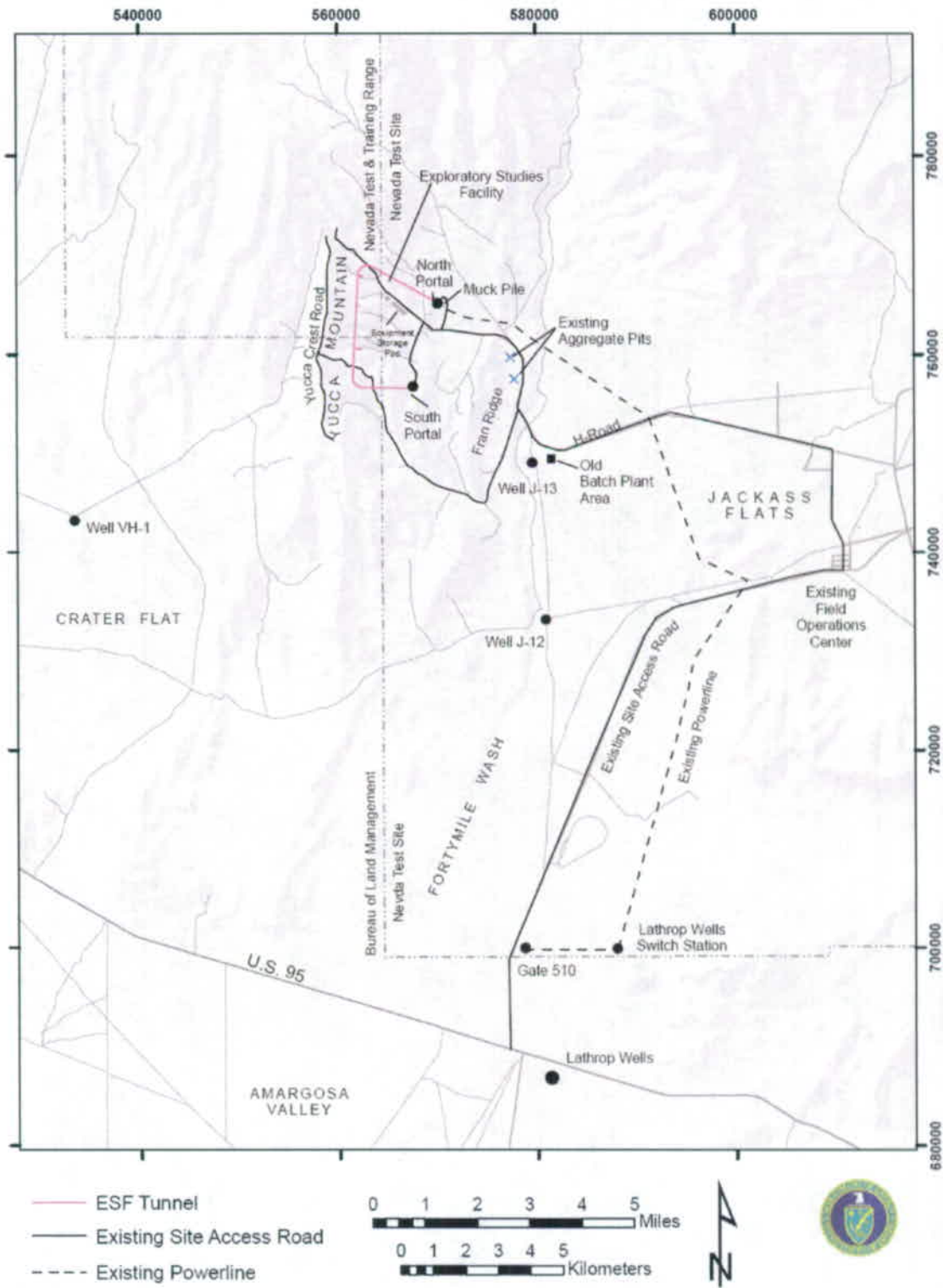


Figure 1-2. Detailed Setting of the Yucca Mountain Site

In accordance with the NWPA of 1982, as amended, the Department prepared a site characterization plan for Yucca Mountain that identified scientific, engineering, and other technical studies and evaluations necessary to assess the suitability of Yucca Mountain (DOE 1988, all). Requisite field activities were initiated, and tunnels, including an underground Exploratory Studies Facility (ESF), were excavated from 1993 through 1998. The facilities, structures, roads and utilities at Yucca Mountain (collectively referred to herein as *infrastructure*) supporting the site characterization program were constructed with the expectation that a decision regarding the construction and operation of a repository would be made in a relatively short period of time after the site was designated. As an example, there are currently more than 100 temporary structures (e.g., Sea-Land containers, trailers, and tents) used as workshops for equipment fabrication and repair, warehousing, and offices for field operations. In addition, to minimize costs, the construction and operation of the ESF used the existing road network, electric power systems, and fire- and rescue-response capabilities on the Nevada Test Site (NTS).

Recent Departmental assessments have found that many of these temporary structures are in various stages of disrepair, do not offer conditions conducive to an efficient work environment (e.g., temperature controls), or no longer meet code requirements (e.g., electrical). Furthermore, the road network and power systems are requiring greater levels of maintenance to safely and reliably support Yucca Mountain activities. As a result, the Department has implemented more than 60 safety mitigations, including underground restrictions on rail speed, electrical load limitations, and surface-road speed restrictions, to maintain and ensure safe ongoing operations, scientific testing, and routine maintenance at Yucca Mountain.

1.2 PURPOSE AND NEED FOR AGENCY ACTION

The Department, in order to continue ongoing scientific activities and tests, must ensure the health and safety of its workers, regulators, and visitors that access Yucca Mountain. As a result the Department needs to improve Yucca Mountain's infrastructure, not only to ensure safety for workers, regulators, and visitors, but also to comply with pertinent environmental, health and safety standards and DOE Directives. Thus, the Department needs to:

- Perform routine maintenance of the existing infrastructure.
- Refurbish, disposition, or replace components of some existing structures, utilities, and roads.
- Construct new replacement structures and utilities.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

The resources and areas of concern examined in this EA were identified through internal Departmental scoping based largely on experience with other NEPA documents prepared for the Yucca Mountain Project, including consideration of comments by the public and agency experts on these other NEPA documents. Table 1-1 shows the results of this internal scoping. The geographic scope of this EA is generally confined to the area shown on Figure 1-2. Where the scope is broader or different than that shown on Figure 1-2, the text in Chapter 4 describes the affected area.

Table 1-1. Scope of Environmental Assessment

Resources/Areas of Concern	Proposed Action and No-Action Alternative		Comments
	Potentially Affected		
	Yes	No	
Air Quality	X		Examined in EA
Wildlife, Plants, and Special-Status Species	X		Examined in EA
Floodplain and Wetlands Assessment	X		Examined in EA (Appendix A)
Wild Horses and Burros		X	Wild horses do not inhabit the Yucca Mountain area; feral burros in the area are acclimated to human activity and would not be substantially affected by the actions.
Water Resources (includes surface water, groundwater, and water demand)	X		Examined in EA
Land Use	X		Examined in EA
Mineral Resources	X		Examined in EA under Land Use
Prime or Unique Farmlands		X	No prime or unique farmlands occur in the affected area
Wild and Scenic Rivers		X	No wild and scenic rivers occur in the affected area
Wilderness and Wilderness Study Areas		X	No wilderness or wilderness study areas occur in the affected area
National Parks and Monuments, National Forests		X	No National Parks, Monuments, or Forests occur in the affected area
Range Management/Grazing		X	No grazing allotments occur in the affected area
Recreation	X		Examined in EA under Land Use
Soils	X		Examined in EA under Plants
Cultural Resources	X		Examined in EA
American Indian Concerns	X		Examined in EA
Environmental Justice		X	No environmental justice populations would be affected by the actions
Socioeconomic Concerns	X		Examined in EA
Visual Resources	X		Examined in EA
Transportation	X		Examined in EA
Hazardous Materials	X		Examined in EA under Water Resources
Noise	X		Examined in EA under Wildlife. Otherwise, the public would be unaffected by the actions because noise-generating activities would be largely confined to the Yucca Mountain area which is 14 miles from the nearest population center (at Lathrop Wells along U.S. 95).
Health and Safety	X		Examined in EA
Energy and Utilities	X		Examined in EA

1.4 RELATIONSHIP BETWEEN THIS ENVIRONMENTAL ASSESSMENT AND OTHER NEPA DOCUMENTS

In 2002 the Department issued the repository EIS on the construction, operation, and closure of a repository at Yucca Mountain (DOE 2002, all). Major conclusions were that the repository would cause small, short-term impacts to public health. These impacts would occur primarily

from nonradiological traffic fatalities during transport of the waste to the repository from existing commercial and DOE sites throughout the Nation.

1.5 PERMITS AND APPROVALS

The Department maintains many Federal and state-issued environmental permits for current and planned operations of the Yucca Mountain Project (YMP 2005, all). Many of the activities proposed in this EA would likely be allowed under the terms of these existing permits. However, several new permits or modifications to existing permits would likely be required. Table 1-2 lists the new permits and approvals that might be required for the proposed action, as well as the existing permits and approvals that might need to be modified.

Table 1-2. Permits and Approvals for the Proposed Action⁽¹⁾

Regulatory Agency	Authorizing Action/ Permit
Nevada Division of Environmental Protection <i>Bureau of Air Pollution Control</i>	Modify existing <i>Air-Quality Operating Permit</i> .
U.S. Fish and Wildlife Service	A <i>Biological Opinion</i> issued to the Department in 2001 by the U.S. Fish and Wildlife Service would cover all of the proposed activities.
U.S. Army Corps of Engineers	A <i>Nationwide or Individual Permit</i> would likely be required for compliance with Section 404 of the Clean Water Act.
Nevada Division of Environmental Protection <i>Bureau of Water Pollution Control</i>	<ul style="list-style-type: none"> • New NPDES ⁽²⁾ General Construction Storm Water Permit • New Temporary Permit for Working in Waterways • New Section 401 Water Quality Certification
Nevada Division of Environmental Protection <i>Bureau of Safe Drinking Water</i>	New <i>Public Water System Permit</i> or modify existing permit.
Nevada Department of Conservation and Natural Resources <i>Division of Water Resources</i>	Establish an agreement with the State of Nevada regarding the temporary use of groundwater for proposed activities.
Bureau of Land Management	<ul style="list-style-type: none"> • Possible new <i>Right-of-Way Reservation</i> for construction of a two-lane access road across Bureau of Land Management (BLM) land. The proposed action would be in conformance with the BLM's <i>Las Vegas Resource Management Plan</i> (BLM 1998), specifically with decisions RW-1 and RW-1-h of the Plan, which provide an orderly system of development for transportation, communications, and major utility transmission lines and related facilities. • New Free-Use Permit for access to and use of common varieties of sand and gravel.

⁽¹⁾ Other permits/approvals required to implement the proposed action, including those for handling hazardous materials/wastes, are already in the Department's possession and would not need to be modified.

⁽²⁾ NPDES = National Pollutant Discharge Elimination System (part of the Clean Water Act of 1977).

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes two alternatives under consideration by the Department: a no-action alternative and the proposed action. The Department identified many of the activities comprising these alternatives (described below in Sections 2.1 and 2.2) through assessments of the condition of the infrastructure of the Yucca Mountain Project; these assessments are described briefly in Section 1.1. In the future, DOE will conduct additional assessments which may result in the identification of other activities necessary to enhance safety for workers, regulators, and visitors. If so, these activities will be subject to separate NEPA reviews, as appropriate.

As described in more detail below, the proposed action includes all of the activities that would be conducted under the no-action alternative, including ongoing operations, scientific testing, and routing maintenance. This EA does not, however, consider nor include any actions beyond an NRC decision on construction authorization. For purposes of analysis in this EA, DOE assumes a duration of up to 10 years until an NRC construction authorization decision is made.

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Department would continue to operate the Yucca Mountain Project using the existing infrastructure with appropriate mitigations to protect worker health and safety, and continue maintenance and replacement on an as-needed basis only, until such time as the NRC decided whether to authorize construction of a repository at Yucca Mountain. For purposes of analysis in this EA, DOE assumes a duration of up to 10 years until an NRC construction authorization decision is made.

Operation of the Yucca Mountain Project involves the conduct of scientific activities and tests, and maintenance of the existing infrastructure. Under the no-action alternative, the activities and tests that would be conducted include, but are not limited to:

- Testing and monitoring of natural and engineered barriers, including precipitation monitoring, subsurface testing of water and rock, monitoring groundwater in the saturated zone, and drift inspection.
- Testing and monitoring geotechnical features, including mapping of subsurface joints, faults and stratigraphic units, monitoring regional seismicity, and testing in a high-temperature environment.
- Designing and testing engineered features, such as borehole seals.

To accomplish these activities, the Department provides access to the ESF and other areas of Yucca Mountain to oversight groups, elected officials, and representatives of state, local, and Federal Government agencies. Interested members of the public and American Indians also are afforded access to Yucca Mountain.

The existing infrastructure associated with the Yucca Mountain Project is illustrated on Figure 1-2. Under the no-action alternative, the Department would continue performing only those mitigation activities, as needed, on certain safety and security facilities, communication systems,

roads, buildings, as well as underground infrastructure in the ESF. Some of these mitigation activities include:

- Upgrade and replace guard station and security-access gate facilities on the NTS (Gate 510) about 2 miles north of Lathrop Wells (Lathrop Wells, located along U.S. 95, is now part of the unincorporated Town of Amargosa Valley and approximately 18 miles from Yucca Mountain).
- Installing a new microwave communication system to replace an existing unreliable communication system.
- Refurbishing and replacing existing systems of the ESF as appropriate (e.g., the ventilation system, and installing new fire-detection and alarm systems).
- Repair/replace existing water system
- Constructing and/or relocating pathways and short roads.
- Routine maintenance and custodial services for buildings, trailers, structures, and equipment on an as needed basis (e.g., replacing roofs).
- Repairing/maintaining existing roads (e.g., pothole/asphalt repair, dirt grading).
- Constructing and operating, as needed, new, temporary support buildings and structures (e.g. replace those structures destroyed by a fire).
- Relocating and/or disposing of buildings unsuitable for further use.

Over the next 10 years, water consumption for operations would generally be less than 10 acre-feet/year based on annual water use since 2002. Land disturbances for field activities and tests over the next 10 years would generally be less than 20 acres per year based on annual disturbances since 2002.

The Department leases offices and other facilities in communities surrounding Yucca Mountain (Las Vegas, Pahrump, and Beatty). Either the no-action alternative or the proposed action would not affect these offices and facilities.

2.2 PROPOSED ACTION

The proposed action includes activities described under the no-action alternative and includes additional activities to enhance worker health and safety. The proposed action is to repair, replace, or improve certain infrastructure at the Yucca Mountain site (Figure 2-1); to enhance safety at the project; and to enable the DOE to continue ongoing operations, scientific testing, and routine maintenance until such time as the NRC decides whether to authorize construction of a repository. For purposes of analysis in this EA, DOE assumes a duration of up to 10 years until an NRC construction authorization decision is made. This EA does not, however, consider nor include any actions beyond an NRC decision on construction authorization. Ongoing

operations, scientific testing, and routine maintenance under the proposed action would be similar to that described under the no-action alternative (Section 2.1).

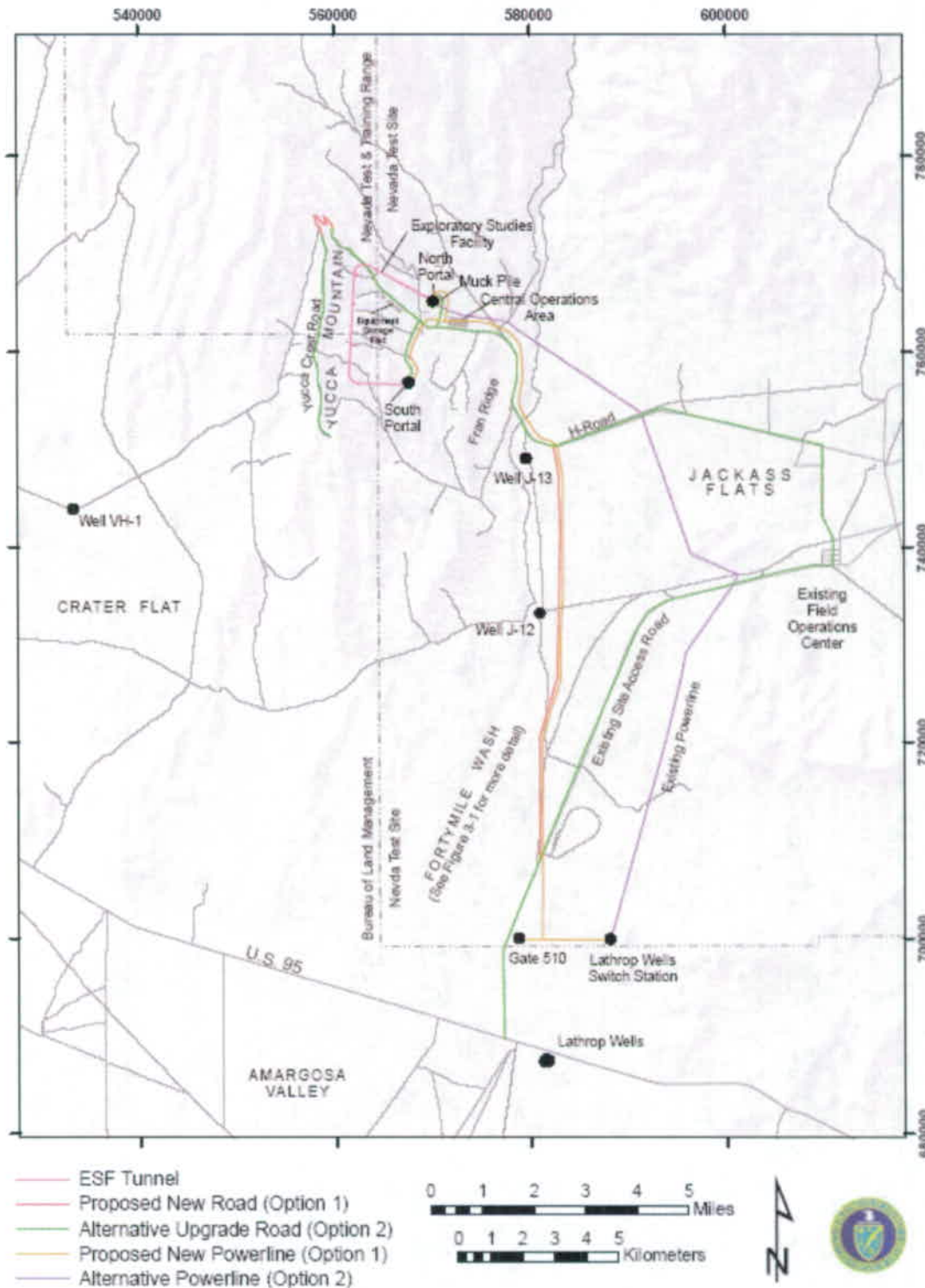


Figure 2-1. Proposed Action

The actions proposed by the Department are designed to maintain a safe and healthy working environment with increased safety over the no-action alternative, while also continuing to protect the environment. The main elements of the proposed action are as follows (Figure 2-1):

- Construction of up to 33 miles of new and replacement roads (with two options for an access road; Section 2.2.1)
- Construction of up to 20.6 miles of new 138 kV power lines (with two options for a main power line; Section 2.2.2)
- Develop a Central Operations Area consisting of six support buildings to replace existing infrastructure that is nearing or, in some instances, has exceeded its design and operational life (Section 2.2.3)
- Site, repair, and construct other facilities and structures for the Yucca Mountain Project (Section 2.2.4)

As described in Section 2.2.1, the Department identifies two options for an access road (road Option 1 and road Option 2). In Section 2.2.2, the Department identifies two options for a main power line (power-line Option 1 and power-line Option 2). In this EA, road- and power-line Options 1 are examined together, as are road- and power-line Options 2 because the Department would select either road- and power-line Option 1 or road- and power-line Option 2.

2.2.1 Road Construction

2.2.1.1 Option 1 (Preferred)

Under this preferred option, the Department would build several new roads and replace several existing roads (Figure 2-1). In total, about 25 miles of paved roads would be constructed (new roads and replacement roads). Road construction would require borrow material that would be obtained from either the existing muck pile near the North Portal (the muck is the material that was excavated for construction of the ESF), existing borrow pits (Figure 1-2), a new borrow site at an unspecified location within 15 miles travel distance, or from a combination of these sources (Figure 2-1).

The Department would build (1) a new 8.5-mile-long, two-lane-wide, paved access road from a point 2.3 miles north of Gate 510 on the NTS to a point about 0.5 miles east of Fortymile Wash, and (2) a new 1.3-mile-long, two-lane-wide, paved road to the crest of Yucca Mountain (Figure 2-1). Core drilling would be conducted along the centerline of each new roadbed at intervals based on field conditions. Vegetation and about six inches of topsoil would be removed by blading; soil would be stockpiled for use in reclamation. High points along the roadbeds would be leveled and the excess material would be deposited in low points to balance cut and fill. Road shoulders, erosion controls, drainage culverts, riprap, and ditches would be installed according to best-management practices. Drilling, blasting, and retaining walls may be required for part of the new crest road. A strip 36 feet wide for the crest road and 50 feet wide for the access road would then be compacted and paved. An 18-inch-thick layer of fill would be placed on the roadbed and compacted, after which a 16-inch-thick layer of aggregate would be placed over the

fill and compacted. Finally, a 7-inch-thick layer of asphalt would be applied to the road surface. The total width of the disturbance for these new roads and shoulders would be about 120 feet for the access road and about 60 feet for the crest road. A total of about 135 acres would be disturbed for both roads.

The Department would replace up to 12.4 miles of existing access road (also called H-Road) and 2.9 miles of the existing crest road with two-lane asphalt roads (Figure 2-1). These improved and widened roads would cause about 85 acres of disturbances adjacent to the roads (e.g., the access road would require that a 120-foot-wide area be disturbed, whereas the crest road would require that a 60-foot-wide area be disturbed). Included in this effort would be construction of a culvert crossing at Fortymile Wash (the existing road is not raised; see the *floodplain and wetlands assessment* in Appendix A). The existing asphalt roadbed would be excavated and stockpiled for possible use as fill material or disposed of at a landfill on the NTS. After removal of the old asphalt, the construction procedure would be identical to that described in the preceding paragraph for new roads.

All of the proposed roads would be on either the NTS or the Nevada Test and Training Range (formerly known as the Nellis Air Force Range) (Figure 2-1). Most of the roads proposed for improvement would also be on the NTS and the Nevada Test and Training Range, with two exceptions that would be on public land administered by BLM: (1) a 2-mile segment of the access road between U.S 95 and Gate 510 on the NTS, and (2) a 1.5-mile segment of the crest road on Yucca Mountain (Figure 2-1).

2.2.1.2 Option 2

The only difference between this option and Option 1 is the alignment of part of the access road. Under this option, the existing access road would be removed and replaced (Figure 2-1). It would be about 8 miles longer than the access road under Option 1, bringing the total mileage under Option 2 to about 33 miles. Under this option (Figure 2-1), 16.7 miles of the existing access road where it diverges from Option 1 (about 2.3 miles north of Gate 510) to the point where it intersects Option 1 (about 0.5 miles east of Fortymile Wash), would be replaced with a two-lane-wide paved road. The access road to the north and south of these intersections would be identical under Options 1 and 2.

2.2.2 Electrical Power-Line Construction

2.2.2.1 Option 1 (Preferred)

Under this preferred option, the Department would install a new 138 kV power line from the existing Lathrop Wells switch station to a proposed substation at the Central Operations Area (Figure 2-1). From the Lathrop Wells switch station, the power line would extend due west about 1.5 miles along the boundary of the NTS. It would then turn northward for about 2.0 miles before intersecting the proposed new access road. From this point, the power line would extend about 8.5 miles next to the Road Option 1 access road to its junction with the existing access road about 0.5 miles east of Fortymile Wash. From this point, the power line would extend another 5.5 miles adjacent to the existing access road, crossing Fortymile Wash, and ending at

the Central Operations Area (Figure 2-1). The total length of the power line under this option from the Lathrop Wells switch station to the Central Operations Area would be about 17.6 miles.

From the proposed substation at the Central Operations Area, two new 12.47kV power lines would be installed; an approximately 1-mile-long line replacement line to power existing ESF equipment and a 2-mile-long line to a new proposed substation at the South Portal (to provide power to operate exhaust fans that currently function intermittently on generator power) (Figure 2-1). Each power line would be adjacent to existing roads. The proposed substations at the Central Operations Area and the South Portal would each require a pad measuring 100 x 100 feet. Existing distribution equipment (the poles and cable discussed in Section 2.2.2.2) would not be removed and might be maintained as a backup power supply for the Yucca Mountain.

2.2.2.2 Option 2

The only difference between this option and Option 1 is the alignment of the main power line (Figure 2-1). Under this option, the existing power line from the Lathrop Wells switch station would be replaced with a new 138 kV power line. Following the existing power-line alignment, this line would be about 20.6 miles long from the Lathrop Wells switch station to the Central Operations Area (about 3 miles longer than Option 1).

2.2.3 Central Operations Area

The Department would develop a Central Operations Area (approximately one-half mile southwest of the North Portal) for all operations, including support and replacement of underground infrastructure in the ESF (Figure 2-1). Proposed construction would occur on about 30 acres of land previously used for equipment storage and laydown. As much as 150,000 cubic yards of fill material would be transported to the area and graded flat. The fill material would be obtained from either the existing muck pile near the North Portal, existing borrow pits, a new borrow site at an unspecified location within 15 miles travel distance, or from a combination of these sources. The fill would be crushed and screened at the source location(s). After placement and grading of the fill material, six new support buildings would be constructed and utilities would be installed (power, water, sewer, and communications). The six support buildings include a 43,000 square-foot field operations center for offices, training, computer operations, and emergency facilities; a 10,000 square-foot incident-response station for fire and medical support; a 43,000 square-foot craft shop and annex for maintenance and repair operations; a fuel and vehicle-wash facility; and a 35,000 square-foot warehouse and material-storage yard. The fuel facility would have space for refueling islands to supply diesel, gasoline, propane, and compressed natural gas and a separate facility for washing vehicles. The areas surrounding each building would be paved with asphalt to control dust during operations. The entire site would be fenced and exterior lighting would be installed. These buildings would replace the more than 100 temporary structures (e.g., Sea-Land containers, trailers, and tents) used for workshops for equipment fabrication and repair, warehousing, and offices.

Upon completion, the Department would dismantle and dispose of existing temporary structures and utilities at the North Portal and the existing Field Operations Center that are deemed obsolete (the location of the existing Field Operations Center is shown on Figures 1-2 and 2-1).

2.2.4 Other Facilities and Activities

As part of the proposed action, the Department would also repair the 15-acre equipment-storage pad approximately one-mile northeast of the North Portal, which has been damaged over the years by natural erosion (Figure 2-1). The Department would repair this damage and improve drainage on the storage pad by leveling the area with up to 5,000 cubic yards of borrow material. The borrow material would be obtained from either the existing muck pile near the North Portal, existing borrow pits, a new borrow site at an unspecified location within 15 miles travel distance, or from a combination of these sources (Figure 2-1).

A new building, referred to as the Sample Management Facility, would be constructed within 10 miles of Gate 510 on private land, perhaps near Lathrop Wells (no less than 15 miles south of the North Portal). This facility would house a variety of samples collected from studies, including rock cores. The building would be about 42,000 square feet surrounded by a 36,000 square-foot fenced area. About 3.0 acres would be disturbed for this facility.

2.2.5 Estimated Disturbances, Water Requirements, and Work Force for the Proposed Action

Table 2-1 lists the estimated land disturbances, water requirements, and work force for the components of the proposed action. Acreage disturbances refer to areas not previously disturbed by vehicular or construction activities associated with the Yucca Mountain Project. Re-disturbance of such previously disturbed areas are not included on the table, but are discussed in the text where appropriate (e.g., impacts to air quality in Section 4.1). The work-force estimates assume a construction period of two years.

2.2.6 Reclamation

All land disturbed by the proposed activities that would no longer be needed to support the Department's mission would be reclaimed in accordance with the Department's *Reclamation Implementation Plan* (YMP 2001, all). This plan includes specifications for topsoil and vegetation salvaging; control of weeds; erosion-control measures, contouring, soil decompaction, and other site-preparation activities; revegetation with native plants; and monitoring the progress of revegetation. The Plan meets the requirements for reclamation of desert tortoise habitat as specified by the U.S. Fish and Wildlife Service (Williams 2001, all), and stipulations in Right-of-Way Reservations issued to the Department by the BLM.

Table 2-1. Estimated Disturbances, Water Requirements, and Work Force for the Proposed Action

Major Activity	Disturbances (acres) ⁽¹⁾	Water Requirements ⁽²⁾ (acre-feet)	Estimated New Workers during Construction ⁽³⁾
Roads: ⁽⁴⁾			
Option 1:	220	200	40
Option 2:	185	265	40
Power Lines: ⁽⁴⁾			
Option 1:	30	6	16
Option 2:	0	8	16
Central Operations Area	0	22	100
Work at Equipment Storage Pad	0	<1	10
Sample Management Facility	3	<1	30
Totals			
Option 1:	253	230	196
Option 2:	188	297	196

⁽¹⁾ Some of the land included in this category has experienced minor disturbances from previous activities associated with the Yucca Mountain Project and other earlier Department activities.

⁽²⁾ For analytical purposes it is assumed that construction would take two years to complete, even though in some cases the activities would be completed in less than two years.

⁽³⁾ The workforce needed to operate the Central Operations Area already work on the Yucca Mountain Project.

⁽⁴⁾ Road Option 1 and power-line Option 1 are considered together, as are road Option 2 and power-line Option 2.

2.3 ALTERNATIVES CONSIDERED BUT REJECTED

The Department considered an option for an access road that would follow an existing dirt road west of Fortymile Wash. This option was rejected because of known cultural resources along this alignment that could not be avoided. The Department also considered an option for an access road a short distance west of Fortymile Wash that would avoid the placement of fill material into Midway Valley Wash (which drains into Fortymile Wash and may be regulated under Section 404 of the Clean Water Act). Any access road in this area, however, would have to be constructed in steep, rough terrain that has not been disturbed previously by construction or vehicular traffic associated with the Yucca Mountain Project. This option was rejected as not practicable because of the substantial increase in construction costs and because of potential adverse effects to desert tortoises and other natural resources.

The Department considered several alternatives to the proposed road to the crest of Yucca Mountain. These alternatives, some of which would follow existing dirt roads, were rejected because a grade of 8 percent or less could not be achieved. Road grades exceeding 8 percent are too steep for some vehicles and could pose a traffic hazard for both ascending and descending traffic.

2.4 SUMMARY OF FINDINGS AND COMPARISON OF ALTERNATIVES

The analyses in this EA indicate that the environmental impacts associated with the construction activities under the proposed action would be small. Impacts from ongoing operation, scientific testing, and routing maintenance would be negligible. Table 2-2 summarizes these impacts for the no-action alternative and the proposed action.

Although the impacts from the proposed action would be small, some adverse impacts would nevertheless occur. The Department would substantially reduce these impacts with the environmental protection measures and management practices listed in Table 4-1.

Table 2-2. Summary and Comparison of Impacts Among the Alternatives

Resource/ Concern	No-Action Alternative	Proposed Action
Air Quality	None; because only minor infrastructure improvements would occur, additional impacts to air quality beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Air-quality impacts from operations would be negligible.	Small; modeling results for the proposed action with road/power-line Option 1 showed a 24-hour average concentration of PM ₁₀ of 42 µg/m ³ (the regulatory standard is 150 µg/m ³) and an annual average concentration of PM ₁₀ of 3 µg/m ³ (the regulatory standard is 50 µg/m ³). Modeling results for the proposed action with Option 2 showed a 24-hour average concentration of PM ₁₀ of 46 µg/m ³ and an annual average concentration of PM ₁₀ of 2 µg/m ³ . Exposure to cristobalite dust would likely be within regulatory standards (see Health and Safety below). Air-quality impacts from operations would be negligible.
Wildlife and Plants	None; because only minor infrastructure improvements would occur, additional impacts to wildlife and plants beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to wildlife and plants from operations would be negligible.	Small; under the proposed action with Option 1, 253 acres of habitat would be disturbed. The proposed action with Option 2 would disturb 188 acres of habitat. Construction would remove habitat, increase the potential for invasive plant species, and directly harm some individuals; noise and human contact would force some animals into nearby areas. Overall, impacts to wildlife and plants from operations would be negligible.
Special-Status Species	None; because only minor infrastructure improvements would occur, additional impacts to special-status species beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to special-status species from operations would be negligible.	Small; under the proposed action with Option 1, 253 acres of habitat would be disturbed. The proposed action with Option 2 would disturb 188 acres of habitat. These land disturbances would be well within the limits imposed by the 2001 <i>biological opinion</i> issued to the Department by the U.S. Fish and Wildlife Service. Impacts to special-status species from operations would be negligible.

Table 2-2. Summary and Comparison of Impacts Among the Alternatives (Continued)

Resource/ Concern	No-Action Alternative	Proposed Action
Water Resources	None; because only minor infrastructure improvements would occur, additional impacts to water resources, floodplains, and waters of the U.S. beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Operational impacts from water demand of generally less than 10 acre-feet/year would be negligible, as would impacts to floodplains, and waters of the U.S.	<p><u>Surface hydrology</u>: Small; land disturbances would cause minor changes to runoff and infiltration rates; impacts to floodplains and waters of the U.S. would be small. No distinction between Options 1 and 2.</p> <p><u>Groundwater Quality</u>: No impacts expected to the quality of groundwater.</p> <p><u>Water Demand</u>: Small; water needed for construction (ranging from 230 to 297 acre-feet per year for two years under the proposed action with Options 1 and 2, respectively) would be far below the lowest estimate of the groundwater basin's perennial yield of 580 acre-feet.</p> <p>Impacts to water resources, floodplains, and waters of the U.S. from operations would be negligible.</p>
Land Use	None; because only minor infrastructure improvements would occur, additional impacts to land use beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to land use from operations would be negligible.	Negligible; impacts to recreation and other uses of affected public land would be negligible. Impacts to operations at the NTS and the Nevada Test and Training Range would not be expected. Impacts to land use from operations would be negligible.
Cultural Resources	None; because only minor infrastructure improvements would occur, additional impacts to cultural resources beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. In-place mitigation measures, including detailed surveys prior to land disturbances, would avoid or, when necessary, collect artifacts; in-place education programs would minimize impacts from illicit collecting at archaeological sites. Impacts to cultural resources from operations would be negligible.	Small; under the proposed action with Option 1, 253 acres of land would be disturbed. The proposed action with Option 2 would disturb 188 acres of land. In-place mitigation measures, including detailed surveys prior to land disturbances, would avoid or, when necessary, collect artifacts; in-place education programs would minimize impacts from illicit collecting at archaeological sites. Impacts to cultural resources from operations would be negligible.
American Indian Concerns	American Indians consider the repository program to be an adverse impact to all elements of the natural and physical environment. Programs are in place to continue consultations with affected tribes and organizations.	American Indians consider the repository program to be an adverse impact to all elements of the natural and physical environment. Programs are in place to continue consultations with affected tribes and organizations.
Socioeconomics	None; because only minor infrastructure improvements would occur, additional impacts to socioeconomic conditions resources beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to socioeconomic conditions from operations would be negligible.	Negligible; the level of employment during construction represents far less than a 1 percent increase in composite regional employment and would have negligible impacts on employment, economics, population, housing, and public services. Impacts to socioeconomic conditions from operations would be negligible.

Table 2-2. Summary and Comparison of Impacts Among the Alternatives (Continued)

Resource/ Concern	No-Action Alternative	Proposed Action
Visual Resources	None; because only minor infrastructure improvements would occur, additional impacts to visual resources and from night lighting beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to visual resources and night lighting from operations would be negligible.	No impacts would occur to the visual resources of the Yucca Mountain area. Small impacts could occur to the nighttime environment at offsite locations from increased night lighting at Yucca Mountain from the proposed action and during operations.
Transportation	<p><u>Public Transportation:</u> None; because only minor infrastructure improvements would occur, additional impacts to the public transportation system beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. Impacts to the public transportation system from operations would be negligible.</p> <p><u>Transportation at Yucca Mountain:</u> None; because the road system at Yucca Mountain would be repaired, as needed, rather than widened, realigned, or replaced, there would be little improvement in the safety of the road system at Yucca Mountain and speed restrictions would likely remain in effect. Overall operations would not be improved because these roads would require increasing levels of maintenance just to maintain safety.</p>	<p><u>Public Transportation:</u> Negligible; the transport of personnel and materials to Yucca Mountain during construction would be a very small component of the traffic volume on U.S. 95. Therefore, measurable impacts to the level-of-service ratings of U.S. 95 during the two-year construction period and of operations would be negligible.</p> <p><u>Transportation at Yucca Mountain:</u> Beneficial; because the road system at Yucca Mountain would be substantially upgraded, the safety of the road network would increase and speed restrictions currently in place could be adjusted.</p>
Health and Safety	None; because only minor infrastructure improvements would occur, additional impacts to the health and safety of workers, regulators, and visitors beyond existing baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur. The infrastructure at Yucca Mountain would be maintained and repaired, as needed, to maintain worker and environmental safety. Infrastructure that is nearing or, in some instances, has exceeded its design and operational life would require extensive repairs or complete re-building in place. These repairs would do little to improve the margin of operational safety for workers, regulators, and visitors.	<p><u>Post-Construction:</u> Beneficial; because the margin of operational safety for workers, regulators, and visitors would be increased as the new infrastructure would meet applicable construction codes and operating standards (e.g., electrical, heating, and cooling), structures that are in various stages of disrepair would be replaced, and the work environment would be improved (e.g., temperature controls would be installed).</p> <p><u>Construction:</u> Small impacts to health and safety during construction could occur to workers exposed to airborne hazardous minerals from excavation of the existing muck pile near the North Portal for road construction, as well as exposure to common hazards associated with industrial/mining sites. Site monitoring during construction, as well as the use of personal protective equipment (as needed) and worker-awareness training, would minimize these potential adverse impacts.</p>

Table 2-2. Summary and Comparison of Impacts Among the Alternatives (Continued)

Resource/ Concern	No-Action Alternative	Proposed Action
Energy, Utilities, and Site Services	None; because only minor infrastructure improvements would occur, additional impacts to the availability and use of electricity, fossil fuels, utilities, and services, beyond existing the baseline conditions (from ongoing operations, scientific testing, and routine maintenance) would not occur.	Negligible; peak electrical demand during the two-year construction period would be about 1.2 to 1.9 megawatts/year, would be met by the electrical supply available in southern Nevada. Consumption of fossil fuels would increase over current consumption, but supplies are abundant and readily available in southern Nevada. Construction would generate increased volumes of nonhazardous solid waste, construction debris, hazardous waste, recyclables, sanitary sewage, and wastewater, but current facilities and programs that deal with these materials would easily handle the expected volume of these materials. Impacts to existing emergency services, law enforcement, fire protection, and medical services at Yucca Mountain would be negligible because construction would not involve a substantial increase in the number of new workers and employees and, upon completion of construction, operations would be similar to current operations. The impacts to energy, utilities, and services from continued activities upon completion of the proposed action would be negligible.

3. AFFECTED ENVIRONMENT

This chapter describes the existing environment that could potentially be affected by the proposed action and the no-action alternative. These descriptions provide the environmental baseline against which potential consequences are identified and evaluated. The information in this chapter is summarized largely from the repository EIS (DOE 2002) and updated and referenced where appropriate.

3.1 AIR QUALITY

The quality of the outside air is determined by measuring concentrations of six *criteria pollutants* in the atmosphere. These pollutants are nitrogen dioxide, ozone, lead, carbon monoxide, particulate matter, and sulfur dioxide. The U.S. Environmental Protection Agency (EPA) designates an area as being *in attainment* for a particular criteria pollutant if ambient concentrations of that pollutant are below National Ambient Air Quality Standards (Table 3-1). The EPA established the national standards to define levels of air quality that are necessary to protect the public health (the primary standards) and the public welfare (the secondary standards). The standards specify the maximum pollutant concentrations and frequencies of occurrence for specific averaging periods.

Areas in violation of one or more of these standards are called *nonattainment areas*. If air quality data are not sufficient to determine the status of attainment, as is usually the case for remote or sparsely populated parts of the country, the area is listed as *unclassified*. Yucca Mountain and the areas potentially affected by the actions are *unclassified* with respect to attainment (40 CFR Part 81.329).

Air quality in attainment areas is controlled under the Prevention of Significant Deterioration program of the Clean Air Act. The goal of this program is to prevent significant deterioration of existing air quality. Under provisions of the program, Congress established a land classification scheme for areas of the country with air quality that is better than the National Ambient Air Quality Standards. Class I allows very little deterioration of air quality; Class II areas allow moderate deterioration; and Class III allows more deterioration. In all cases, however, the pollution concentrations must not violate any of the National Ambient Air Quality Standards listed in Table 3-1. Yucca Mountain and surrounding areas are designated as Class II. There are no Class I areas nearby.

Since 1991, the Department has held an operating permit for land disturbances and has obtained permits, as needed, for operation of generators and other emission sources at Yucca Mountain. In mid-1995, the State of Nevada consolidated those permits into a single Class-II air-quality operating permit (Johnson 1995). A new Class II permit was issued to the Department on July 23, 2001 (Elges 2001). As required by the State of Nevada, the Department submits an annual report summarizing emissions from Yucca Mountain. Data collected since 1991 indicate that the air quality at Yucca Mountain is well within the regulatory standards shown in Table 3-1.

From 1991 to 1999, the Project's air-quality operating permit required the Department to measure inhalable particulate matter 10 micrometers or less in diameter (PM₁₀). Monitoring has continued since then to demonstrate continued compliance with Federal (40 CFR Part 50) and

Nevada ambient air-quality standards [Nevada Administrative Code (NAC) 445B]. Monitoring results from 2000 through 2004 are shown in Table 3-2. All measurements have been much lower than the maximum allowable 24-hour concentration of 150 $\mu\text{g}/\text{m}^3$ and the maximum allowable annual arithmetic-mean concentration of 50 $\mu\text{g}/\text{m}^3$.

Table 3-1. National Ambient Air-Quality Standards⁽¹⁾

Pollutant	Primary and Secondary Standards		
	Level	Averaging Time	Form
Ozone	0.12 ppm	1 hour	More than 3 days over 3 years
	0.08 ppm	8 hours	3-year average of annual fourth-highest daily maximum
PM ₁₀	150 $\mu\text{g}/\text{m}^3$	24 hours	Not to be exceeded more than once per year
	50 $\mu\text{g}/\text{m}^3$	Annual	Expected annual arithmetic mean at each monitor within an area not to be exceeded
PM _{2.5}	65 $\mu\text{g}/\text{m}^3$	24 hours	3-year average of the 98th percentile of the 24-hour concentrations at each population-monitor within an area must not exceed 65 $\mu\text{g}/\text{m}^3$
	15 $\mu\text{g}/\text{m}^3$	Annual	3-year average of the annual arithmetic mean PM _{2.5} concentrations from a single or multiple community-oriented monitors must not exceed 15.0 $\mu\text{g}/\text{m}^3$
CO	35 ppm	1 hour	Not to be exceeded more than once per year
	9 ppm	8 hours	Not to be exceeded more than once every 2 years
SO ₂	0.50 ppm	3-hour (secondary)	Not to be exceeded more than once per year
	0.14 ppm	24 hours	
	0.03 ppm	Annual	Not to be exceeded
NO ₂	0.053 ppm	Annual	Not to be exceeded
Lead	1.5 $\mu\text{g}/\text{m}^3$	Quarterly	Not to be exceeded

⁽¹⁾ CO=carbon monoxide; NO₂=nitrogen dioxide; PM₁₀=particulate matter with an aerodynamic diameter of 10 micrometers or less; PM_{2.5}=particulate matter with an aerodynamic diameter of 2.5 micrometers or less; ppm=parts per million; SO₂=sulfur dioxide; and $\mu\text{g}/\text{m}^3$ =micrograms per cubic meter.

Source: 40 CFR Parts 50.4 through 50.11.

Table 3-2. Summary of Ambient Particulate Matter Sampling (PM₁₀), 2000 through 2004 ($\mu\text{g}/\text{m}^3$)⁽¹⁾

Site	2000	2001	2002	2003	2004
Highest 24-hour average					
Site 1 ⁽²⁾	38	19	52	33	24
Site 9 ⁽³⁾	36	22	43	38	27
Second-highest 24-hour average					
Site 1	34	18	37	17	19
Site 9	33	19	39	35	21
Arithmetic mean of 24-hour average					
Site 1	11	8	10	8	8
Site 9	11	9	10	9	9

⁽¹⁾ $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter.

⁽²⁾ Site 1 is in Midway Valley near the ESF; it represents conditions near most of the surface-disturbing activity at Yucca Mountain. Monitoring at this site began in 1989.

⁽³⁾ Site 9 is at Gate 510 on the NTS about 12 miles south of the ESF near the community of Lathrop Wells. Monitoring at this site began in 1992.

3.2 WILDLIFE

Thirty-six species of mammals have been recorded in and around Yucca Mountain. None of these mammals are classified as threatened or endangered. Rodents are the most abundant mammals, with 17 documented species. Three species of rabbits, seven carnivores, two ungulates (mule deer [*Odocoileus hemionus*] and feral burros [*Equus asinus*]), and several species of bats have also been seen in this area. No wild horses occur at or near Yucca Mountain.

Twenty-seven species of reptiles, including 12 species of lizards, 14 species of snakes, and one species of tortoise, have been found at and near Yucca Mountain. The desert tortoise (*Gopherus agassizii*) is listed as threatened under the Endangered Species Act, and the western chuckwalla (*Sauromalus obesus*) and the western red-tailed skink (*Eumeces gilberti rubricaudatus*) are classified as sensitive species in Nevada by the BLM (see Section 3.4 for more information on these and other special-status species).

More than 120 species of birds have been recorded at Yucca Mountain and the surrounding region, including 15 species of raptors (DOE 2002). Several bird species are classified as sensitive species in Nevada by the BLM (see Section 3.4 for more information on these and other special-status species).

3.3 PLANTS

Native plants at Yucca Mountain below an elevation of about 4,000 feet are typical of the Mojave Desert. Common shrubs include white bursage (*Ambrosia dumosa*), creosotebush (*Larrea tridentata*), Nevada jointfir (*Ephedra nevadensis*), littleleaf ratany (*Krameria erecta*), pale wolfberry (*Lycium pallidum*), California buckwheat (*Eriogonum fasciculatum*), and spiny hopsage (*Grayia spinosa*). Above 4,000 feet is a vegetation transition zone between the Mojave Desert and the colder Great Basin Desert. Blackbrush (*Coleogyne ramosissima*) is the most

abundant shrub at and above this elevation. Other common plants at these elevations include California buckwheat, heathgoldenrod (*Ericameria teretifolius*), Nevada jointfir, broom snakeweed (*Gutierrezia sarothrae*), and green ephedra (*Ephedra viridis*). Big sagebrush (*Artemisia tridentata*) is common on steep north-facing slopes.

About 30 invasive, non-native plant species also occur in the Yucca Mountain region. These species are so prevalent and opportunistic that it is no longer practical or possible to eliminate them from the environment. Areas that have not been disturbed by construction or vehicular traffic almost always have some of these species in the soil or in nearby areas. The most common species include red brome (*Bromus rubens*), Russian thistle (*Salsola* spp.), tumble mustard (*Sisymbrium altissimum*), halogeton (*Halogeton glomeratus*), and Arabian schismus (*Schismus arabicus*). Red brome is the most abundant non-native species in the area. None of these species is on the State of Nevada's Noxious Weed List (NDA 2005).

3.4 SPECIAL-STATUS SPECIES

Special-status animal and plant species considered in this EA include (1) species that are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act and species that are proposed for listing or are designated as candidates for potential future listing under the Endangered Species Act; (2) species considered to be sensitive by the BLM as designated by the State BLM Director (BLM 2003); (3) flora classified by the State of Nevada as fully protected (NAC 527), and (4) protected wild mammals, birds, fish, reptiles and amphibians classified as endangered, threatened or sensitive by Nevada (NAC 503).

Information on the presence of special-status species at and near Yucca Mountain is based on extensive surveys of flora and fauna in the Yucca Mountain region, as summarized in the repository EIS (DOE 2002) and other reports (Blomquist et al. 1995; CRWMS M&O 1996; 1998 a, b, c; 1999) and examination of the Nevada Natural Heritage Program database (version dated December 2005). Special-status species that occur at Yucca Mountain are listed in Table 3-3.

3.4.1 Federally-Listed Species

The Mojave population of the desert tortoise (*Gopherus agassizii*) is listed as threatened by the U.S. Fish and Wildlife Service per the Endangered Species Act, and as protected and threatened by the State of Nevada per NAC 503.080. The desert tortoise is the only Federally-listed species in areas potentially affected by the actions. Yucca Mountain is near the northern edge of this species' range, and the abundance of tortoises at Yucca Mountain is low to very low compared to other parts of its range.

The desert tortoise occurs on arid lands, generally below 4,500 feet, in association with creosote-bush scrub communities that have sufficient herbaceous cover to provide food and water. Tortoises occur most often on flats and gentle slopes characterized by sandy to sandy-gravelly soils, but can occur on other landforms and soils. Tortoises spend much of their time in burrows, which provide refuge from heat and low humidity and winter hibernation. Tortoises are generally inactive from November to late February (depending upon temperatures). They are most active in the spring until the beginning of the summer heat. Primary threats to tortoises are

habitat loss, mortality from vehicles, an upper respiratory-tract disease, and predation of young tortoises by ravens.

Critical habitat for the tortoise was designated on February 8, 1994 (59 Federal Register 5820). Yucca Mountain and nearby areas are not part of this critical habitat (U.S. Fish and Wildlife Service; 50 CFR Part 17.95) nor is Yucca Mountain near any BLM-designated Tortoise Areas of Critical Environmental Concern (BLM, 1998).

In 1989, the Department consulted with the U.S. Fish and Wildlife Service about the effects of activities on desert tortoises. The Service concluded in a 1990 biological opinion that it was unlikely that activities would jeopardize the desert tortoise. In 1996, the Department reinitiated formal consultation to allow the Service to clarify its interpretation of take, revise the incidental-take limit, and reevaluate terms and conditions for relocating tortoises. In a 1997 biological opinion, the Service again concluded that it was unlikely that completion of activities would jeopardize the desert tortoise. Consequently, the Service revised the terms and conditions the YMP must follow to legally and incidentally take desert tortoises. The Department is allowed to disturb up to 414 acres of desert tortoise habitat under the 1990 and 1997 opinions. The total amount of desert tortoise habitat that has been disturbed under these two opinions is 336 acres, 78 acres less than the 414-acre limit (YMP 2005).

In 2000, the Department again formally consulted with the U.S. Fish and Wildlife Service about the effects on the desert tortoise from Yucca Mountain activities. The Service concluded in a biological opinion in 2001 that it was unlikely that activities would jeopardize the desert tortoise (Williams 2001). This opinion, and its associated incidental-take provisions, is applicable to the actions in this EA. The opinion limits the amount of desert tortoise habitat that can be disturbed to 1,643 acres. The Department has not yet conducted any activities at Yucca Mountain covered by this opinion and thus has not disturbed any desert tortoise habitat that would count toward the limit of 1,643 acres. However, the disturbances from the proposed action will count toward this new limit, but will not exceed the limit.

No plant species classified as threatened, endangered, proposed, or candidate under the Endangered Species Act occur in areas potentially affected by the activities.

3.4.2 Other Special-Status Species

At least seven species of bats have been documented at Yucca Mountain (Table 3-3). All species are classified as sensitive by the BLM. The State of Nevada classifies three of these species as protected (pallid bat [*Antrozous pallidus*], fringed myotis [*Myotis thysanodes*], and Brazilian free-tailed bat [*Tadarida brasiliensis*]).

Two reptiles in addition to the desert tortoise are classified as sensitive by the BLM (Table 3-3). The western chuckwalla (*Sauromalus obesus obesus*) is found in rock outcrops on ridges and hills at Yucca Mountain. The western red-tailed skink (*Eumeces gilberti rubricaudatus*) has been observed once at Yucca Mountain; this species is more common at higher elevations to the south and west.

Table 3-3. Special-Status Species Observed at Yucca Mountain⁽¹⁾

Common Name/ Scientific Name	Status: USFWS/State/BLM	Evaluation of Potential for Occurrence at Yucca Mountain
Birds ^(2,3)		
Golden Eagle (<i>Aquila chrysaetos</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Short-eared owl (<i>Asio flammeus</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Long-eared owl (<i>Asio otus</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Western Burrowing Owl (<i>Athene cunicularia hypugaea</i>)	BLM – Sensitive	Known to nest at Yucca Mountain.
Ferruginous hawk (<i>Buteo regalis</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Swainson's hawk (<i>Buteo swainsoni</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Prairie falcon (<i>Falco mexicanus</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Loggerhead shrike (<i>Lanius ludovicianus</i>)	Nevada – Sensitive BLM – Sensitive	Known to nest at Yucca Mountain.
Long-billed curlew (<i>Numenius americanus</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
LeConte's thrasher (<i>Toxostoma lecontei</i>)	BLM – Sensitive	Known to occur at Yucca Mountain.
Mammals ⁽⁴⁾		
Pallid bat (<i>Antrozous pallidus</i>)	Nevada – Protected BLM – Sensitive	Common in the Yucca Mountain region
Hoary bat (<i>Lasiurus cinereus</i>)	BLM – Sensitive	Rare in the Yucca Mountain region
California myotis (<i>Myotis californicus</i>) or Small-footed myotis (<i>Myotis ciliolabrum</i>)	BLM – Sensitive	Common in the Yucca Mountain region. (The two species could not be confidently distinguished in the field.)
Fringed myotis (<i>Myotis thysanodes</i>)	Nevada – Protected BLM – Sensitive	Rare in the Yucca Mountain region
Long-legged myotis (<i>Myotis volans</i>)	BLM – Sensitive	Rare in the Yucca Mountain region
Western pipistrelle (<i>Pipistrellus hesperus</i>)	BLM – Sensitive	Most common bat species observed at Yucca Mountain
Brazilian free-tailed bat (<i>Tadarida brasiliensis</i>)	Nevada – Protected BLM – Sensitive	Rare in the Yucca Mountain region
Reptiles		
Desert tortoise (<i>Gopherus agassizii</i>)	Federal – Threatened Nevada – Threatened BLM – Sensitive	Found in low abundance throughout affected environment
Western red-tailed skink (<i>Eumeces gilberti rubricaudatus</i>)	BLM – Sensitive	Has been observed once at Yucca Mountain
Western chuckwalla (<i>Sauromalus obesus obesus</i>)	BLM – Sensitive	Found in rocky habitat on ridges in affected environment
Plants		
None		

⁽¹⁾ Special-status species that were evaluated include (1) species that are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act and species that are proposed for listing or are designated as candidates for potential future listing under the Endangered Species Act; (2) species considered sensitive by the BLM as designated by the State BLM Director (BLM 2003); and (3) flora classified as fully protected (NAC 527) and mammals, birds, fish, reptiles and amphibians classified as protected, threatened, or sensitive (NAC 503) by the State of Nevada.

⁽²⁾ All migratory birds are classified by Nevada as protected.

⁽³⁾ Only special-status birds observed in the affected environment or surrounding region are listed, based on CRWMS M&O (1998b). Other special-status bird species may be uncommon migrants in the region.

⁽⁴⁾ Only special-status mammals observed in the affected environment or surrounding region are listed, based on CRWMS M&O (1998a; 1999). Other special-status species of bats may be uncommon in the region.

All migratory birds are classified by the State of Nevada as protected. One of those species, the loggerhead shrike (*Lanius ludovicianus*), is also classified by Nevada as sensitive. The loggerhead shrike is a common nesting species at Yucca Mountain. Ten bird species that have been observed at Yucca Mountain also are classified as sensitive by the BLM, including seven species of raptors (Table 3-3).

No plant species classified as protected by Nevada or sensitive by the BLM occur in areas potentially affected by the activities.

3.5 WATER RESOURCES

The hydrologic system in the affected area is characterized and influenced by a very dry climate, limited surface water, and deep aquifers. Average precipitation ranges from about 4 to 10 inches per year, while potential evaporation is about 66 inches per year.

3.5.1 Surface Water

There are no springs, wetlands, or other natural sources of surface water at or near Yucca Mountain. The usually dry washes in the area can fill with flowing water after very heavy, sustained rain or snow. On rare occasions, water in the washes flows to the Amargosa River more than 25 miles to the south. Although referred to as a "river," the Amargosa is dry along most of its length. Exceptions include short stretches of the river near Beatty, Nevada; Tecopa, California; and southern Death Valley, California. The river drains an area of about 3,100 square miles by the time it reaches Tecopa, CA, and its course extends roughly 60 miles farther before it ends in the Badwater Basin in Death Valley, which is more than 260 feet below sea level.

Thunderstorms in the area are usually local and sometimes intense. On rare occasions, storms can be extensive enough to cause flooding throughout the entire Amargosa drainage system. Glancy and Beck (1998) documented conditions during March 1995 and February 1998 where the Amargosa River flowed continuously to Death Valley. During a February 1998 flood, the peak flow in Fortymile Wash along the east side of Yucca Mountain was 3,500 cubic feet per second (Figure 3-1). These floods, if sufficiently large, can spread laterally onto adjacent floodplains.

Although none of the dry washes in the affected area support wetlands or riparian habitat, placement of dredged or fill materials in jurisdictional washes may be subject to permitting under Section 404 of the Clean Water Act. Washes within which fill material might be placed were examined in January 2006 for the presence of an ordinary high-water mark, as defined in 33 CFR Part 328.3. Characteristics of an ordinary high-water mark include the presence of a clearly defined channel bank, shelving, changes in the characteristics of the soils such as unconsolidated sediment within the channel bed, destruction of terrestrial vegetation, and presence of plant litter and debris. Where present, the limit of the ordinary high-water mark was mapped.

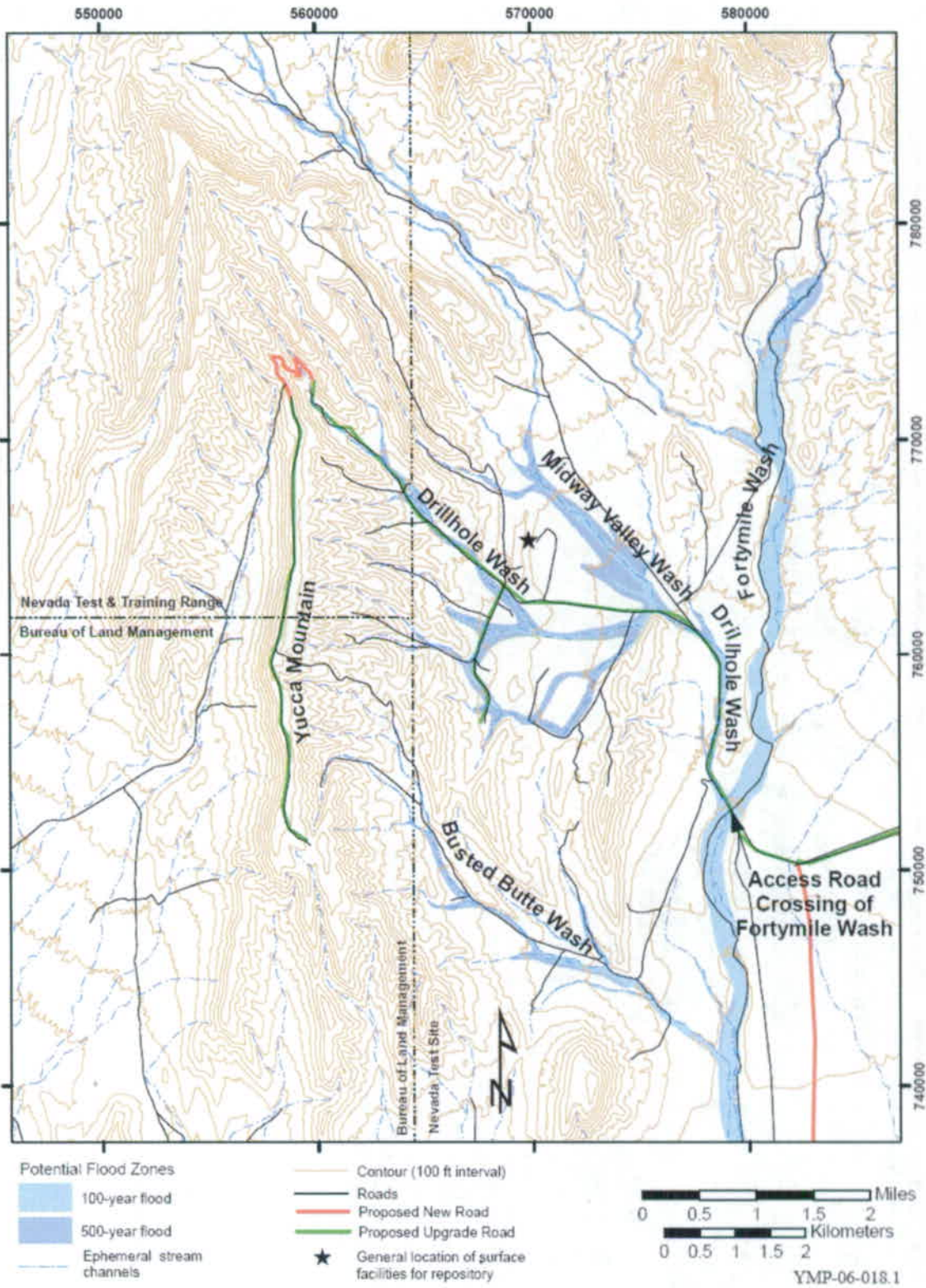


Figure 3-1. Surface Drainage at Yucca Mountain

Dry washes that have characteristics of an ordinary high-water mark were found within the affected area in Fortymile Wash and its major tributary, Midway Valley Wash (also known as Sever Wash; see Figure 3-1). Fortymile Wash is an intermittent braided stream at the location where the access road crosses the wash. On the north side of the road in Fortymile Wash there are four active channels having a total width of about 37 feet. On the south side of the road there are three active channels in the wash having a total width of about 43 feet. Midway Valley Wash is intersected by the access road about 2.2 miles northwest of Fortymile Wash. At that point, the 5-foot-wide channel of Midway Valley Wash flows in a ditch along the north shoulder of the road. The channel remains in that ditch for about 0.5 miles, then flows in a natural channel north and east of the road for about 0.6 miles, and finally returns to the ditch for about 1.1 miles before entering Fortymile Wash along the north side of the road.

Three dry washes with characteristics of an ordinary high-water mark were found along the existing access road east of Fortymile Wash (Figure 3-1). One of those washes is crossed by the existing access road about 2.5 miles west of the proposed Central Operations Area (Figure 2-1). That wash has a 2-foot-wide channel. The other two washes are crossed by the existing access road about 2.9 and 3.6 miles east of Fortymile Wash (Figure 3-1). They have channels that are about 4.9- and 6.5-feet wide.

No other washes with characteristics of an ordinary high water mark were found within the affected area.

3.5.2 Groundwater

The groundwater flow system in the affected area is very complex, involving many aquifers and confining units. Aquifers are rock units that can transmit groundwater to wells and springs in usable quantities. In contrast, confining rock units limit or block the flow of groundwater. Over distance, these rock units vary in their characteristics and even their presence. In some areas, confining units allow considerable movement between aquifers; in other areas, confining units are sufficiently impermeable to produce artesian conditions (where water in a lower aquifer is under pressure in relation to an overlying confining unit; when intersected by a well, the water rises up the borehole).

Groundwater at and near Yucca Mountain occurs at a depth of 900 to 2,500 feet below the surface. The groundwater generally flows southward and discharges in a playa more than 50 miles south of Yucca Mountain and even farther away in Death Valley. The principal water-bearing units are the alluvial aquifer, various volcanic aquifers, and the carbonate aquifer (DOE 2002, Section 3.1.4). The alluvial aquifers are composed largely of sand, silt, gravel, and other rock debris deposited primarily by running water. These aquifers, generally speaking, are the shallowest aquifers in the area. Volcanic aquifers occur in various types of permeable volcanic rocks and, generally speaking, lie beneath the alluvial aquifer. The regionally-extensive carbonate aquifer is composed of permeable limestone and dolomite and, generally speaking, lies far beneath the volcanic aquifers. The alluvial aquifers beneath the Amargosa Desert receive underflow from a mixture of aquifers from the north and east, probably including the volcanic aquifers beneath Yucca Mountain (DOE 2002, Section 3.1.4).

3.5.3 Water Use at Yucca Mountain

Water for operations is pumped from underground sources in Crater Flat west of Yucca Mountain (Well VH-1) and Jackass Flats on the east side of Yucca Mountain (Wells J-12 and J-13) (Figure 1-2). The amount of water used from 2000 through 2005 is listed in Table 3-4. Authorization to use this water is based on an agreement between the State of Nevada and the Department. The agreement allows the Department to use sufficient water to maintain the status quo at Yucca Mountain while litigation continues over the State Engineer's denial in 2000, and again in 2003, of the Department's request for permanent rights to 430 acre-feet per year for the Yucca Mountain Project (Turnipseed 2000; Ricci 2003). The perennial yield of the western two-thirds of the Jackass Flats basin (Basin 227A as defined by the Nevada State Engineer) from which groundwater would be pumped is estimated at between 580 acre-feet to 4,000 acre-feet (DOE 2002, Table 3-11, footnote f).

Table 3-4. Recent Water Use at Yucca Mountain⁽¹⁾

Year	Acre-Feet (Gallons)
2000	41.4 (13,473,100)
2001	43.1 (14,039,000)
2002	13.6 (4,426,000)
(Yucca Mountain Site Recommended to President -- End of Site Characterization)	
2003	5.0 (1,641,805)
2004	5.0 (1,629,600)
2005	8.9 (2,913,350)

⁽¹⁾ Source: Yucca Mountain Project quarterly pumping reports for Wells J-13, J-12, VH-1 for Jan. 2000 – Dec. 2005 (YMP 2000-2005)

3.6 LAND USE

Land at Yucca Mountain is controlled by the DOE (the NTS), the U.S. Air Force (the Nevada Test and Training Range), and the BLM (Figures 1-1 and 1-2). Public access to DOE and U.S. Air Force lands is restricted. Public lands managed by the BLM at and near Yucca Mountain are open to public access and use, with the exception of 5,000 acres at Yucca Mountain that were withdrawn in 1990 to protect the physical integrity of the area from mining and mineral leasing (Public Lands Order 6802, *Withdrawal of Public Land to Maintain the Physical Integrity of the Subsurface Environment, Yucca Mountain Project*).

The NTS and the Nevada Test and Training Range are used for a variety of defense-related activities. Access to and use of about 58,000 acres of land on the NTS for activities associated with the Yucca Mountain Project is based on a management agreement between DOE's National Nuclear Security Administration and DOE's Office of Civilian Radioactive Waste Management (DOE 2002, Section 3.1.1.2). Use of about 19,000 acres of land on the Nevada Test and Training Range for the same purpose is governed by a Right-of-Way Reservation (N-48602) issued to the Department by the BLM, which manages the surface resources on the range (DOE 2002, Section 3.1.1.2).

Public land at Yucca Mountain has been, and is still being, used by the Department for a variety of tests related to the repository program. Authorization to use this land for these purposes is based on a 51,632-acre Right-of-Way Reservation (N-47748) issued to the Department by the BLM. Public land at Yucca Mountain is also used on occasion by the public for off-road driving, organized off-highway racing, and dispersed recreation. There are no BLM-issued grazing allotments at or near Yucca Mountain. Several mining operations occur near Yucca Mountain; the closest is a cinder mine about nine miles southwest of Yucca Mountain just north of U.S. 95 (Patented Mining Claim No. 27-83-0002). The cinder is used as a raw material in the manufacture of cinderblocks. The nearest farms are in Amargosa Valley 15 miles to the south.

Areas to the south and southwest of Yucca Mountain are popular throughout the year for camping, hiking, and nature study. Two that are particularly well known are Ash Meadows National Wildlife Refuge (25 miles to the south) and Death Valley National Park (22 miles to the southwest) (Figure 1-1).

3.7 CULTURAL RESOURCES

Years of research at and near Yucca Mountain have discovered more than 900 archaeological and historic sites. These sites range from single artifacts to campsites and quarries. Collectively, they indicate that the Yucca Mountain region has been occupied by American Indian populations for at least 12,000 years. At the time of the first recorded arrival of Euroamericans in 1849, the area was inhabited by Southern Paiute and Western Shoshone Indians.

The sites that have been discovered at and near Yucca Mountain are largely the result of programs in place on the Yucca Mountain Project to comply with Federal laws that protect cultural resources. For example, any proposed land-disturbing activity for the Yucca Mountain Project must have a pre-construction survey conducted prior to the disturbance. If cultural resources are discovered, they are evaluated for their importance and eligibility for inclusion in the *National Register of Historic Places*. To the extent possible, these sites are avoided. When avoidance is not possible, the artifacts at eligible sites are collected in accordance with Section 106 of the National Historic Preservation Act, and the findings are documented. In this way, the artifacts from, and knowledge about, these sites are preserved.

3.8 AMERICAN INDIAN CONCERNS

In 1987, the Department began the Native American Interaction Program to consult and interact with tribes and organizations on the characterization of Yucca Mountain and the possible construction and operation of a repository. The program currently includes 17 tribes and organizations that have cultural and historic ties to the Yucca Mountain area—Southern Paiute, Western Shoshone, and Owens Valley Paiute and Shoshone people from Arizona, California, Nevada, and Utah. These tribes and organizations have formed the Consolidated Group of Tribes and Organizations, which consists of officially-appointed tribal representatives who are responsible for presenting their respective tribal concerns and perspectives to the Department.

The Native American Interaction Program concentrates on the protection of cultural resources at Yucca Mountain and promotes a government-to-government relationship with the tribes and organizations. The purpose of the program is to help the Department comply with various

Federal laws and regulations, including the American Indian Religious Freedom Act, the Archaeological Resources Protection Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, DOE Order 1230.2 (*American Indian and Tribal Government Policy*), and Executive Orders 13007 (*Indian Sacred Sites*) and 13084 (*Consultation and Coordination with Indian Tribal Governments*). These laws and regulations mandate the protection of archaeological sites and cultural items and require agencies to include American Indians and Federally-recognized tribes in discussions and interactions on major Federal actions.

According to American Indians, the Yucca Mountain area is part of the holy lands of the Western Shoshone, Southern Paiute, and Owens Valley Paiute and Shoshone people. These lands were central in the lives of American Indian people who shared them for religious ceremonies, resource uses, and social events. They believe that the water, animals, plants, air, rocks, and artifacts are interrelated and dependent on each other for existence.

Despite the current physical separation of tribes from Yucca Mountain and neighboring lands, American Indians continue to value and recognize the meaningful role of these lands in their culture and continued survival. Many areas in the Yucca Mountain region are important to these tribes. For example, Fortymile Wash was an important crossroad where traditional trails from such distant places as Owens Valley, Death Valley, and the Avawatz Mountains came together. American Indians believe that Prow Pass at the north end of Yucca Mountain was an important ceremonial site and, because of this religious importance, have recommended that the Department conduct no studies in this area. Oasis Valley west of Yucca Mountain (north of Beatty) was an important area for trade and ceremonies. Other areas are important based on the abundance of artifacts, traditional-use plants and animals, rock art, and possible burial sites.

3.9 SOCIOECONOMICS

Nye County and adjoining parts of neighboring counties are rural and sparsely populated, with most residents concentrated in a few small communities. Estimated populations in July 2004 were as follows: 38,181 in Nye County, 3,822 in Lincoln County, and 1,176 in Esmeralda County (NSDO 2005). The estimated population of Inyo County, California, in July 2004 was 18,636 (California State Department of Finance 2005).

Near Yucca Mountain are the Nevada communities of Beatty, Amargosa Valley, and Pahrump in Nye County and, in the northwest corner of Clark County, Indian Springs (Figure 1-1). The July 2004 estimated populations of these communities were 981 in Beatty, 1,211 in Amargosa Valley, 30,465 in Pahrump, and 1,661 in Indian Springs (NSDO 2005). In California, about 48 people reside in Furnace Creek in Death Valley about 35 miles southwest of Yucca Mountain; about 52 people reside in the town of Shoshone about 65 miles south of Yucca Mountain; and about 145 people reside in the town of Tecopa about 75 miles south of Yucca Mountain (California State Department of Finance 2005).

Annual employment at the NTS between 1996 and 2001 varied between 3,285 and 3,659 employees (DOE 2002a, Table 4-4). Of these employees, about 80 percent lived in Las Vegas and 20 percent lived in Nye County. Annually at Yucca Mountain, between 100 and 150

scientists and engineers supported by 150 to 200 craft personnel are involved in ongoing operations, scientific testing, and routine operations.

3.10 VISUAL RESOURCES

Using criteria from the BLM visual-resource management system, the Department assigned the Yucca Mountain area a scenic-quality rating of C, which is the least sensitive of BLM's three scenic-quality ratings (DOE 2002, Section 3.1.10). Generally, the BLM assigns a Class-C rating to public lands that have physical characteristics that are fairly common to the region. Class-B areas are those with a combination of some outstanding scenic characteristics and some fairly common characteristics, whereas Class-A areas have outstanding scenic quality.

Direct visibility of Yucca Mountain from U.S. 95 is very limited, as is visibility from the few dirt roads that access public lands along the south and west sides of Yucca Mountain. There is no public access north or east of Yucca Mountain to enable viewing. The nearest permanent residents are in Lathrop Wells about 14 miles to the south.

3.11 TRANSPORTATION

The transport of personnel and material to and from Yucca Mountain is by way of U.S. 95, chiefly from Las Vegas. The traffic volume and roadway capability of U.S. 95, including the potential for congestion and other problems, is expressed in terms of a level of service. The level-of-service scale ranges from A to F, as follows (DOE 2002, Section 3.2.2.2.11):

- A Indicates free-flow conditions.
- B Indicates free-flow, but the presence of other vehicles begins to be noticeable. Average travel speeds are somewhat lower than an A level-of-service.
- C Indicates a range in which the influence of traffic density on flow becomes marked. The ability to maneuver in the traffic stream and to select an operating speed is clearly affected by the presence of other vehicles.
- D Indicates conditions in which speed and the ability to maneuver are severely restricted due to traffic congestion.
- E Indicates full capacity; a disruption, no matter how minor, causes traffic to backup.
- F Indicates a breakdown of flow or stop-and-go traffic.

A range of volume-to-capacity ratios defines each level. Levels-of-service A, B, and C are considered good operating conditions in which motorists experience minor or tolerable delays of service. Level-of-service D represents below-average conditions. Level-of-service E corresponds to the maximum capacity of the roadway. Level-of-service F indicates a heavily congested or overburdened capacity.

From Las Vegas to the Mercury exit (Figure 1-1), U.S. 95 is designated level-of-service B. From the Mercury exit to Tonopah, which includes the intersection of U.S. 95 and the access road to Yucca Mountain, the designated level-of-service along U.S. 95 is C.

3.12 HEALTH AND SAFETY

During site characterization of Yucca Mountain in the 1990s, which included underground construction of the ESF, health and safety concerns were: (1) hazards common to mining and construction sites and (2) hazardous minerals released as dust during construction of the ESF. As described in Section 1.1, the Department implemented safety mitigations related to these hazards.

Hazards Common to Mining and Construction Sites: Categories of health and safety impacts to workers included total recordable incidents, lost workdays, and fatalities. Recordable incidents include occupational injuries and illnesses that resulted in (1) a fatality, regardless of the time between the injury or the onset of the illness and death, (2) lost workdays (nonfatal), and (3) incidents that result in the transfer of a worker to another job, termination of employment, medical treatment, loss of consciousness, or restriction of motion during work. Over a 30-month period between 1994 and 1997, the Department gathered data on these categories of worker impacts (DOE 2002, Table 3-31). This period was selected because it coincided with tunnel excavations for the ESF during which time many people were employed. For all three categories, worker impacts at Yucca Mountain were comparable to worker impacts for the overall mining and construction industries. There were no worker fatalities at Yucca Mountain during this period.

Since 2002 when Congress designated Yucca Mountain as suitable for a repository, testing and other activities have been reduced. As a consequence, the number and rate of total recordable incidents have also gone down. For example, in 2004 there were only two recordable incidents at Yucca Mountain.

Hazardous Dust: Certain minerals occur in the volcanic rocks at Yucca Mountain that can present a risk to worker health. The risks are related chiefly to inhalation of airborne particulates of silica dust, especially in underground excavations. The most prevalent of these hazardous minerals is cristobalite, a form of silicon dioxide. Inhaling silica dust can cause a disease called *silicosis* that damages an area of the lungs called the air sac (alveoli). The presence of silica dust in the alveoli causes a defensive reaction resulting in the formation of scar tissue in the lungs. This scar tissue can reduce overall lung capacity. In addition, crystalline silica has been listed by the World Health Organization as a carcinogen (IARC 1997, p. 41).

The rock excavated from the ESF was placed at the surface near the North Portal and is referred to as the muck pile. Because the muck pile could be used for road construction and surface leveling at the Central Operations Area, the health concerns of cristobalite are discussed here.

The Department conducts evaluations of exposure to silica dust at Yucca Mountain by analyzing for cristobalite and other forms of silica during routine and dust-producing activities. The volcanic rock in which the ESF was developed has a cristobalite content ranging from 18 to 28 percent. Hence, fugitive dust released from the muck pile can be assumed to have a cristobalite

content of up to 28 percent (reflecting the maximum cristobalite content of the parent rock) and would be the largest potential source of cristobalite exposure to workers (regulators and visitors are not exposed to cristobalite dust from operations). This is probably an overestimate of the airborne cristobalite concentration because most of the cristobalite particles are coarse, not respirable, and settle rapidly to the surface. The American Conference of Governmental Industrial Hygienists has established Threshold Limit Values for various forms of crystalline silica (ACGIH 1999, p. 61). These limits are based on an 8-hour day and 40-hour week and, therefore, could be exceeded for a short period as long as the average time spent by a worker is below the limit. The Threshold Limit Value for respirable cristobalite dust is 0.05 milligram per cubic meter (recently, the Threshold Limit Value was decreased to 0.025 milligrams per cubic meter). Current management practices require dust-control programs and real-time measurements of cristobalite dust. Employees involved in activities that could exceed the Threshold Limit Value are required to reduce their exposure through work rotations and the use of respiratory protection. In addition, the concentration of silica dust is measured during dust-producing activities at some work sites to allow for prompt response if dust concentrations become too high.

3.13 ENERGY, UTILITIES, AND SITE SERVICES

Electric power for operations at Yucca Mountain comes through the NTS power grid. The capacity of the grid is 72 megawatts. Since 1990, the peak load was about 37 megawatts and occurred in January 1992. Power use at Yucca Mountain peaked in 1997 at 5.3 megawatts. The ESF and the Field Operations Center consumed most of this power. From 1995 through 1997, the ESF accounted for 15 to 20 percent of the electric power used by all of the NTS. Electrical consumption for operations at Yucca Mountain since 2002 has ranged from about 1.2 to 1.9 megawatts/year.

The NTS buys power at 138 kilovolts at a switching station near Mercury (Figure 1-1). The 138-kilovolt system on the NTS is connected by about 130 miles of transmission line. A 138-kilovolt line owned by the Nevada Power Company connects the Mercury switching station to a substation in Jackass Flats east of Yucca Mountain. A second 138-kilovolt line owned by the Valley Electric Association also provides power to the NTS via the Lathrop Wells switch station (Figure 1-2) and connects to the Jackass Flats substation. From the Jackass Flats substation a 138-kilovolt line extends to the Canyon Substation east of Yucca Mountain. The Canyon Substation reduces the voltage from 138 to 69 kilovolts, with a capacity of 10 megawatts, and transmits it to the Field Operations Center, nearby buildings that support operations at Yucca Mountain, and the ESF (Figure 1-2).

Fossil fuels are delivered to the NTS and the ESF by truck from readily available supplies in southern Nevada. Fuels used for operations include heating oil, propane, diesel, gasoline, and kerosene (natural gas is not used). In 1996, during the height of construction of the ESF, activities consumed about 270,000 gallons of heating oil and diesel fuel and about 17,000 gallons of propane; in 1997, activities consumed slightly less than 264,000 gallons of heating oil and diesel fuels. The amounts of gasoline and kerosene used at the ESF were very small in those years. Since 2002, when Congress designated the site as suitable for a repository, consumption of fossil fuels has declined in step with a reduction in activities. Annually over the past several

years, activities have consumed about 60,000 gallons of heating oil and diesel fuel and about 5,000 gallons of propane.

Operations at Yucca Mountain generate nonhazardous solid waste; construction debris; hazardous waste; recyclables such as lead-acid batteries, used oil, metals, paper, and cardboard; sanitary sewage; and wastewater (radioactive wastes are not generated by operations). The Department uses landfills on the NTS to dispose of solid waste and construction debris that cannot be recycled or reused. Hazardous waste is accumulated and transported to licensed facilities for treatment and disposal. Sanitary sewage is treated and disposed of via a septic system that has a capacity of 25,000 gallons per day. Other forms of wastewater are processed through an oil-water separator and the treated water is used for dust suppression. The oil is recycled with other used oil generated by operations. The Department has programs in place to collect materials that can be recycled or reused.

The Department has an established framework for emergency services at the ESF that describes emergency planning, preparedness, and response (YMP 2003, all). The Yucca Mountain Project cooperates with the NTS in such areas as training, emergency drills, and exercises, and has developed a full emergency-preparedness capability. In addition, the Yucca Mountain Project trains and maintains an underground rescue team. The NTS security program is responsible for security at Yucca Mountain, with enforcement provided by a contractor following direction from the Department. The Nye County Sheriff's Department provides law enforcement and officers for patrol at Yucca Mountain. NTS personnel and equipment provide fire protection and medical services for workers at Yucca Mountain with a response time of about 45 minutes. Programs in Las Vegas provide urgent medical transport. The U.S. Air Force and Nye County can also provide emergency support.

4. ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences of the no-action alternative and the proposed action. Under the proposed action where appropriate, potential environmental impacts are reported separately for (1) the proposed action with road- and power-line Options 1, and (2) the proposed action with road- and power-line Options 2 (see Section 2.2 for more details about these options).

4.1 AIR QUALITY

4.1.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to air quality beyond the baseline emissions characterized in Section 3.1 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts on air quality as demonstrated by the results of environmental programs in place at Yucca Mountain and permit-compliance monitoring [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. For example, since 1989 the Department has monitored particulate matter at several locations at Yucca Mountain. The results have demonstrated that even during the height of ESF construction in the mid- to late-1990s, emissions of particulate matter have been within regulatory standards. Furthermore, the Department has been monitoring local meteorology at Yucca Mountain since 1986 to characterize environmental conditions and study mechanisms of potential airborne transport of contaminants. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to air quality would be negligible.

4.1.2 Proposed Action

The impacts to air quality from proposed construction and improvement would be small. Sources of air pollutants from the proposed action would include (1) fugitive dust from surface grading for roads and for possible blasting for parts of the new road to the crest of Yucca Mountain, possibly moving or reusing the existing muck pile near the North Portal, vehicle travel on paved and unpaved roads, and wind erosion, and (2) emissions of nitrogen dioxide, sulfur dioxide, carbon monoxide, and hydrocarbons from the combustion of fossil fuel by diesel- and gasoline-powered construction equipment. The proposed action would not result in any radiological air emissions.

The proposed activities are related chiefly to land disturbances. Therefore, the primary criteria pollutant of concern is PM₁₀ (Table 3-1). Gaseous pollutants from fuel-burning equipment would be spread out over a very large area and emissions would be expected to be far below the regulatory standards listed on Table 3-1. This conclusion is based on the results of modeling for gaseous emissions from construction of a repository at Yucca Mountain, which found that emissions of nitrogen dioxide, sulfur dioxide, and carbon monoxide would be less than 1 percent of the regulatory limits for these pollutants (DOE 2002, Table 4-1). Because repository

construction would use far more diesel- and gasoline-powered equipment compared to the proposed action, it is concluded that gaseous emissions from the proposed action would be exceedingly small.

PM₁₀ emissions were evaluated using a standard dispersion model from the EPA (ISC3). The dispersion model was used to examine PM₁₀ emissions from (1) all land disturbances under the proposed action with road- and power-line Option 1, and (2) all land disturbances under the proposed action with road- and power-line Option 2 (Sections 2.2.1 and 2.2.2 for details about these options). Conservative estimates of PM₁₀ emission rates were used in the model based on regulatory guidance, with reasonable levels of emission controls in place. The meteorological data used in the dispersion model are from the Desert Rock Airport, a nearby weather station that is representative of conditions at Yucca Mountain. Receptor points were selected on public land near Lathrop Wells (and points to the east and west of Lathrop Wells), and on the nearest public land at points along a north-south line about 2 miles west of the Yucca Mountain crest. Maximum pollutant concentrations predicted by the dispersion model at these receptor points were used to determine impacts.

Modeling results for the proposed action with road/power-line Option 1 showed a 24-hour average concentration of PM₁₀ of 42 µg/m³, which is far below the corresponding regulatory standard of 150 µg/m³ (Table 3-1). The annual average concentration of PM₁₀ with Option 1 was 3 µg/m³, which is far below the corresponding regulatory standard of 50 µg/m³ (Table 3-1). The addition of ambient measured concentrations of PM₁₀ (Table 3-2) to the modeled concentrations with Option 1 would also be below the corresponding regulatory standards.

Modeling results for the proposed action with road/power-line Option 2 showed a 24-hour average concentration of PM₁₀ of 46 µg/m³, which is far below the corresponding regulatory standard of 150 µg/m³ (Table 3-1). The annual average concentration of PM₁₀ with Option 2 was 2 µg/m³, which is far below the corresponding regulatory standard of 50 µg/m³ (Table 3-1). The addition of ambient measured concentrations of PM₁₀ (Table 3-2) to the modeled concentrations with Option 2 would also be below the corresponding regulatory standards.

Certain forms of hazardous silica-dust could be dispersed if the muck pile near the North Portal were used for road or pad construction (see Sections 3-12 and 4-12 for details). The Department would monitor the environment at and near the muck pile to ensure that workers were not exposed to harmful concentrations of this dust. If engineering controls were unable to maintain safe dust concentrations, administrative controls such as access restrictions or respiratory protection (dust suppression, air filters, and/or personal-protective gear) would be used until such time that engineering controls could re-establish safe conditions.

Section 176(c)(1) of the Clean Air Act (CAA) states, "No department, agency or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan after it has been approved or promulgated under section 7410 of this title." Conformity to an implementation plan means that such activities will not (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation if any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. CAA §176(c)(1)(B).

Despite the broad language of section 176(c)(1) of the CAA, federal actions do not need to conform to an applicable implementation plan in all situations. 40 CFR Part 51, Subpart W and Part 93, Subpart A. Under the General Conformity regulations, federal agencies only need to perform a conformity determination for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by the action would equal or exceed certain, specified thresholds, where the action does not fall within a list of enumerated exceptions. 40 CFR 51.853(b) and 40 CFR 93.153(b). Because Yucca Mountain and the areas potentially affected by the actions are designated unclassifiable or attainment, no conformity determination is required. 40 CFR 81.329. Furthermore, the proposed action would not cause direct or indirect emissions in excess of de minimis thresholds.

The impacts to air quality, from ongoing operations, scientific testing, and routine maintenance upon completion of the proposed action, would be negligible. This conclusion is based on the results of 15 years of air-quality modeling [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to air quality would be negligible.

4.2 WILDLIFE

4.2.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to wildlife beyond the baseline conditions characterized in Section 3.2 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts to wildlife as demonstrated by the results of environmental programs in place at Yucca Mountain and permit-compliance monitoring associated with wildlife [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. For example, the Department routinely surveys areas before any proposed construction to ensure that migratory birds are not harmed. If construction occurred during the migratory-bird nesting season (generally March 15 through July 30 at Yucca Mountain), areas to be disturbed would be surveyed by a qualified biologist prior to disturbance. If active nests were found, a protective buffer would be delineated around the nests within which disturbance would be avoided until the young have fledged. Thus, the activities would not result in mortality or directly affect nesting of migratory birds. In addition, facilities such as water tanks are routinely inspected during surveillances to ensure that migratory birds are not trapped or otherwise harmed. Under a State-issued scientific-collection permit, the Department prepares an annual report that is submitted to the Nevada Department of Wildlife. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to wildlife would be negligible.

4.2.2 Proposed Action

Direct and indirect impacts to wildlife from the proposed action would be small. The proposed action with Road/power-line Option 1 and road/power-line Option 2 would disturb about 253 acres and 188 acres, respectively (Table 2-1). These are very small areas compared to the large amount of surrounding undisturbed, similar habitat.

Loss of habitat under either option would nevertheless adversely affect some large and small animals (e.g., burros, mule deer, birds, and reptiles). Birds and other mobile animals, including game species, could be startled by construction noise and would tend to avoid contact with humans by moving to other areas. Construction equipment could crush or smother animals that use underground habitats, such as rodents, snakes, desert tortoises, kit foxes (*Vulpes macrotis*), and burrowing owls. Mortality to wildlife could also occur from collisions with vehicles traveling to and from Yucca Mountain. New man-made structures would provide additional perches for raptors and ravens (*Corvus corax*), which could result in an increase in predation of lizards, snakes, rodents, and tortoises.

If construction occurred during the migratory-bird nesting season (generally March 15 through July 30 at Yucca Mountain), areas to be disturbed would be surveyed by a qualified biologist prior to disturbance. If active nests were found, a protective buffer would be delineated around the nests within which disturbance would be avoided until the young have fledged. Thus, the proposed activities would not result in mortality or directly affect nesting of migratory birds.

The impacts to wildlife from continued activities upon completion of the proposed action would be negligible. This conclusion is based on the results of 15 years of permit-compliance monitoring associated with wildlife [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing and routine maintenance, it is concluded that impacts to wildlife would be negligible.

4.3 PLANTS

4.3.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to plants beyond the baseline conditions characterized in Section 3.3 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts to plants as demonstrated by the results of environmental programs in place at Yucca Mountain and compliance monitoring and use stipulations associated with Right-of-Way Reservations issued to the Department by the BLM [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. For example, Right-of-Way Reservations issued to the Department by the BLM require recontouring and revegetation of disturbed sites before relinquishing them to the BLM, and monitoring the growth of vegetation on those sites until reclamation is successful. Native perennial species are seeded or planted during reclamation to reduce colonization by

invasive plants. The abundance of non-native species on these reclaimed sites is monitored periodically, and control efforts such as weeding and reseeding of native perennials are implemented as needed to reduce the abundance of invasive species. After any construction activity has been completed, disturbed areas no longer needed would be re-vegetated with native species, and invasive species on those sites would be controlled. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to plants would be negligible.

4.3.2 Proposed Action

Direct and indirect impacts to vegetation from the proposed action would be small. Construction would remove vegetation on about 253 acres of undisturbed habitat under the proposed action with road- and power-line Option 1 and 188 acres with road- and power-line Option 2 (Table 2-1). Soil compaction would change the physical structure of the soil and would likely reduce the re-establishment of local, native species. Dust generated during construction would stress downwind plant communities by covering leaves and reducing photosynthetic capacity. This impact would be temporary and would end when sufficient rain and wind removed the dust from the leaves.

Clearing native vegetation and disturbing the soil would create habitat for non-native invasive plant species. These plants often out-compete native species and generally have little or no value for native wildlife. The seeds of non-native species can spread into surrounding undisturbed areas by wind and wildlife, as well as by workers and construction equipment. Because many non-native plant species are annuals or grasses that generate large amounts of litter, the potential for fires is generally higher than in nearby areas of native vegetation. After construction has been completed, disturbed areas no longer needed for operation of facilities would be re-vegetated with native species, and invasive species on those sites would be controlled.

The impacts to plants from continued activities upon completion of the proposed action would be negligible. This conclusion is based on the results of environmental programs in place at Yucca Mountain and compliance monitoring and use stipulations associated with Right-of-Way Reservations issued to the Department by the BLM [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing and routine maintenance, it is concluded that impacts to plants would be negligible.

4.4 SPECIAL-STATUS SPECIES

4.4.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to special-status species beyond the baseline conditions characterized in Section 3.4 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts on special-status species as demonstrated by the results of environmental programs in place at Yucca Mountain and compliance with monitoring associated with a biological opinion (Buchanan 1997) issued to the Department by the U.S. Fish and Wildlife Service [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. This opinion required (and still requires) the Department to minimize harm to tortoises by conducting pre-construction surveys, removing tortoises and tortoise nests from construction sites, controlling litter, setting appropriate speed limits, reclaiming desert habitat, and implementing a worker-education program about the desert tortoise. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to special-status species would be negligible.

4.4.2 Proposed Action

Direct and indirect impacts to special-status species from the proposed action would be small. The desert tortoise is the only species (animal or plant) in the affected area that is listed under the Endangered Species Act (Table 3-3). About 253 acres of tortoise habitat would be destroyed under the proposed action with road- and power-line Option 1 and 188 acres would be destroyed with road- and power-line Option 2. The U.S. Fish and Wildlife Service concluded in a biological opinion issued in 2001 that construction activities at Yucca Mountain are not likely to jeopardize the Mojave population of the desert tortoise (Williams 2001). Some tortoises, however, might be incidentally killed or injured by construction activities, and there could be an increase in the number of ravens or other predators of tortoises due to additional perching sites associated with new man-made structures. The Fish and Wildlife Service and the Department have agreed on measures to minimize harm to desert tortoises, including surveys prior to any land disturbances and, if tortoises and tortoise nests are found, they are to be moved to undisturbed areas distant from the construction sites. If tortoises are found at construction sites, all work that could harm a tortoise would stop until the tortoise was removed by a qualified biologist or the tortoise itself moved to a safe area. All trenches and other excavations would be backfilled, covered, or fenced to prevent entrapment of tortoises. A litter-control program would be implemented to reduce the availability of food for ravens and other predators of tortoises. All workers would be required to attend training on these protective measures, as well as the penalties for noncompliance with the Endangered Species Act. These actions would reduce but not completely eliminate the possibility that tortoises would be killed during construction.

Other special-status animal species that occur and may occur at Yucca Mountain are listed in Table 3-3. Implementation of the proposed action with either road- or power-line option would result in the loss of habitat for a small number of chuckwallas, loggerhead shrikes, burrowing owls, and some other migratory birds. These species occur widely in neighboring undisturbed areas and the overall affects to these species would be negligible. Actions described above to protect migratory birds would also protect these species from direct mortality or destruction of active nests.

Either road- or power-line option would have negligible impacts to bats because there are no preferred roosting sites (e.g., caves and cliffs) or foraging sites (e.g., ponds) within the affected area. The proposed action would have little impact on the population of chuckwallas at Yucca

Mountain because, except for construction of the new road leading to the crest of Yucca Mountain, no disturbances would occur on or near rocky ridges where that species occurs.

Within the affected area, there are no plant species classified as threatened, endangered, proposed, or candidate under the Endangered Species Act; species classified as fully protected by Nevada; or species classified as sensitive by the BLM.

The impacts to special-status species from continued activities upon completion of the proposed action would be negligible. This conclusion is based on the results of environmental programs in place at Yucca Mountain and compliance with monitoring associated with biological opinions issued to the Department by the U.S. Fish and Wildlife Service [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to special-status species would be negligible.

4.5 WATER RESOURCES

4.5.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to water resources beyond the baseline conditions characterized in Section 3.5 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts on the hydrology of surface waters and groundwater as demonstrated by the results of environmental programs in place at Yucca Mountain and compliance monitoring for a variety of water-related permits [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); site environmental reports are available at www.ocrwm.doe.gov]. For example, groundwater levels and spring flows in the Yucca Mountain region have been monitored since 1992. This program is designed to detect and document background fluctuations in regional groundwater levels and spring flows, and to identify potential effects of groundwater withdrawals for operations at Yucca Mountain on regional groundwater levels and spring flows. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to water resources would be negligible.

4.5.2 Proposed Action

Surface Water: Potential adverse effects to surface-water hydrology, drainages, and floodplains from the proposed action would be minor. The use of petroleum, oil, lubricants, and other hazardous materials during construction would be strictly controlled; spills would be promptly cleaned up and, if needed, the soil and alluvium would be remediated. Road crossings of washes would be designed to maintain the flow of water through culverts and to prevent erosion upstream and downstream of the crossings.

The proposed construction would require improvement of the access road that crosses Fortymile Wash and extends along Midway Valley Wash. Both washes, including their floodplains, would be affected by this action, but the effects would be minor, as described in detail in the *floodplain and wetlands assessment* in Appendix A.

Improvement of the road that crosses Fortymile Wash under either road Option 1 or road Option 2 would require placing fill in channels of the wash (i.e., concrete culverts, training dikes, roadbed material; see Figure 3-1). It is estimated that raising the road across Fortymile Wash would require that about 0.2 acres of new fill be placed in these channels for culverts, training dikes, and other structures upstream and downstream of the culverts. To the extent required, this construction would likely be covered under the U.S. Army Corps of Engineers (Corps) Nationwide Permit 14 (Linear Crossings) for compliance with Section 404 of the Clean Water Act (65 FR 12818). The Department would follow the requirements of that Nationwide permit as applicable or, if required, obtain a separate permit from the Corps for this and other actions that would require placement of fill material in jurisdictional waters, as required by the Clean Water Act. The effects of constructing this crossing on water resources, plants and animals, cultural resources, and other aspects of the environment are examined in Appendix A where it is concluded that the effects would be minor.

Replacement of the access road next to Midway Valley Wash just north of its confluence with Fortymile Wash might require that the flow channel of Midway Valley Wash be modified. This part of Midway Valley Wash may be jurisdictional waters of the U.S. (Figure 3-1). If replacement of the road in this area required only minor changes in its configuration, it could be considered maintenance of existing fill and would be covered by the Corps' Nationwide Permit 3 (Maintenance) (65 FR 12818). If more than minor deviations are required, the Department would obtain separate permit coverage for channelization of the wash in this area. Improvement of the access road in this area would have a beneficial effect on surface water flow because the drainage area would be designed and constructed to reduce erosion along the existing road and more appropriately accommodate the flow of Midway Valley Wash.

If the existing access road to Yucca Mountain were to be improved (road Option 2; see Section 2.2.1.2), culverts would be replaced at three crossings that may be jurisdictional waters of the U.S., as described in Section 3.5.1. Less than 0.1 acres of fill would be placed in each wash. Construction of these crossings would be covered under the Corps' Nationwide Permit 14 (Linear Crossings) (65 FR 12818). Replacing culverts at these locations would have negligible impacts on surface water or other resources because the crossings would be designed and constructed to minimize erosion and accommodate the flow in the washes during storms (see Appendix A).

Groundwater Quality: The proposed action would have negligible impacts on the quality of groundwater because the groundwater table varies from 900 feet to 2,500 feet below the surface. Hazardous materials inadvertently spilled during construction would be quickly remediated. The likelihood that materials spilled at the surface would find their way into groundwater is remote.

Water Demand: The quantity of groundwater needed for the proposed action would range from 230 to 297 acre-feet per year over a two-year period under road- and power-line Options 1 and 2, respectively (Table 2-1). This water would be pumped from wells at Yucca Mountain within the

western two-thirds of the Jackass Flats water basin, which encompasses all of Yucca Mountain east of the crest and adjacent flats. This amount of water is less than the lowest estimate of perennial yield for this part of the Jackass Flats basin (580 acre-feet) and much less than the highest estimate (4,000 acre-feet) (DOE 2002, Table 3-11, footnote f). Although the impacts of withdrawing this amount of groundwater were not modeled for this EA, the impacts can nevertheless be bounded by comparing them to the modeled impacts of pumping 430 acre-feet/year, which is the amount that the Department applied for with the Nevada State Engineer. The results showed that, over a pumping period of 100 years, groundwater elevations would decline up to 10 feet within 0.6 miles of the pumping wells, and would decline 1.2 to 3.6 feet near Lathrop Wells 14 miles to the south (DOE 2002; Section 4.1.3.3). Because the proposed action would require no more than 307 acre-feet per year for only two years (with Option 2), the affects on groundwater elevations would be expected to be far less than the projected effects from pumping 430 acre-feet/year for 100 years. Hence, the impacts to regional water availability from the proposed action would be expected to be small, with the effects of Option 1 (230 acre-feet per year) being somewhat less than the effects of Option 2 (297 acre-feet per year).

The impacts to water resources from continued activities upon completion of the proposed action would be negligible. This conclusion is based on the results of environmental programs in place at Yucca Mountain and compliance monitoring for a variety of water-related permits [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to water resources would be negligible.

4.6 LAND USE

4.6.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to land use beyond the baseline conditions characterized in Section 3.6 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts on land use as demonstrated by the results of environmental programs in place at Yucca Mountain and compliance monitoring and use stipulations associated with Right-of-Way Reservations issued to the Department by the BLM [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. For example, Right-of-Way Reservations issued to the Department by the BLM require that disturbed sites be reclaimed and that colonization by invasive plants be minimized to the extent possible. In response, the Department has developed an extensive reclamation program for Yucca Mountain (YMP 2001). Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to land use would be negligible.

4.6.2 Proposed Action

The proposed action would have negligible effects on existing or future land uses. Most of the affected land is on the NTS and the Nevada Test and Training Range. Use of U.S. Air Force land for the Yucca Mountain Project is provided for in a Right-of-Way Reservation issued to the Department by the BLM. Use of NTS land is based on a 2002 management agreement between DOE's Nevada Operations Office and DOE's Office of Repository Development. Because the proposed action would not change the nature of current activities at Yucca Mountain, it is concluded that the proposed action would not affect operations at either the NTS or the Nevada Test and Training Range.

Under the proposed action, a 2-mile segment of the existing two-lane access road from U.S. 95 to Gate 510 on the NTS would be improved (Figure 2-1). This road is located on BLM land for which the Department does not have a Right-of-Way Reservation (the Department would consult with the BLM and Nye County regarding this proposed improvement). Improvement of this road would disturb a 120-foot-wide corridor, which would be 50 feet wider than the current road corridor and shoulders. The corridor for the crest road on Yucca Mountain where it enters public land would also be widened from 20 feet to 60 feet (Figure 2-1; the Department has a Right-of-Way Reservation for activities on public land in this area). Because these public lands are infrequently used by the public, it is concluded that impacts to the public from the proposed improvement would be negligible. Improvement of the access road would not affect operations at the cinder quarry north of U.S. 95.

The proposed action includes the possible development of an aggregate pit within 15 miles travel distance. Access to and use of common varieties of sand, stone, and gravel on public lands by Federal agencies is governed by the Materials Act of 1947 which authorizes the BLM to issue free-use permits for these materials. If the Department required the development of this pit, it would apply to the BLM for a free-use permit. Aggregate is an abundant resource throughout this part of Nevada. The use of this material by the Department from a new pit would not adversely affect the supply of aggregate for other users. If an adequate quantity and quality of aggregate could be obtained from existing pits at Yucca Mountain (Figure 1-2), a new pit would not be needed.

The proposed action includes the construction of a Sample Management Facility on private land in the vicinity of Lathrop Wells (Figure 2-1). The contents of the existing Sample Management Facility at the field operations center (Figure 1-2) would be moved to the new facility and the existing facility would be dismantled and disposed. Construction of the new facility would not affect the use of public land in the area.

The impacts to land use from continued activities upon completion of the proposed action would be negligible. This conclusion is based on the results of environmental programs in place at Yucca Mountain and compliance monitoring and use stipulations associated with Right-of-Way Reservations issued to the Department by the BLM [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to land use would be negligible.

4.7 CULTURAL RESOURCES

4.7.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to cultural resources from land disturbances beyond the baseline disturbances that have already occurred from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, more than 900 archaeological and historic sites have been discovered at and near Yucca Mountain. These discoveries are largely the result of programs in place on the Yucca Mountain Project to comply with Federal laws that protect cultural resources. For example, proposed activities that would disturb the land must first have a pre-construction survey conducted prior to the disturbance. If cultural resources are discovered, they are evaluated for their importance and eligibility for inclusion in the *National Register of Historic Places*. To the extent possible, all sites are avoided. When avoidance is not possible, the artifacts at eligible sites are collected in accordance with Section 106 of the National Historic Preservation Act and the findings are documented. In this way, the artifacts from, and knowledge about, these sites are preserved. The Department provides all survey reports, data recovery plans, and annual reports to the State Historic Preservation Officer for comment and review. In addition, the Department has developed educational displays to inform Project employees, regulators, and visitors about the Yucca Mountain archaeological program. These displays are located at Yucca Mountain Information Centers in Las Vegas, Beatty, and Pahrump, and at Yucca Mountain for use during regulator or visitor tours.

Impacts to cultural resources from operations would be negligible because the programs described above would remain in place [additional information about these programs is available in the *Site Environmental Report for Yucca Mountain (YMP 2005)*; previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to cultural resources would be negligible.

4.7.2 Proposed Action

Land disturbances associated with proposed construction could have direct impacts to cultural resources, but these impacts would also be negligible. The alignment of the proposed new access road (road Option 1; see Section 2.2.1.1) was surveyed during parts of 2005 and 2006 to determine the nature and extent of cultural resources. Based on the results of these surveys, the corridor for the access road was moved eastward to avoid cultural sites near Fortymile Wash. Before other ground-disturbing activities would begin (e.g., at existing sites and alignments where disturbances would be expanded), the Department would conduct pre-construction surveys to identify cultural sites in the affected areas. These sites would then be evaluated for their importance and eligibility for inclusion in the *National Register of Historic Places*. Where practical, the Department would avoid sites or, if that were not practical, would collect the artifacts at eligible sites in accordance with Section 106 of the National Historic Preservation

Act, and document the findings. The artifacts from, and knowledge about, these sites would be preserved.

The potential for indirect impacts to cultural resources from construction activities and workers would increase, due to workers proximity to the physical evidence of past use of the cultural landscape such as cultural artifacts and features. The Department or the construction contractor would train workers to minimize the potential for indirect impacts to cultural resources.

The impacts to cultural resources from continued activities upon completion of the proposed action would be negligible because the programs to protect cultural resources would remain in place [additional information about these programs is available in the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to cultural resources would be negligible.

4.8 AMERICAN INDIAN CONCERNS

4.8.1 No-Action Alternative

In general, American Indians consider the intrusive nature of the entire repository program at Yucca Mountain to be an adverse impact to all elements of the natural and physical environment, despite the recognition that past restrictions on public access to the NTS and the Nevada Test and Training Range have generally been beneficial by protecting cultural resources, sacred sites, and traditional cultural properties from theft and vandalism (DOE 2002, Sections 4.1.5.2 and 4.1.13.4). The American Indian view includes little or no differentiation between types of impacts (direct versus indirect), but considers all impacts to be adverse and immune to mitigation. Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional concerns by American Indians beyond those already voiced.

The Department recognizes the concerns of American Indian Tribes and organizations with respect to the repository program. The Department would continue to consult with tribes and organizations through the Native American Interaction Program as the Department has done in the past [see the *Site Environmental Report for Yucca Mountain* (YMP 2005); previous site environmental reports are available at www.ocrwm.doe.gov]. Currently, the Native American Interaction Program involves 17 concerned tribes and organizations comprised of Western Shoshone, Southern Paiute, and Owens Valley Paiute and Shoshone people in Nevada, California, Utah, and Arizona.

4.8.2 Proposed Action

The proposed action would likely be viewed by American Indians as an adverse impact to the natural and physical environment, and immune to mitigation. The Department recognizes these concerns and would continue to interact with tribes and organizations through the Department's Native American Interaction Program.

The impacts from actions proposed to maintain on-going activities at Yucca Mountain would also likely be viewed by American Indians as adverse. The Department would continue to consult with tribes and organizations through the Native American Interaction Program as the Department has done in the past [see the *Site Environmental Report for Yucca Mountain (YMP 2005)*; previous site environmental reports are available at www.ocrwm.doe.gov].

4.9 SOCIOECONOMICS

4.9.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no impacts to local or regional socioeconomic conditions beyond the baseline conditions characterized in Section 3.9 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, employment for operations, scientific testing, and routine maintenance has had negligible impacts on socioeconomic conditions because this employment has been a very small part of composite regional employment. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to socioeconomic conditions would be negligible.

4.9.2 Proposed Action

The proposed action would have negligible socioeconomic impacts. Construction would require a maximum of 196 workers for two years (Table 2-1). Most of these workers would likely come from Las Vegas. In comparison, construction of a repository at Yucca Mountain was estimated in the repository EIS to peak at 3,400 workers, of which 1,900 would be new workers (DOE 2002, Section 4.1.6.2). The Department concluded in the repository EIS that this level of employment represented less than a 1-percent increase in composite regional employment and, therefore, would have small socioeconomic consequences (DOE 2002, Section 4.1.6.2). Hence, the 196 workers required for the two-year construction period under the proposed action would have negligible impacts on employment, economics, population, housing, and public services.

The impacts to socioeconomic conditions from continued activities upon completion of the proposed action would be negligible because employment would be reduced to pre-construction levels, which would be a very small part of composite regional employment.

4.10 VISUAL RESOURCES

4.10.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no additional impacts to visual resources beyond the baseline conditions characterized in Section 3.10 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, operations, scientific testing, and routine maintenance have had negligible impacts on the visual resources of the Yucca Mountain area because the visibility from publicly accessible locations is very limited. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that visual impact would be negligible because the visual setting of Yucca Mountain would not be altered.

4.10.2 Proposed Action

The proposed action would not cause adverse impacts to the visual resources in the region. Yucca Mountain has visual characteristics fairly common to the region (a scenic quality rating of C; see Section 3.10). Visibility of Yucca Mountain from publicly accessible locations is very limited. The view of Yucca Mountain from Lathrop Wells about 14 miles to the south is obscured by intervening hills. There is no public access to the north or east of Yucca Mountain to enable public viewing.

Night-lighting during construction and from operations at the Central Operations Area and the Sample Management Facility near the town of Lathrop Wells could contribute to the diminishment of the natural nighttime environment as viewed from places like Death Valley National Park. The use of shielded or down-directed lighting at new facilities at and near Yucca Mountain would minimize the amount of light that could be viewed from beyond Yucca Mountain. Overall, impacts from night lighting would be small.

4.11 TRANSPORTATION IMPACTS

4.11.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no impacts to local or regional transportation beyond the baseline conditions characterized in Section 3.11 from ongoing operations, scientific testing, and routine maintenance.

Over the past 15 years, the transport of personnel and material to Yucca Mountain to support operations, scientific testing, and routine maintenance has had negligible impacts on public roads because employment and construction during this period have been a very small part of regional employment and construction. Because ongoing operations, scientific testing, and routine maintenance (described in Section 2.1) would be similar to past operations, scientific testing, and routine maintenance, it is concluded that impacts to public roads would be negligible.

Under the no-action alternative, the road system at Yucca Mountain would receive only minor repairs, as needed, rather than reconstructed. These repairs would do little to improve the safety of the road network or enable the Department to adjust current speed restrictions. Therefore, operations would not be improved under this alternative because these roads would require increasing levels of maintenance over the years to maintain safety and would not be widened. Overall, impacts to the transportation system at Yucca Mountain under the no-action alternative would be adverse.

4.11.2 Proposed Action

The proposed action would require the transport of additional personnel and materials to and from Yucca Mountain for two years. Materials would include, among other things, asphalt and pre-cast concrete-culverts for new and improved roads, power poles and lines, and a variety of other materials, including concrete and steel, to construct facilities at the Central Operations Area.

The number of shipments of construction materials to Yucca Mountain under the proposed two-year construction period would be very small compared to the traffic volume on U.S. 95. Likewise, vehicle use by the temporary construction workforce required under the proposed action (estimated at 196 workers) would be very small compared to the existing traffic volume on U.S. 95. This increased traffic would not be expected to result in measurable impacts to the level-of-service ratings assigned to U.S. 95; hence, the impacts to public transportation systems from the proposed action would be negligible. The impacts to public transportation from operations, scientific testing, and routine maintenance upon completion of the proposed action would be reduced to pre-construction levels, which would be a very small component of regional traffic. Therefore, impacts to public transportation from operations, scientific testing, and routine maintenance would be negligible.

These proposed action would improve the safety of workers and enable the Department to adjust speed restrictions. Overall, the impacts to transportation would be beneficial.

4.12 HEALTH AND SAFETY

4.12.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no direct impacts to health and safety beyond the baseline conditions characterized in Section 3.12 from ongoing operations, scientific testing, and routine maintenance. Air samples collected during the past several years have not detected any respirable silica dust.

Under this alternative, the infrastructure at Yucca Mountain would be maintained and repaired, as needed, to maintain worker and environmental safety. Infrastructure that is nearing or, in some instances, has exceeded its design and operational life would require extensive repairs or complete re-building in place. These repairs would do little to improve the margin of operational safety for workers, regulators, and visitors.

4.12.2 Proposed Action

Potential health and safety impacts that could occur during the two-year construction period under the proposed action include (1) accidents and hazards that are common to construction and mining sites, and (2) inhalation of hazardous dust from possible use of the muck pile near the North Portal for road construction and surface leveling. Upon completion of construction, health and safety of workers would have an increased margin of safety.

Hazards Common to Mining and Construction Sites: The recorded rates of industrial accidents from past activities at Yucca Mountain provide a reasonable estimate of the potential for future industrial accidents. During excavation of the ESF in the mid- to late-1990s, health and safety statistics showed that the accident rate was similar to the rate at construction and mining sites, but with no fatalities at Yucca Mountain (DOE 2002, Table 3-31). This suggests that the rate of expected accidents during the proposed action would be less than the accident rate at other construction and mining sites because underground construction would not occur under the proposed action.

Hazardous Dust: The proposed action includes the possibility that the muck pile near the North Portal could be used for road construction and surface leveling at the Central Operations Area. Leveling at the Central Operations Area alone would require 150,000 cubic yards of material. Based on the content of cristobalite in the rock excavated for the ESF, the muck pile could have a cristobalite content ranging from 18 to 28 percent (see Section 3.12). Upon excavating and crushing the muck-pile rock, cristobalite dust could become airborne. To limit this potential, engineering controls would be utilized. If monitoring, which provides instant readouts, found that concentration limits for total dust were being exceeded during these operations, the Department would immediately adjust the dust-control measures. The Department would continue to monitor and sample the work environment to ensure that workers were not exposed to dust concentrations higher than the applicable limits for cristobalite (Section 3.12). If engineering controls were unable to maintain dust concentrations below the limits, administrative controls such as access restrictions, employee rotations, and respiratory protection would be used until such time that engineering controls could re-establish safe conditions. If the muck pile were to be used for road construction and leveling, the Department would ensure through management practices that exposure of workers would be below the Threshold Limit Value for cristobalite dust. Based on these measures, potential health impacts to workers from inhalation of cristobalite dust would be expected to be very small. Regulator or visitor exposure to cristobalite dust from the proposed action would not be expected.

The margin of operational safety for workers, regulators, and visitors from continued activities upon completion of the proposed action would be increased because the new infrastructure would meet applicable construction codes and operating standards (e.g., electrical), structures that are in various stages of disrepair would be replaced, and the work environment would be improved (e.g., temperature controls would be installed).

4.13 ENERGY, UTILITIES, AND SITE SERVICES,

4.13.1 No-Action Alternative

Under the no-action alternative, only minor infrastructure improvements would occur. Consequently, there would be no direct impacts to the availability and use of electricity and fossil fuels in the region or to utilities and services beyond the baseline conditions characterized in Section 3.13 from ongoing operations, scientific testing, and routine maintenance.

4.13.2 Proposed Action

Under the proposed action, electrical demand for construction would remain at post-2002 levels, which have been between 1.2 to 1.9 megawatts/year (Section 3.13). This consumption rate is 64 to 77 percent less than the peak electrical demand of 5.3 megawatts in 1997 during construction of the ESF. Electrical demand for proposed action can easily be met by the abundant electrical supply available in southern Nevada. Construction would also consume a variety of fossil fuels, including gasoline, heating oil, diesel fuel, propane, and kerosene. Compared to peak demand for these fuels in the late 1990s during construction of the ESF (see Section 3.13), the activities under the proposed action would annually consume far less of these fuels. Overall, impacts of the proposed action on the regional supply of electricity and fossil fuels would be negligible.

The proposed action would generate increased volumes of nonhazardous solid waste; construction debris; hazardous waste; recyclables; sanitary sewage; and wastewater compared to current volumes of these materials. Current facilities and programs that deal with these materials would easily handle the expected volume of these materials.

Impacts to existing emergency services, law enforcement, fire protection, and medical services at Yucca Mountain would be negligible because construction would not involve a substantial increase in the number of new workers and employees and, upon completion of construction, ongoing operations, scientific testing, and routine maintenance would be similar to past operations, scientific testing, and routine maintenance.

The impacts to emergency services, fire protection, and medical services at Yucca Mountain from ongoing operations, scientific testing, and routine maintenance upon completion of the proposed action would be improved by the addition of the Incident Response Station. The impacts to law enforcement services, energy and utilities would be negligible.

4.14 MEASURES TO PROTECT THE ENVIRONMENT

The Department would implement a variety of environmental-protection measures and management practices under the proposed action to avoid and/or mitigate potential adverse effects. These measures and practices are described in Table 4-1 for relevant resource areas.

4.15 RESIDUAL IMPACTS

With the successful implementation of the environmental protection measures and management practices described in Table 4-1, residual impacts would be negligible to minor under the proposed action.

Table 4-1. Measures and Management Practices to Reduce and Mitigate Environmental Impacts

Resource	Environmental Protection Measures / Management Practices
Air Quality	The Department would consult with the Nevada Bureau of Air Pollution Control regarding the possible need to modify the current air-quality operating permit for operations. Stipulations in the permit would minimize impacts to air quality.
Wildlife	When possible, project construction would not be scheduled during the migratory bird-nesting season. In the event that construction would occur during the nesting season (generally March 15 through July 30 in upland desert habitats such as Yucca Mountain), areas to be disturbed would be surveyed by a qualified biologist prior to the start of construction. If active nests were located, a protective buffer would be delineated around these nests within which disturbance would be avoided until the young have fledged. The size of the protective buffer would be determined based upon specific requirements of the species.
Plants	Where appropriate, the Department would restore areas affected by grading, plowing or trenching to their approximate original contour. Disturbed areas would be reclaimed per the Department's <i>Reclamation Implementation Plan</i> for Yucca Mountain (YMP 2001), as described in Section 2.2.6.
Endangered and Threatened Species	The Department would follow the mitigation measures for the protection of desert tortoises required by the U.S. Fish and Wildlife Service's 2001 Biological Opinion on Yucca Mountain (Williams 2001). This includes clearance surveys for tortoises and the removal to a nearby safe area of any tortoises that may be harmed by an activity.
Special-Status Species	The Department would clearly mark with flagging or "caution tape" populations of special-status plant or animal species discovered during pre-construction surveys. The Department would require the construction contractor to inform crews about the importance of avoiding flagged areas.
Water Resources, (including jurisdictional waters)	<p>The Department or their contractor would obtain a Construction Storm Water Permit from the Nevada Division of Environmental Protection that would include preparation of a Storm Water Pollution Prevention Plan. This plan would include established best-management practices for the control of erosion and pollution while constructing crossings and/or working in dry washes.</p> <p>The Department would, if required, obtain a Section 404 permit from the U.S. Army Corps of Engineers for construction in washes that meet the Corps' criteria as jurisdictional waters of the U.S. and would implement mitigation measures and best-management practices specified in the Section 404 permit.</p>
Land Use	<p>If needed, the Department would obtain a Right-of-Way Reservation from the BLM for activities on public land for which the Department currently does not have a Right-of-Way Reservation. In addition, the Department would consult with the BLM regarding proposed activities on public lands for which the Department holds a Right-of-Way Reservation. In either case, the Department would follow the mitigation measures and stipulations spelled out in these Reservations regarding the use of these public lands.</p> <p>The Department would coordinate with Nye County regarding the construction schedule and possible conflicts with any off-road vehicle events on public lands in the affected area.</p>
Cultural Resources	The Department would conduct pre-construction surveys to identify cultural sites in the affected areas. Each site would be evaluated for eligibility for inclusion in the <i>National Register of Historic Places</i> . Where practical, the Department would avoid sites or, if that were not practical, collect the artifacts at eligible sites in accordance with Section 106 of the National Historic Preservation Act, and document the findings.

Table 4-1. Measures and Management Practices to Reduce and Mitigate Environmental Impacts
(Continued)

Resource	Environmental Protection Measures / Management Practices
American Indian Concerns	Through the ongoing Native American Interaction Program, the Department would continue to solicit input from the 17 tribes and organizations that have cultural and historic ties to the Yucca Mountain area. Through this program, the tribes and organizations can express their views and concerns regarding the management of cultural resources and related issues.
Visual Resources	The Department would use shielded or down-directed lighting at the Central Operations Area and at other new facilities at Yucca Mountain to minimize the amount of night lighting that could be viewed from off-site locations.
Transportation	None.
Health and Safety	If engineering controls were unable to maintain safe concentrations of silica dust during possible use of the muck pile near the North Portal for road construction and surface leveling, respiratory protection (air filters, and/or personal-protective gear) would be used until such time that engineering controls could re-establish safe conditions.
Energy, Utilities, and Site Services	None.

4.16 CUMULATIVE IMPACTS

A cumulative impact is “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR Part 1508.7). Cumulative impacts can result from individually minor actions that, when viewed collectively over time, could have substantial impacts. The expression reasonably foreseeable refers to future actions for which there is a reasonable expectation that the action could occur, such as a proposed action under analysis, a project that has already started, or a future action that has obligated funding. For purposes of analysis in this EA, DOE assumes the reasonably foreseeable time frame for the cumulative analysis is 10 years.

Projects included in the analysis are those that have the potential to produce impacts that interact with the effects from the proposed action.

4.16.1 Foreseeable Future Projects

4.16.1.1 Construction of a Geologic Repository at Yucca Mountain

Construction and operation of a repository at Yucca Mountain is a reasonably foreseeable project that would have potential cumulative impacts in the same region that would be affected by the actions examined in this EA. The cumulative impacts of constructing, operating, and closing a repository, including the construction of a rail line, were examined in the repository EIS (DOE 2002, Table 8-5). Where appropriate, the impacts described in the repository EIS are added to the impacts of the proposed action under this EA and the total cumulative impact is described.

4.16.1.2 Construction of a Rail Line for a Geologic Repository at Yucca Mountain

The Department is preparing an EIS on the alignment, construction, and operation of a proposed rail line within the State of Nevada for the shipment of spent nuclear fuel, high-level radioactive waste to a repository at Yucca Mountain. For purposes of analysis in this EA, it is assumed that construction of the rail line in the vicinity of Yucca Mountain would occur after the construction projects described for the proposed action have been completed.

4.16.1.3 Land Withdrawal to Study a Corridor for a Proposed Rail Line to Yucca Mountain

On December 28, 2005, acting on an application from the Department, the Secretary of the Interior published Public Land Order No. 7653 that withdrew for 10 years about 308,600 acres of public land encompassing the potential rail lines under study in the above-mentioned EIS from the staking of new mining claims (70 Federal Register 76854) (see Section 1.4.2 for more details). The withdrawal does not result in any surface disturbances, nor does it affect the development of existing valid mining claims. It does, however, preclude the staking of new claims on these public lands, including certain public lands in the vicinity of Yucca Mountain. The public lands affected in the Yucca Mountain area are west of the area affected by the actions evaluated in this EA and are a subset of the broader withdrawal associated with the land withdrawal for the repository discussed in Section 4.16.1.1.

4.16.1.4 Activities on the Nevada Test and Training Range

The Nevada Test and Training Range is operated by the U.S. Air Force (Figure 1-1). The *Renewal of the Nellis Air Force Range Land Withdrawal: Legislative Environmental Impact Statement* (U.S. Air Force 1999, all) addressed potential environmental consequences of extending the land withdrawal for military activities by the U.S. Air Force. The land-withdrawal renewal for the Nevada Test and Training Range was approved and activities on the Training Range continue to evolve, as military needs change. In general, however, current and future developments at the Nevada Test and Training Range would have negligible cumulative impacts with the proposed actions examined in this EA because these actions would not occur on U.S. Air Force land that is used by the Department for operations at Yucca Mountain.

4.16.1.5 Activities on the Nevada Test Site

The NTS has been the Nation's proving ground for developing and testing nuclear weapons. From 1951 to 1992, the Department and its predecessor agencies conducted more than 900 nuclear weapons tests at the site.

Current activities at the NTS include the management of radioactive and hazardous wastes; weapons stockpile, stewardship and management; materials disposition; nuclear emergency response; and non-defense research and development. Past and present activities on the NTS, specifically within Area 25 where many of the facilities for the Yucca Mountain Project are located, are part of the existing environment, which is described in Chapter 3. Current and future activities by the NTS in Area 25 that would have cumulative impacts with the proposed action include the continued withdrawal of groundwater for NTS operations.

4.16.1.6 Desert Space Station Science Museum

Nye County proposes to construct a Desert Space Station Science Museum and other commercial facilities near Lathrop Wells. In total, 820 acres would be transferred from the BLM to Nye County, of which 100 acres would be used for the science museum and the remaining 720 acres would be managed for natural-resource values and habitat for the desert tortoise.

4.16.2 Cumulative Impacts

4.16.2.1 Air Quality

Air emissions during the proposed two-year construction period would be minor (Section 4.1.2). These emissions would have negligible cumulative impacts on ongoing operations, scientific testing, and routine maintenance during this two-year construction period because operational air emissions are very small (Section 3.1).

After completion of the proposed action, construction, air emissions would decrease and would be expected to be similar to current operational emissions (Section 3.1). These emissions could eventually overlap in time with new air emissions from construction of the repository if authorized by the NRC, the rail line, and the Desert Space Station Science Museum near Lathrop Wells. The most substantial contributor to air emissions during this period would come from construction of the repository. The repository EIS concluded that cumulative concentrations of criteria pollutants and cristobalite at the boundary of the land withdrawal would be small fractions of applicable regulatory limits (generally less than 10 percent of the regulatory limit for nitrogen dioxide, sulfur dioxide, carbon monoxide, PM10 and PM2.5, and cristobalite) (DOE 2002, Table 8-5). These estimated cumulative emissions, plus the emissions from continued operations, scientific testing, and routine maintenance, and construction of the Desert Space Station Science Museum, would not change the conclusions reached in the repository EIS. Overall, the cumulative impacts to air quality would be small.

4.16.2.2 Wildlife and Plants

The proposed action could result in up to 253 acres of disturbances during the construction period (Option 1; Table 2-1). Added to this would be minor additional disturbances associated with continued testing (probably less than 20 acres per year). These projected disturbances, when added to past disturbances from NTS activities and past and future disturbances for the repository, the rail line and end-of-line facilities, and the Desert Space Station Science Museum, would have a direct cumulative effect on wildlife and plants (e.g., lost productivity and animal mortality and displacement). The repository alone could disturb 1,360 acres (DOE 2002, Table 8-5). Combined, the cumulative disturbance from all past, present, and reasonably foreseeable future activities in this region over the next 20 years could total up to 5,000 acres. The direct cumulative impacts to wildlife and plants would likely be small because there is abundant, similar undisturbed habitat in surrounding areas. However, the indirect cumulative impacts to wildlife would be greater than the direct impacts from disturbing 5,000 acres because some intervening habitat would be fragmented and its value for some species of wildlife would be diminished.

4.16.2.3 Surface Water

The proposed action could result in disturbances of up to 253 acres (Option 1; Table 2-1). Added to this would be (1) minor additional disturbances associated with continued testing (probably less than 20 acres per year), (2) thousands of acres of disturbance associated with past, present, and future activities for construction of the repository, the rail line, and end-of-line facilities, and (3) several hundred acres for the Desert Space Station Science Museum. Combined, the cumulative disturbance from all activities in this area over the next 20 years could total up to 5,000 acres. Most of these disturbances would be from construction of the repository and associated rail-line facilities. The cumulative impacts analysis in the repository EIS concluded that impacts to surface hydrology would be small. Inclusion of surface-water impacts from the proposed action and the Desert Space Station Science Museum would not alter this conclusion (DOE 2002, Table 8-5). The floodplain and wetlands assessment in the repository EIS and in this EA (Appendix A) both concluded that impacts to floodplains would be small. There is no evidence to suggest that the cumulative impacts to floodplains, including floodplains that may be affected by the construction of end-of-line rail facilities in the vicinity of Yucca Mountain, and the Desert Space Station Science Museum, would be anything other than small.

4.16.2.4 Groundwater Quality

The proposed action would not affect the quality of groundwater because the groundwater table is 900 to 2,500 feet below the surface and any hazardous materials inadvertently spilled during construction would be quickly remediated. The likelihood that materials spilled at the surface would find their way to groundwater is remote. Cumulative impacts to groundwater quality would therefore not occur.

4.16.2.5 Water Demand

Water demand under the proposed action could be as high as 307 acre-feet over a two-year construction period under Option 2 (Table 2-1). If this demand occurred in only one year, combined with the 280 acre-feet/year currently pumped from the same groundwater basin by the NTS, would total 587 acre-feet/year, after which water use at Yucca Mountain would decrease substantially to its approximate rate over the past six years of 5 to 41 acre-feet/year (Table 3-4). This temporary cumulative demand would slightly exceed the lowest estimate of perennial yield for the western two-thirds of the Jackass Flats basin (580 acre-feet) and would likely have no measurable impacts on nearby wells.

The cumulative effects of water demand on the availability of groundwater from the Jackass Flats basin were considered in the repository EIS (DOE 2002, Table 8-5). The EIS concluded that the highest combined annual water demand for the repository (320 acre-feet/year) and the NTS (280 acre-feet/year) would exceed the lowest estimate of perennial yield of the western two-thirds of the Jackass Flats basin (580 acre-feet), but would be far less than the highest estimate of perennial yield of the basin (4,000 acre-feet) (DOE 2002, Table 8-5). Added to this cumulative impact would be about 55 acre-feet/year for five years for rail construction in the Yucca Mountain area (Nevada Rail Partners 2006), 10 acre-feet/year during repository construction, and perhaps several acre-feet/year for the Desert Space Station Science Museum. Combined, the total demand would be less than 700 acre-feet/year, which would still be far less

than the highest estimated perennial yield of the basin of 4,000 acre-feet (DOE 2002, Table 8-5). Hence, cumulative impacts to the availability of groundwater would be expected to be minor.

4.16.2.6 Land Use

The proposed action would have negligible impacts on land use (see Section 4.6.2). Cumulative impacts to land use would therefore not occur.

4.16.2.7 Cultural Resources

Cumulative adverse impacts from damage to archaeological and historical sites and illicit collection of artifacts would likely increase during construction, despite efforts by the Department and others Federal and local agencies to protect these resources.

4.16.2.8 American Indian Concerns

American Indians view all non-beneficial impacts to the environment to be adverse. The cumulative effects of the proposed action, along with the effects of past, present, and reasonably foreseeable projects (Section 4.16.1), would be viewed by American Indians as adverse and immune to mitigation.

4.16.2.9 Socioeconomics

Construction under the proposed action would not overlap in time with construction associated with the projects identified in Section 4.16.1. Therefore, the proposed action would not result in any cumulative impacts to socioeconomic conditions.

4.16.2.10 Visual Resources

The proposed action would cause negligible impacts to the visual resources of the area (see Section 4.10.1). Therefore, the proposed action would not result in any cumulative impacts to visual resources.

Night-lighting associated with the proposed action (e.g., at the Central Operations Area and the Sample Management Facility near the town of Lathrop Wells) would contribute to the diminishment of the natural nighttime environment in places like Death Valley National Park. Added to this would be the adverse effects of night-lighting associated with the repository (e.g., possible beacons on the exhaust stacks) and the other projects described in Section 4.16.1. Cumulatively, all projects would contribute to the minor diminishment of the natural nighttime environment, especially as viewed from Death Valley National Park.

4.16.2.11 Transportation

Construction under the proposed action would not overlap in time with the projects identified in Section 4.16.1. Therefore, the proposed action would not result in any cumulative impacts to the transportation system near Yucca Mountain.

4.16.2.12 Health and Safety

Construction under the proposed action would not overlap in time with the projects identified in Section 4.16.1. Therefore, the proposed action would not result in any cumulative impacts to the health and safety of workers, regulators, or visitors.

4.16.2.13 Energy, Utilities, and Site Services

Construction under the proposed action would not overlap in time with the projects identified in Section 4.16.1. Therefore, the proposed action would not result in any cumulative impacts to the regional availability of electricity, fossil fuels, utilities, and services.

5. CONSULTATION AND COORDINATION

5.1 PUBLIC PARTICIPATION

This draft of the EA is being released to the public for a 30-day review period.

5.2 AGENCIES CONSULTED

The following agencies were contacted during the course of compiling this EA.

- U.S. Department of Energy, Nevada Nuclear Security Agency
- U.S. Army Corps of Engineers
- Nye County

6. GLOSSARY OF TERMS

(NOTE: Several terms in this Glossary emphasize their specific relationship to the Yucca Mountain Project.)

- acre-foot (of water)** The volume of water required to cover 1 acre to a depth of 1 foot (about 1,200 cubic meters or 330,000 gallons).
- air quality** A measure of the concentrations of pollutants, measured individually, in the air.
- alluvial aquifer** See *aquifer*.
- ambient air-quality standards** Standards established on a Federal or state level that define the limits for airborne concentrations of designated criteria pollutants [nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns (PM10), ozone, and lead] to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards). See Standards established on a Federal or state level that define the limits for airborne concentrations of designated criteria pollutants [nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns (PM10), ozone, and lead] to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards). See *criteria pollutants*.
- American Indian** A person having origin in any of the original peoples of North America and who maintains cultural identification through tribal affiliation or community recognition.
- aquifer** A subsurface saturated rock unit (formation, group of formations, or part of a formation) of sufficient permeability to transmit groundwater and yield usable quantities of water to wells and springs. An *alluvial aquifer* consists largely of rock debris deposited originally by flowing water.
- arid** (1) Areas where mean annual evaporation exceeds mean annual precipitation; (2) having insufficient rainfall to support agriculture; (3) the hyper-arid zone (arid index 0.03) comprises dryland areas without vegetation with the exception of a few scattered shrubs. Annual rainfall is low, rarely exceeding 100 millimeters (4 inches). In the arid

zone (arid index 0.03-0.20), the native vegetation is sparse, being comprised of annual and perennial grasses and other herbaceous vegetation, and shrubs and small trees. There is high rainfall variability, with annual amounts ranging between 100 and 300 millimeters (4 and 12 inches).

borehole	A hole drilled into the earth's crust to collect hydrologic and geologic data.
borrow pit/material	An excavated area where materials such as sand and gravel are obtained.
carbonate aquifer	An aquifer in limestone and/or dolomite. Carbonate aquifers typically produce water containing relatively high concentrations of calcium and magnesium. A deep carbonate aquifer underlies Yucca Mountain and much of southern Nevada.
cinder	Volcanic rock ejected during a volcanic eruption. The rock debris can form a cinder cone at the land surface.
crystalite	A form of crystalline silica (silicon dioxide) that, if inhaled as dust particles, can cause a disease called <i>silicosis</i> that can damage the lungs by reducing lung capacity.
criteria pollutants	Six common pollutants (ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen dioxide) known to be hazardous to human health and the environment and for which the EPA sets National Ambient Air Quality Standards under the Clean Air Act.
direct impact	Effects, which are caused by the action and occur at the same time and place.
endangered species	A species that is in danger of extinction throughout all or a large part of its range; a formal listing of the U.S. Fish and Wildlife Service under the Endangered Species Act.
Euroamerican	A person whose ancestry can be traced to Europe, but who immigrated to the United States and became either a naturalized or a legal citizen.
Exploratory Studies Facility	An underground laboratory at Yucca Mountain that includes an 8-kilometer (5-mile) main loop (tunnel), a 3-kilometer (2-mile) cross drift, and a research alcove system constructed for performing underground studies. The data collected contributed toward determining the suitability of the Yucca Mountain site as a repository. Some or all of the facility could be incorporated into the proposed

repository.

floodplain	The lowlands adjoining inland and coastal waters and relatively flat areas and floodprone areas of offshore islands including, at a minimum, that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0-percent) floodplain. The critical action floodplain is defined as the 500-year (0.2-percent) floodplain.
fugitive dust	Particulate matter composed of soil; can include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is removed or redistributed.
fugitive emissions	Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.
geologic repository or repository	A system for disposing of radioactive waste in excavated geologic media, including surface and subsurface areas of operation, and the adjacent part of the geologic setting that provides isolation of the radioactive waste in the controlled area.
groundwater	Water contained in pores or fractures in either the unsaturated zone or saturated zone below the surface.
groundwater table	(1) The upper limit of the saturated zone (the portion of the ground wholly saturated with water).(2) The upper surface of a zone of saturation above which the majority of pore spaces and fractures are less than 100 percent saturated with water most of the time (unsaturated zone) and below which the opposite is true (saturated zone).
high-level radioactive waste	(1) The highly radioactive material that is produced from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing, and any solid material derived from such liquid waste that contains fission products in sufficient concentrations. (NOTE: DOE would vitrify liquid high-level radioactive waste before shipping it to the repository.), and (2) other highly radioactive material that the NRC, consistent with existing law, determines by rule requires permanent isolation.
hydrology	(1) The study of water characteristics, especially the movement of water. (2) The study of water, involving aspects of geology, oceanography, and meteorology.

impact	Include both direct impacts and indirect impacts. See <i>direct impact</i> and <i>indirect impact</i> .
indirect impact	Effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
infrastructure	The basic facilities, services, and installations needed for the functioning of the Yucca Mountain site in support of ongoing work.
invasive (plant) species	An alien plant species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
mitigation	Actions and decisions that (1) avoid impacts altogether by not taking a certain action or parts of an action, (2) minimize impacts by limiting the degree or magnitude of an action, (3) rectify the impact by repairing, rehabilitating, or restoring the affected environment, (4) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action, or (5) compensate for an impact by replacing or providing substitute resources or environments.
muck pile	Muck is a mining term for the rock excavated during tunneling operations at Yucca Mountain. This muck is stockpiled and is being considered for use as borrow material.
Nuclear Waste Policy Act (42 U.S.C. 10101 et seq.)	The Federal statute, originally enacted in 1982 (Public Law 97-425; 96 Stat. 2201), that established the Office of Civilian Radioactive Waste Management and defines its mission to develop a Federal system for the management and geologic disposal of commercial spent nuclear fuel and other high-level radioactive wastes, as appropriate. The Nuclear Waste Policy Act also specifies other Federal responsibilities for nuclear waste management, establishes the Nuclear Waste Fund to cover the cost of geologic disposal, authorizes interim storage under certain circumstances, and defines interactions between Federal agencies and the states, local governments, and American Indian tribes. The Nuclear Waste Policy Act was substantially amended in 1987 (see <i>Nuclear Waste Policy Act Amendments of 1987</i>).

Nuclear Waste Policy Act Amendments of 1987 (Public Law 100-203; 101 Stat. 1330)	Legislation that amended the NWPA to limit repository site-characterization activities to Yucca Mountain, Nevada; establish the Office of Nuclear Waste Negotiator to seek a state or American Indian tribe willing to host a repository or monitored retrievable storage facility; create the Nuclear Waste Technical Review Board; and increase state and local government participation in the waste management program.
particulate matter	Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.
perennial yield	The amount of usable water from a groundwater aquifer that can be economically withdrawn and consumed each year for an indefinite period. It cannot exceed the natural recharge to that aquifer and ultimately is limited to the maximum amount of discharge that can be used for beneficial use.
performance confirmation	The program of tests, experiments, and analyses conducted to evaluate the accuracy and adequacy of the information used to determine with reasonable assurance that the performance objectives for the period after permanent closure will be met.
reclamation	The conversion of disturbed land to a pre-disturbed condition.
remediate	Action taken to permanently remedy a release or threatened release of a hazardous substance to the environment, instead of or in addition to removal.
residual impact	The impacts of an action that would remain after mitigation measures were applied.
riparian	Of, on, or pertaining to the bank of a river or stream, or of a pond or small lake.
Section 404 permit	A permit required by Section 404 of the Clean Water Act for the discharge of dredge or fill material into certain waters of the United States.

site characterization	All subsurface and surface investigations (in the ESF) to determine the suitability of the Yucca Mountain site for a geologic repository. On February 14, 2002, the Yucca Mountain site was recommended by the Secretary of Energy to the President as a suitable site for a repository. Activities conducted during site characterization included laboratory and field studies designed to establish the geologic conditions and the ranges of the parameters relevant to the location of a repository. Studies included borings, surface excavations, excavations of exploratory shafts, and subsurface lateral excavations and borings.
spent nuclear fuel	Fuel that has been withdrawn from a nuclear reactor after irradiation, the component elements of which have not been separated by reprocessing. For the Yucca Mountain Project, this refers to (1) intact, nondefective fuel assemblies, (2) failed fuel assemblies in canisters, (3) fuel assemblies in canisters, (4) consolidated fuel rods in canisters, (5) nonfuel assembly hardware inserted in pressurized-water reactor fuel assemblies, (6) fuel channels attached to boiling-water reactor fuel assemblies, and (7) nonfuel assembly hardware and structural parts of assemblies resulting from consolidation in canisters.
volcanic aquifer	A water-bearing unit of volcanic rock or volcanic sediment that yields water in a useable quantity to a well or spring.
wetland	A shoreline or other area, such as a marsh or swamp, that is saturated with moisture, especially when thought of as the natural habitat of wildlife.

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Appendix A
Floodplain and Wetlands Assessment

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APPENDIX A.
FLOODPLAIN AND WETLANDS ASSESSMENT FOR THE PROPOSED
INFRASTRUCTURE IMPROVEMENTS FOR THE YUCCA MOUNTAIN PROJECT,
NEVADA

A.1 INTRODUCTION

Pursuant to Executive Order 11988, *Floodplain Management*, each Federal agency is required, when conducting activities in a floodplain, to take actions to reduce the risk of flood damage; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Pursuant to Executive Order 11990, *Protection of Wetlands*, each Federal agency is to avoid, to the extent practicable, the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands if a practicable alternative exists. Regulations issued by the U.S. Department of Energy (the Department or DOE) that implement these Executive Orders are contained in Title 10 of the Code of Federal Regulations (CFR) Part 1022, *Compliance with Floodplain and Wetlands Environmental Review Requirements*. No wetlands exist in the affected area and this subject is not considered further in this assessment (DOE 2002, Appendix L, Section L.1).

10 CFR Part 1022.4 defines a flood or flooding as “...a temporary condition of partial or complete inundation of normally dry land areas from...the unusual and rapid accumulation of runoff of surface waters...” 10 CFR Part 1022.4 identifies floodplains that must be considered in a floodplain assessment as the base floodplain and the critical-action floodplain. The base floodplain is the area inundated by a flood having a 1.0 percent chance of occurrence in any given year (referred to as the 100-year floodplain). The critical-action floodplain is the area inundated by a flood having a 0.2 percent chance of occurrence in any given year (referred to as the 500-year floodplain). Critical action is defined as any activity for which even a slight chance of flooding would be too great. Such actions could include the storage of highly volatile, toxic, or water-reactive materials. The critical-action floodplain is considered in this assessment because petroleum, oil, lubricants, and other hazardous materials could be when replacing the access road where it crosses Fortymile Wash.

10 CFR Part 1022.11 requires the Department to use Flood Insurance Rate Maps or Flood Hazard Boundary Maps to determine if a proposed action would be located in the base or critical-action floodplain. On Federal or state lands where Flood Insurance Rate Maps or Flood Hazard Boundary Maps are not available, the Department is required to seek flood information from an appropriate land-management agency or from agencies with expertise in floodplain analysis. In the early 1980s, the U.S. Geological Survey was asked by the Department to complete a flood study of Fortymile Wash and its principal tributaries (Busted Butte, Drill Hole, and Midway Valley washes) and outline areas of inundation from 100-year and 500-year floods (Squires and Young 1984).

A.2 PROPOSED ACTION

Under the proposed action examined in the environmental assessment (EA; Section 2.2 in the main body of the EA), the Department would replace the existing access road where it crosses Fortymile Wash (Figure A-1). The road currently crosses about 1,500 feet of wash at grade; that is, it is constructed directly on the surface of the wash and does not contain culverts. At this location the wash is an intermittent braided stream with four active channels on the north side of the road totaling about 37 feet wide, and three active channels on the south side of the road totaling about 43 feet wide. The occasional floods in Fortymile Wash flow across the road unimpeded. As the water subsides, rock debris can be strewn across the road and can make it impassable until the debris is removed by heavy equipment.

The Department proposes to replace the existing road where it crosses Fortymile Wash with a new road. This construction would occur under either road-option 1 or road-option 2, as described in Sections 2.2.1.1 and 2.2.1.2 in the main body of the EA. The new road would be about 10 feet higher than the existing road and would contain six-foot box culverts to channel floodwaters under the road (spacing of the culverts would be determined through further design). The culverts and associated training dikes and other features that would be installed to modify the stream flow would also be designed to minimize erosion upstream and downstream of the crossing. Heavy earth-moving equipment would be used to construct the road according to standard road-construction practices. Petroleum fuels, oils, lubricants and other hazardous materials would be used during construction, although these materials would be stored outside the 500-year floodplain (Figure A-1). Construction aggregate would be obtained from existing borrow pits (see Figure 1-2 in the main body of the EA). Concrete would be obtained from local vendors. Borrow pits would not be located in a floodplain.

On the west side of Fortymile Wash the existing access road continues northward about 2.2 miles to a point where it is next to a 4.9-foot-wide ditch which is the drainage channel of Midway Valley Wash; this ditch/wash drains into Fortymile Wash (Figure A-1). Improvement of the access road could affect the drainage of Midway Valley Wash in this area, but the effects would be beneficial because the drainage area would be sized to more appropriately accommodate flow in Midway Valley Wash. Therefore, the floodplain effects on Midway Valley Wash are not considered further in this assessment.

Under the proposed action analyzed in the EA, two road options exist (see Figure 2-1 in the environmental assessment). Under Road Option 1, a new access road would be constructed northward to a point where it would cross Fortymile Wash (this crossing of Fortymile Wash is discussed in the preceding paragraph). Under Road Option 2, the existing access road would be re-constructed to a point where it too would cross Fortymile Wash (this crossing of Fortymile Wash is identical to where the access road would cross the wash under Option 1, which is discussed in the preceding paragraph). Many small washes would be crossed under either road option. Because these washes are small, the effects of road construction to their associated floodplains are not considered further in this assessment.

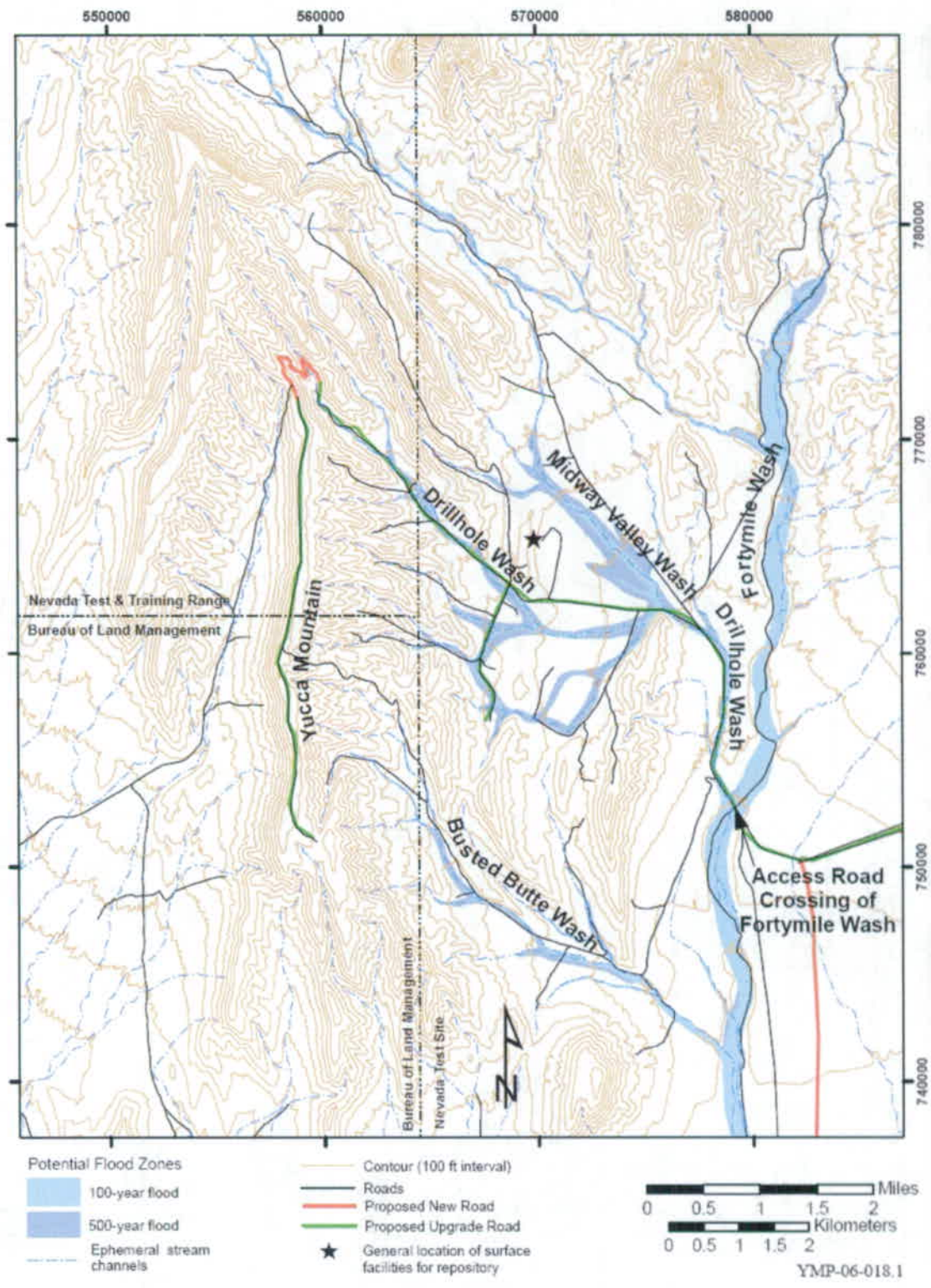


Figure A-1. Surface Drainage at Yucca Mountain

A.3 EXISTING ENVIRONMENT

Fortymile Wash drains an area of about 310 square miles to the east and north of Yucca Mountain (Figure A-1). The wash continues south of Yucca Mountain and drains into the Amargosa River south of U.S. 95. The Amargosa River drains an area of about 3,100 square miles by the time it reaches Tecopa, California. The mostly-dry riverbed extends another 60 miles before ending in Death Valley.

The existing environment at and near Yucca Mountain is described in Chapter 3 of this EA. The information below summarizes several of the more important aspects of the environment that pertain to this floodplain assessment.

A.3.1 Flooding

Water flow in Fortymile Wash is rare. The arid climate and meager precipitation (about 4 to 10 inches per year at Yucca Mountain) result in quick percolation of surface water into the ground and rapid evaporation. Flash floods, however, can occur after unusually strong summer thunderstorms or during sustained winter precipitation. During these times, runoff from ridges, pediments, and alluvial fans flows into the normally dry washes that are tributary to Fortymile Wash. Estimated peak discharges in Fortymile Wash are 12,000 cubic feet per second for the 100-year flood and 58,000 cubic feet per second for the 500-year flood.

The nearest manmade structure within Fortymile Wash from where the access road crosses the wash is U.S. Highway 95, more than 13 miles to the south. Lathrop Wells is the nearest population center to Yucca Mountain, about 14 miles to the south along U.S. 95 and 3 miles east of Fortymile Wash.

Flooding events in the region are usually localized. A flash flood in one or more of the washes draining to Fortymile Wash, for example, might not result in any notable flow in the much larger Fortymile Wash. In rare instances, however, storms can produce runoff that is extensive enough for flow to occur throughout the drainage system. Glancy and Beck (1998, all) documented conditions during March 1995 and February 1998 where Fortymile Wash and the Amargosa River flowed simultaneously through their primary channels to Death Valley. The 1995 incident represented the first documented case of this flow condition.

A.3.2 Biology

Vegetation in and near Fortymile Wash is typical of the Mojave Desert. The mix or association of vegetation in Fortymile Wash, which is dominated by the shrubs white bursage (*Ambrosia dumosa*), creosotebush (*Larrea tridentata*), white burrobush (*Hymenoclea salsola*), and heathgoldenrod (*Ericameria paniculata*), differs somewhat from other vegetation associations at Yucca Mountain (CRWMS M&O 1998, pp. 5 to 7). No plant species are known to be restricted to the floodplain of Fortymile Wash. Moreover, none of the plant species known to occur at Yucca Mountain is endemic to the area.

There are no mammals, reptiles, or bird species that are restricted to or dependent upon the floodplain of Fortymile Wash. These species all are widespread throughout the region. No amphibians have been found at or near Yucca Mountain.

The only plant or animal species that has been found at Yucca Mountain that is classified as threatened, endangered, or proposed under the Endangered Species Act is the desert tortoise (*Gopherus agassizii*), which is classified as threatened. Yucca Mountain is at the northern edge of the range of the desert tortoise. Desert tortoises are known to occur within the floodplain of Fortymile Wash, but their abundance there and elsewhere at Yucca Mountain is low compared to other parts of the tortoises' range farther south and east.

Several animal and plant species classified as sensitive by the Bureau of Land Management occur at Yucca Mountain (see Section 3.4 of the EA). These species may occur within the floodplain of Fortymile Wash, but they are not dependent upon habitat there.

Two small well ponds with some riparian vegetation occur in Fortymile Wash downstream of the existing access road.

A.3.3 Cultural Resources

Years of research at and near Yucca Mountain have discovered more than 900 archaeological and historic sites, some of which are within Fortymile Wash. These sites range from single fragments of lithic stone scatters to campsites and quarries. They indicate that American Indian populations for at least 12,000 years have occupied the Yucca Mountain region. Fortymile Wash was an important crossroad where several trails converged from such distant places as Owens Valley, Death Valley, and the Avawtz Mountains in California.

A.4 FLOODPLAIN EFFECTS

According to 10 CFR 1022.12(a)(2), a floodplain assessment is required to discuss the positive and negative, direct and indirect, and long- and short-term effects of the proposed action on the floodplain and/or wetlands. In addition, the effects on lives and property, and on natural and beneficial values of floodplains, must be evaluated.

The floodplain of Fortymile Wash assessed herein is normally dry, but can be temporarily and infrequently inundated from runoff during 100-year or 500-year floods. Improvement of the existing access road where it crosses Fortymile Wash would reduce the area through which floodwaters naturally flow. During large floods, bodies of water could develop on the upstream side of the crossing and slowly drain through culverts. Such floods, however, would not increase the risk of future flood damage, increase the impact of floods on human health and safety, or harm the natural and beneficial values of the floodplains because there are no nearby human activities or facilities upstream or downstream that would be affected. A sufficiently large flood in Fortymile Wash could create a temporary large lake up-stream of the improved road that would slowly drain through the culverts. If the flood occurred quickly and was sufficiently large, the dammed water could flow over the road and continue downstream. Some road damage would be expected, but the damage would not be expected to increase the risk of future flood damage, increase the impact of floods on human health and safety, or harm the natural and beneficial values of the floodplains because there are no nearby human activities or facilities downstream that would be affected.

During and after each flood, a large amount of sediment would accumulate on the up-stream side of the crossing. Periodically, this material would have to be removed so that future floods would

have sufficient space to accumulate, rather than overflow the road during successively smaller floods. This material would, when deemed necessary, be removed by truck and disposed of appropriately. Under natural conditions this sediment would have continued downstream and been deposited as the floodwaters receded. Compared to the total amount of sediment that is moved by floodwaters along the entire length of the washes, the amount trapped behind the crossings would be small.

During a 100-year or 500-year flood, there would be no preferred channels; most channels across the entire width of Fortymile Wash would be filled with water (Figure A-1). Therefore, the road would not cause preferential flow in a particular channel or alter the velocity or direction of flow on the floodplain.

Improvement of the road would require the removal of some desert vegetation in the wash and the disturbance of soil and alluvium. These actions could adversely impact wildlife, especially the desert tortoise, which is designated as threatened by the U.S. Fish and Wildlife Service. Prior to construction, a biological survey would be conducted to locate and remove tortoises that are in the path of construction and other mitigation measures required by the biological opinion issued to the Department by the U.S. Fish and Wildlife Service (Williams 2001).

Construction could also affect previously unknown cultural resources. Prior to construction, areas that would be disturbed are surveyed for cultural resources. If cultural resources are discovered, they are evaluated for their importance and eligibility for inclusion in the *National Register of Historic Places*. To the extent possible, all cultural sites are avoided. When avoidance is not possible, the artifacts at eligible sites are collected in accordance with Section 106 of the National Historic Preservation Act and the findings are documented. In this way, the artifacts from, and knowledge about, these sites are preserved. The Department provides all survey reports, data recovery plans, and annual reports to the State Historic Preservation Officer for comment and review. Furthermore, workers would be required to be trained on the protection of these resources from excavation or collection.

Potential indirect impacts on flora and fauna include increased emissions of fugitive dust, elevated noise levels, and increased human activities. Emissions of fugitive dust would be short-term and would not be expected to adversely affect vegetation or wildlife. Likewise, no significant long-term impacts to wildlife are expected from the temporary increase in noise during construction. Wildlife displaced during construction would probably return after construction was completed.

Two small well ponds with some riparian vegetation occur in Fortymile Wash downstream of the access road. During a 100- or 500-year flood, both riparian areas would likely be damaged or destroyed by floodwaters regardless of the existence of the improved road.

Neither the quality nor the quantity of groundwater that normally recharges through Fortymile Wash would be substantially affected from improvement of the road. Water infiltration could increase somewhat after large floods as standing water slowly enters the ground upstream of the road. The total volume of these water bodies would be a few acre-feet at most, and much of the water would gradually drain through culverts or evaporate before reaching the groundwater table some 900 feet below the surface.

The use of petroleum, oil, lubricants, and other hazardous materials during road-improvement would be strictly controlled and spills would be promptly cleaned up and, if needed, the soil and alluvium would be remediated. The small amount of these materials that might seep into the ground would not be expected to reach the groundwater table, which is more than 900 feet below the surface.

The nearest population center is Lathrop Wells about 14 miles to the south along U.S. 95 about 3 miles east of Fortymile Wash. If floodwaters from a 100- or 500-year flood reached this far downstream, there would be no measurable increase in flood velocity or sediment load attributable to the improvement of the access road compared to natural conditions. Hence, disturbance of the floodplain of Fortymile Wash would have no adverse impacts on lives and property downstream. Moreover, impacts to the floodplain would be insignificant in both the short- and long-term compared to the erosion and deposition that occur naturally and erratically in this desert wash.

There are no positive or beneficial impacts to the floodplain of Fortymile Wash that have been identified from the proposed action.

A.5 MITIGATION MEASURES

According to 10 CFR 1022.12(a) (3), agencies must address measures to mitigate the adverse impacts of actions in a floodplain or wetlands, including but not limited to minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically-sensitive areas. This section discusses the floodplain mitigation measures that would be considered and, where necessary and feasible, implemented during improvement of the road in Fortymile Wash.

Adverse impacts to the floodplain of Fortymile Wash would be small. Even during 100- and 500-year floods, it is unlikely that differences in the rate and distribution of erosion and sedimentation caused by improvement of the road would be measurably different compared to existing conditions. Similarly, improvements would have little effect on erosion and sedimentation from flooding events. The culverts and associated training dikes and other features that would be installed to modify the stream flow would also be designed to minimize erosion upstream and downstream of the crossing. The Department would follow their reclamation guidelines (YMP 2001) for site clearance, topsoil salvage, erosion and runoff control, recontouring, revegetation, construction practices, and maintenance. Disturbance of surface areas and vegetation would be minimized, and natural contours would be maintained to the maximum extent feasible. Slopes would be stabilized to minimize erosion. Unnecessary off-road vehicle travel would be avoided. Storage of hazardous materials during construction would be outside the floodplains.

Before any construction could begin, the Department would require pre-construction surveys to make sure that the work would not impact important biological or cultural resources. In the event that construction could threaten important resources, appropriate mitigation measures would be implemented, such as relocating sensitive species and, to the extent possible, avoiding cultural sites. Where avoidance is not possible, the cultural resources would be evaluated for their importance and eligibility for inclusion in the *National Register of Historic Places*, and the

artifacts at eligible sites would be collected and documented in accordance with Section 106 of the National Historic Preservation Act.

If hazardous materials are spilled during road improvement, the spill would be quickly cleaned-up and the soil and alluvium would be remediated. Hazardous materials would be stored away from all floodplains to decrease the probability of an inadvertent spill in these areas.

A.6 ALTERNATIVES

According to 1022.12(a)(3), the Department must consider alternatives to the proposed action. Alternative ways to cross Fortymile Wash are considered in the following paragraphs, along with the no-action alternative.

To operate Yucca Mountain, a road that crosses Fortymile Wash is required to access facilities west of the wash. It is unreasonable to consider a new access road across the wash when the existing road, if improved, would adequately meet the operational needs of the Department. Moreover, a new access road across the wash at a different location would increase environmental damage and costs. Because of these concerns, a new access road crossing the wash was eliminated from detailed consideration.

Selection of the no-action alternative would avoid additional impacts to the Fortymile Wash. The Department could still use the existing road, but this alternative would not meet the operational needs of the Department as described in the body of the EA

A.7 FLOODPLAIN STATEMENT OF FINDINGS

The Department prepared this Floodplain Statement of Findings based on the information in the above floodplain and wetlands assessment. The assessment evaluates potential effects to the floodplain of Fortymile Wash from improving the existing access road where it crosses the wash. The assessment describes the proposed action and the existing environment.

Effects to the floodplain of Fortymile Wash would occur from improving the existing access road where it crosses Fortymile Wash. Construction activities could reduce the area through which floodwaters naturally flow. However, none of these impacts would be expected to increase the risk of future flood damage, or increase the impact of floods on human health and safety, or harm the natural and beneficial values of the floodplains because there are no nearby human activities or facilities upstream or downstream that could be affected. There are no wetlands that would be affected.

In addition to the proposed action, the EA analyzes a no-action alternative. Under the no-action alternative, no impacts to the floodplain of Fortymile Wash would occur, but the operational needs of the Department would not be met (see Chapter 4 in the main body of the EA).

During improvements, the Department would use standard mitigation practices to minimize the potential impacts to the floodplain of Fortymile Wash. Procedures would include pre-construction surveys to identify and, when necessary, relocate sensitive species and avoid cultural sites; modifying designs and implementing good engineering practices such as minimizing the size of disturbances, topsoil salvage, preserving natural contours, controlling

surface erosion and runoff; reclaiming and revegetating disturbed areas; and following established guidelines for hazardous materials storage and response to accidental spills.

The Department's proposed action in the floodplain of Fortymile Wash would be conducted in accordance with all applicable requirements, including any applicable State or local floodplain-protection standards.

A.8 REFERENCES

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