Click here to return to the Appendixes Menu

Appendix L

Floodplain/Wetlands Assessment
for the Proposed Yucca Mountain
Geologic Repository

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX L. FLOODPLAIN/WETLANDS ASSESSMENT FOR THE PROPOSED YUCCA MOUNTAIN GEOLOGIC REPOSITORY

L.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 (DOE) that implement these Executive Orders are contained in Title 10 of the Code of Federal Regulations (CFR) Part 1022, *Compliance with Floodplain/Wetlands Environmental Review Requirements*.

In 1982, Congress enacted the *Nuclear Waste Policy Act* in recognition of the national problem created by the accumulation of spent nuclear fuel and high-level radioactive waste at many commercial and DOE sites throughout the country. The Act recognized the Federal government's responsibility to permanently dispose of the Nation's spent nuclear fuel and high-level radioactive waste. By 1986, DOE narrowed the number of potentially acceptable geologic repository sites to three. Then in 1987, Congress amended the Act by redirecting DOE to determine the suitability of only Yucca Mountain in southern Nevada.

If, after a possible recommendation by the Secretary of Energy, the President considers the site qualified for an application to the U.S. Nuclear Regulatory Commission for a construction authorization, the President will submit a recommendation of the site to Congress. If the site designation becomes effective, the Secretary of Energy will submit to the Nuclear Regulatory Commission a License Application for a construction authorization. DOE could then select a rail corridor or a site for an intermodal transfer station, along with its associated route for heavy-haul trucks, among those considered for Nevada in the EIS. Following such a decision, additional field surveys, environmental and engineering analyses, and National Environmental Policy Act reviews would likely be needed regarding a specific rail alignment for the selected corridor or the site for the intermodal transfer station and its associated route. When more specific information becomes available about activities proposed to take place within floodplains and wetlands, DOE will conduct further environmental review in accordance with 10 CFR 1022.

In 1989, DOE published a Notice of Floodplain/Wetlands Involvement (54 *FR* 6318, February 9, 1989) for site characterization studies at Yucca Mountain. These studies are designed to determine the suitability of Yucca Mountain to isolate nuclear waste. A floodplain assessment was prepared (DOE 1991, all) and a Statement of Findings was issued by DOE (56 *FR* 49765, October 1, 1991). In 1992, DOE prepared a second floodplain assessment on locating part of the entry point to the subsurface Exploratory Studies Facility in the 100-year floodplain of a wash at Yucca Mountain (DOE 1992, all). The Statement of Findings for this assessment was published in the Federal Register (57 *FR* 48363, October 23, 1992). Both Statements of Findings concluded that the benefits of locating activities and structures in the floodplains outweigh the potential adverse impacts to the floodplains and that alternatives to these actions were not reasonable.

The Nuclear Waste Policy Act, as amended, requires that a recommendation by the Secretary to the President to construct a repository must be accompanied by a Final EIS. As part of the EIS process, and following the requirements of 10 CFR Part 1022, DOE issued a *Notice of Floodplain and Wetlands Involvement* in the *Federal Register* (64 *FR* 31554, June 11, 1999). The Notice requested comments from

the public regarding potential impacts on floodplains and wetlands associated with construction of a potential rail line or a potential intermodal transfer station with its associated route for heavy-haul trucks to and in the vicinity of Yucca Mountain, depending on the rail or intermodal alternative selected (Figure L-1). As of July 2,1999, DOE had received no comments from the public. This floodplain/wetlands assessment has been prepared in conjunction with the *Notice of Floodplain and Wetlands Involvement*, and in accordance with 10 CFR Part 1022.

This assessment examines the effects of proposed repository construction and operation and potential construction of a rail line or intermodal transfer station on:

1. Floodplains near the Yucca Mountain site (Fortymile Wash, Busted Butte Wash, Drillhole Wash, and Midway Valley Wash; there are no delineated wetlands near the Yucca Mountain site), and

2. Floodplains and areas that may have wetlands (for example, springs and riparian areas) along potential rail corridors in Nevada and at intermodal transfer station locations associated with routes for heavy-haul trucks. If DOE selects rail as the mode of spent nuclear fuel and high-level radioactive waste transport in Nevada to the Yucca Mountain site, one of five rail corridors would be selected (Figure L-2). If DOE selects heavy-haul as the mode of transport for spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site, one of five corridors and one of three intermodal transfer station locations would be selected (Figure L-3). A more detailed floodplain/wetlands assessment of the selected rail corridor or route for heavy-haul trucks would then be prepared. This assessment compares what is known about the floodplains, springs, and riparian areas along the five possible rail corridors and at the three intermodal transfer station locations. This assessment does not evaluate potential floodplain or wetlands effects along routes because these existing roads should already be designed to meet 100-year floodplain design specifications. If upgrades to existing roads are deemed necessary, a more detailed floodplain/wetlands assessment would be prepared at that time.

Title 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..."* Title 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). C*ritical 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 was considered because petroleum, oil, lubricants, and other hazardous materials could be used during the construction of a rail line or road upgrades and because spent nuclear fuel and high-level radioactive waste would be transported across the washes.

Title 10 CFR Part 1022.11 requires DOE 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, DOE is required to seek flood information from the appropriate land-management agency or from agencies with expertise in floodplain analysis. The U.S. Geological Survey was therefore asked by DOE to complete a flood study of Fortymile Wash and its principal tributaries (which include Busted Butte, Drillhole, and Midway Valley washes) and outline areas of inundation from 100-year and 500-year floods (Squires and Young 1984, Plate 1).

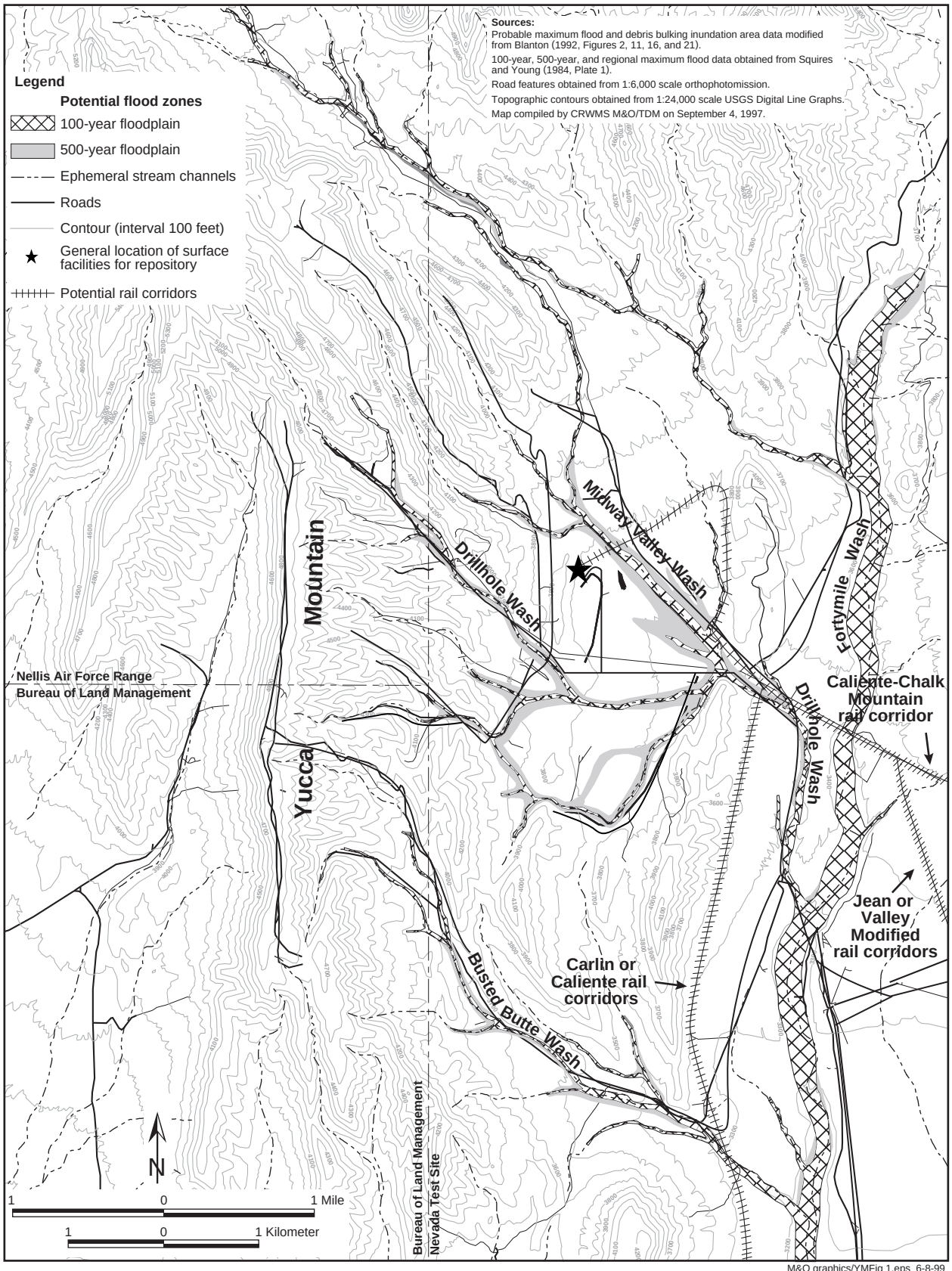

Figure L-1. Yucca Mountain site topography, floodplains, and potentialrail corridors.

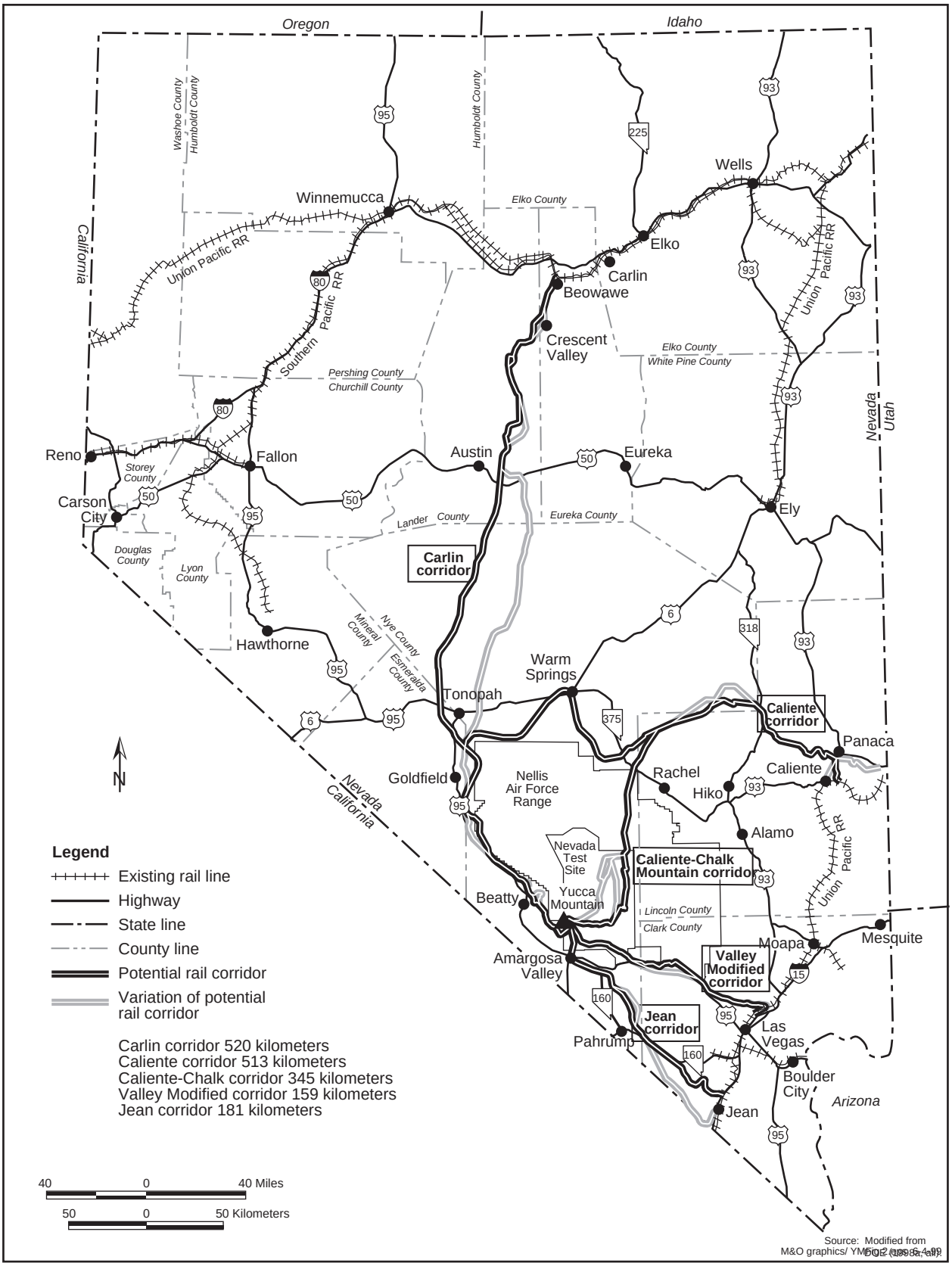

Figure L-2. Potential Nevada rail corridors to Yucca Mountain.

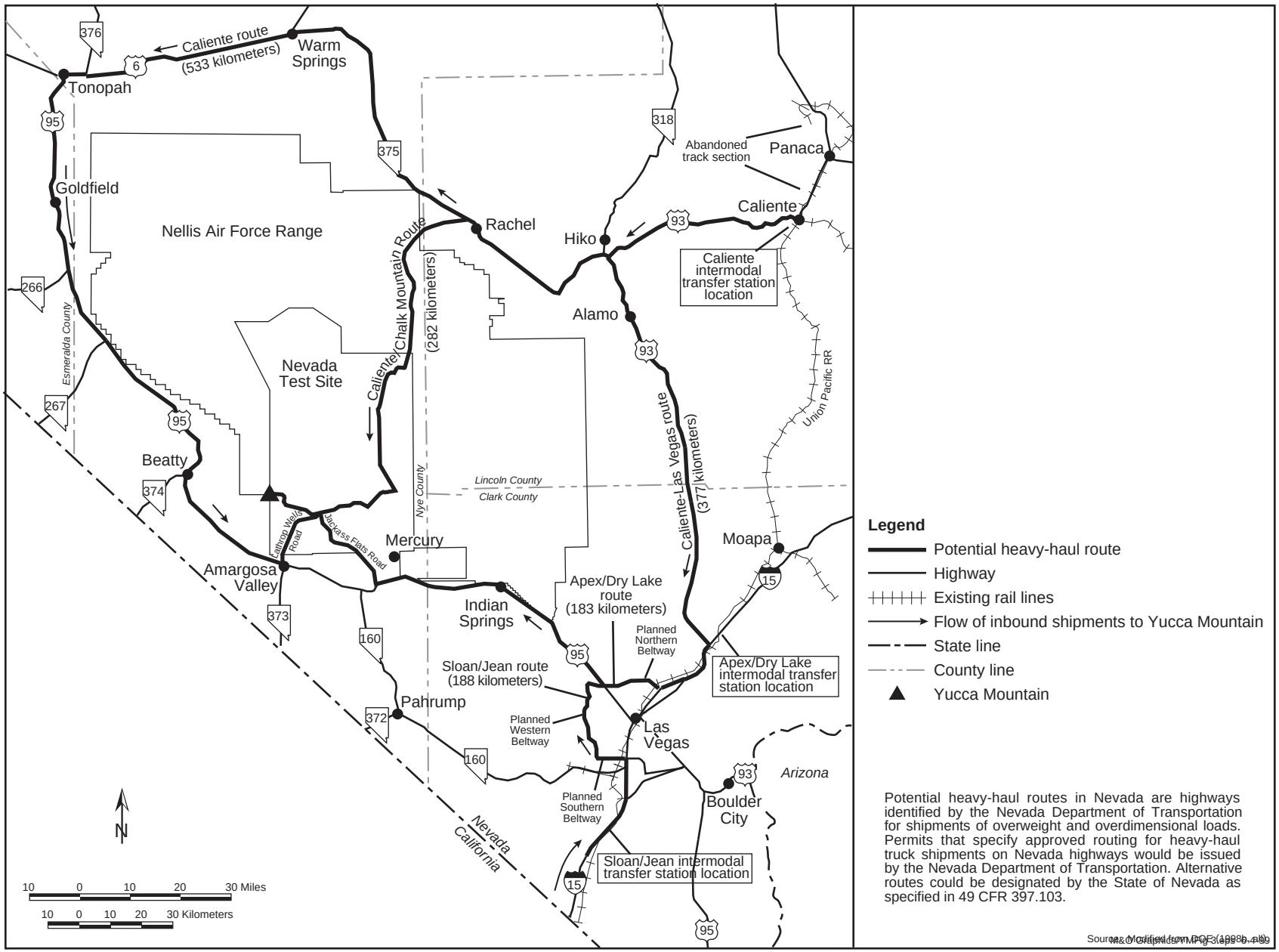

Figure L-3. Potential routes in Nevada for heavy-haul trucks.

Title 10 CFR Part 1022 also requires DOE to determine whether wetlands would be affected by the proposed action and, if necessary, to conduct a wetlands assessment. As required by 10 CFR Part 1022.11(c), DOE examined the following information with regard to possible wetlands in the vicinity of the Yucca Mountain site:

- *U.S. Fish and Wildlife Service National Wetlands Inventory.* Maps from the National Wetlands Inventory do not identify any naturally occurring wetlands in the vicinity of the Yucca Mountain site (FWS 1995, all).

- *U.S. Department of Agriculture, Soil Conservation Service Local Identification Maps.* The Soils Conservation Service (now called Natural Resource Conservation Service) has not conducted a soil survey of the Yucca Mountain site. However, DOE and other agencies have conducted comprehensive surveys and studies of soils at the Yucca Mountain site and in the surrounding area. These surveys are summarized in TRW (1999a, pages 2 to 6). The surveys indicate that there are no naturally-occurring hydric soils at Yucca Mountain.

- *U.S. Geological Survey Topographic Maps.* Topographic maps of the vicinity (for example, USGS 1983, all) do not show springs, permanent streams, or other indications of wetlands.

- *State Wetlands Inventories.* There are no State of Nevada wetlands inventories in the vicinity of Yucca Mountain.

- *Regional or Local Government-Sponsored Wetlands or Land-Use Inventories.* DOE has conducted a wetlands inventory of the Nevada Test Site (Hansen et al. 1997, page 1-161). The closest naturally occurring wetlands to Yucca Mountain is on the upper west slope of Fortymile Canyon, 6 kilometers (3.7 miles) north of the North Portal, outside of the proposed repository construction area. In addition, riparian vegetation occurs adjacent to four man-made well ponds east of Yucca Mountain (TRW 1999b, page 2-14), but these are outside of areas where construction or other proposed actions would occur.

Based on this information, DOE concluded that a wetlands assessment is not required to comply with 10 CFR Part 1022.

L.2 Project Description

If Yucca Mountain is selected as a site to construct a repository, DOE would ship spent nuclear fuel and high-level radioactive waste to the site for a period of about 24 years. Under the current schedule spent nuclear fuel and high-level radioactive waste emplacement would begin in 2010. One of five possible rail corridors leading to the site could be selected in Nevada (Figure L-2). In the vicinity of the Yucca Mountain site the five rail corridors converge to two possible routes. Alternatively, if heavy-haul transport were selected, one intermodal transfer station and one associated route would be identified from the three potential intermodal transfer station locations and five potential routes for heavy-haul trucks (Figure L-3). In the vicinity of the Yucca Mountain site, the potential routes converge to two possible routes that may require upgrades. At greater distances, routes would utilize public roads and existing Nevada Test Site roads to the extent possible.

Some transportation-related actions associated with the DOE proposal would occur in floodplains on the proposed repository site on land the Federal government would manage. Route construction and operation could affect the 100-year and 500-year floodplains of Fortymile Wash, Busted Butte Wash, Drillhole Wash, and Midway Valley Wash in the vicinity of the Yucca Mountain site. This assessment examines the

potential floodplain impacts to all four washes although all four might not be affected. The effects on floodplains and areas that may contain wetlands elsewhere in Nevada along the five rail corridors and at the three intermodal station locations associated with heavy-haul transport are examined using available information. When DOE makes a decision whether to use rail or heavy-haul transport, more information would be obtained to support further environmental review.

This section is divided into two parts. Section L.2.1 discusses the proposed action in the vicinity of the Yucca Mountain site including rail access; heavy-haul truck access; and potential construction of an associated rail line, bridge, and roads. Section L.2.2 discusses possible actions elsewhere in Nevada including rail access and intermodal transfer station locations.

L.2.1 PROPOSED ACTIONS AT YUCCA MOUNTAIN

The preliminary layout of surface facilities at the repository is shown on Figure L-1. Except for a possible rail line and roads, no facilities are generally anticipated to be located within either the 100-year or 500-year floodplains of Fortymile Wash, Busted Butte Wash, Drillhole Wash, or Midway Valley Wash. The paragraphs below describe the rail line and roads that could affect the floodplains of these washes in the vicinity of the Yucca Mountain site.

L.2.1.1 Rail Access

At this time, there is no rail access to the Yucca Mountain site. DOE has identified five potential rail corridors in Nevada for transporting spent nuclear fuel and high-level radioactive waste to Yucca Mountain.

If DOE selected a rail corridor leading to the Yucca Mountain site from the west and south (either the Carlin or Caliente corridors), the rail line could cross Busted Butte Wash, Drillhole Wash just west of its confluence with Fortymile Wash, and Midway Valley Wash (Figure L-1). Cut, fill, drainage culverts or bridges could be used to cross Busted Butte, Drillhole, and Midway Valley washes. The widths of Busted Butte Wash and Drillhole Wash (including their floodplains) are about 150 meters (500 feet) each where they would be crossed by the rail line. The width of Midway Valley Wash (including its floodplain) is about 300 meters (1,000 feet) where it could be crossed by the rail line.

If DOE selected a rail corridor leading to the Yucca Mountain site from the east (Caliente-Chalk Mountain, Jean, or Valley-Modified corridors) the rail line could cross approximately 400 meters (1,300 feet) of Fortymile Wash and its associated floodplains. In this case, the rail line could cross the wash on either a bridge (with supports located in the wash) or on a raised rail line that could be constructed in the wash (with appropriately-sized drainage culverts). After crossing Fortymile Wash, the rail line could continue along the east side of Yucca Mountain and cross about 300 meters (1,000 feet) of Midway Valley Wash before arriving at the repository.

L.2.1.2 Heavy-Haul Truck Access

DOE has identified five potential routes for heavy-haul trucks in Nevada for transporting spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site.

If DOE selected a route leading to the Yucca Mountain site from the west and south, the route could cross Busted Butte Wash, Drillhole Wash, and Midway Valley Wash (Figure L-1). Cut, fill, drainage culverts or bridges could be used to cross Busted Butte, Drillhole, and Midway Valley washes.

If DOE selected a route leading to the Yucca Mountain site from the east, the route could cross Fortymile Wash. The route could either cross through the wash or a bridge could be constructed over it. After crossing Fortymile Wash, the route could continue along the east side of Yucca Mountain and could cross Midway Valley Wash before arriving at the repository.

During potential repository operation, some spent nuclear fuel and high-level radioactive waste would be transported to the Yucca Mountain site by legal-weight trucks. These trucks could access Yucca Mountain from the east by crossing Fortymile Wash along the existing road or access Yucca Mountain along the route used by heavy-haul trucks. The legal-weight trucks could then proceed along the east side of Yucca Mountain and cross Midway Valley Wash along the route.

L.2.1.3 Construction

Construction of a potential rail line near Yucca Mountain as well as upgrading the existing roads for heavy-haul and legal-weight trucks in the vicinity would take about one year to complete. Standard construction practices would be used, including the use of explosives and heavy earth-moving equipment. Standard measures would also be used to minimize erosion. Petroleum fuels, oils, lubricants and other hazardous materials would be used during construction, although these materials would be stored outside the 500-year floodplain.

Construction aggregate could be obtained from local borrow pits, but rail-bed ballast would need to be obtained from outside sources. Concrete would be obtained from a nearby concrete batch plant or from a new batch plant that may be built closer to the repository site. Neither the borrow pits nor the concrete batch plant would be located in a floodplain or wetlands.

If a bridge were constructed across Fortymile Wash, it would be about 30 meters (100 feet) wide. Supports for the bridge would be constructed in the floodplain of the wash. If a rail line were constructed across the bottom of Fortymile Wash, extensive earthwork (cut and fill) would be required to maintain the less than two percent grade required for the rail alignment.

L.2.2 POSSIBLE ACTIONS ELSEWHERE IN NEVADA

At this time there is no rail access to Yucca Mountain. This means that material traveling by rail would have to continue to the repository on a new branch rail line or transfer to heavy-haul trucks at an intermodal transfer station in Nevada and then travel on existing highways. DOE is considering construction of *either* a new branch rail line *or* an intermodal transfer station and associated highway improvements. The DOE has identified five possible rail corridors, each of which has alignment variations (Figure L-2), and three possible locations for an intermodal transfer station associated with heavy-haul trucks (Figure L-3).

For analytical purposes, it is assumed that construction of a rail line in Nevada would take approximately two and one half years. If a decision were made to proceed with development of a repository, it is likely that the DOE would decide at that time whether to build a rail line or to develop an intermodal transfer station site for heavy-haul waste transport. Should the DOE decide to construct a rail line, standard practices for construction of rail lines would be used, including minimizing steep grades, utilizing cut and full earthwork techniques, and crossing flood prone areas using culverts or bridges. Should the DOE decide to use a route for heavy-haul trucks, portions of the existing roads used for heavy-haul transport may require upgrades to accommodate the heavy loads.

L.3 Existing Environment

L.3.1 EXISTING ENVIRONMENT AT YUCCA MOUNTAIN

Fortymile Wash is about 150 kilometers (93 miles) long and drains an area of about 810 square kilometers (310 square miles) to the east and north of Yucca Mountain (Figure L-1). The wash continues southward and connects to the Amargosa River. The Amargosa River drains an area of about 8,000 square kilometers (3,100 square miles) by the time it reaches Tecopa, California. The mostly-dry river bed extends another 90 kilometers (56 miles) before ending in Death Valley.

Busted Butte and Drillhole washes drain the east side of Yucca Mountain and flow into Fortymile Wash (Figure L-1; Midway Valley Wash is a tributary to Drillhole Wash). Busted Butte Wash drains an area of 17 square kilometers (6.6 square miles) and Drillhole Wash drains an area of 40 square kilometers (15 square miles).

The existing environment at and near Yucca Mountain, including Fortymile Wash, Busted Butte Wash, Drillhole Wash, and Midway Valley Wash is described in Chapter 3 of the EIS. The information below summarizes several of the more important aspects of the environment that pertain to this floodplain assessment.

L.3.1.1 Flooding

Water flow in the four washes is rare. The arid climate and meager precipitation [about 10 to 25 centimeters (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 340 cubic meters per second (720,000 cubic feet per second) for the 100-year flood and 1,600 cubic meters per second (3,390,000 cubic feet per second) for the 500-year flood. Estimated peak discharges in Busted Butte Wash are 40 cubic meters per second (85,000 cubic feet per second) for the 100-year flood and 180 cubic meters per second (380,000 cubic feet per second) for the 500-year flood. Estimated peak discharges in Drillhole Wash are 65 cubic meters per second (140,000 cubic feet per second) for the 100-year flood and 280 cubic meters per second (590,000 cubic feet per second) for the 500-year flood.

The nearest man-made structure within Fortymile Wash is U.S. Highway 95 more than 19 kilometers (12 miles) south of the confluence of Drillhole and Fortymile washes. Lathrop Wells, the nearest population center to Yucca Mountain, is also about 19 kilometers to the south along U.S. 95 and 3.2 kilometers (2 miles) east of Fortymile Wash.

L.3.1.2 Wetlands

There are no springs, perennial streams, hydric soils, or naturally occurring wetlands at Yucca Mountain. There are two man-made well ponds within Fortymile Wash, and two east of that wash, that have riparian vegetation (TRW 1999a, pages 5 to 6; TRW 1999b, page 2-14).

L. 3.1.3 Biology

Vegetation at 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 association at Yucca Mountain (TRW 1998a, pages 5 to 7). No plant species are known to be restricted to the floodplains. In addition, none of the more than 180 plant species known to occur at Yucca Mountain is endemic to the area.

None of the 36 mammal, 27 reptile, or 120 bird species that have been documented at Yucca Mountain are restricted to or dependent on the floodplain. These species all are widespread throughout the region. No amphibians have been found at 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 (Rautenstrauch, Brown, and Goodwin 1994, page 11). 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 its range farther south and east (TRW 1997, pages 6 to 11). Information on the ecology of the desert tortoise population at Yucca Mountain is summarized in TRW (1999b, page 2-8).

Four species classified as sensitive by the Bureau of Land Management occur at Yucca Mountain: two species of bats [the long-legged myotis (*Myotis volans*) and the fringed myotis (*Myotis thysanodes*)] (TRW 1998b, page 11), the western chuckwalla (*Sauromalus obesus obesus*) (TRW 1998c, pages 22 to 23), and the western burrowing owl (*Speotyto cunicularia hypugaea*) (Steen et al. 1997, pages 19 to 29). These species may occur within the floodplain of Fortymile Wash, but they are not dependent upon habitat there (TRW 1998b, page 8; TRW 1998c, pages 22 to 23; Steen et al. 1997, pages 19 to 29).

L.3.1.4 Archaeology

Archaeological surveys have been conducted in Fortymile Wash east of Yucca Mountain. Fortymile Wash was an important crossroad where several trails converged from such distant places as Owens Valley, Death Valley, and the Avawtz Mountains.

L.3.2 EXISTING ENVIRONMENT ELSEWHERE IN NEVADA

The following sections describe the environment along each of the five possible rail corridors (Figure L-2) and at the three intermodal transfer station locations (Figure L-3). Table L-1 lists surface-water-related resources along each of the five rail corridors. The corridors are about 0.4 kilometer (0.25 mile) wide, and the length of each corridor varies (Table L-2). Details of each of the corridors and surface-water-related resources are found in TRW (1999b, Appendixes E, F, G, H, and I).

More detail on each of the rail corridors is provided in Chapter 2, Section 2.1.3.3.2, and Chapter 3, Section 3.2.2. Chapter 6, Section 6.3.2, describes the potential impacts of rail implementing alternatives and Chapter 6, Section 6.3.3 describes the potential impacts of the construction and use of intermodal transfer stations under the heavy-haul truck implementing alternatives.

L.3.2.1 Caliente Rail Corridor

Flooding: The Caliente rail corridor crosses 352 washes en route to the Yucca Mountain site (TRW 1999c, pages 3 to 4). Approximately 12 washes along this route are large enough that bridges would be required to cross them. Floodplains associated with these washes have not been defined at this time.

Wetlands: At least four springs or groups of springs and three streams or riparian areas that may have associated wetlands are within 0.4 kilometer (0.25 mile) of the Caliente rail corridor. However, no field

Table L-1. Surface-water-related resources along candidate rail corridors.[a]

Rail corridor	Distance from corridor (kilometers)[b]	Feature
Caliente		
Caliente to Meadow Valley	0.5	Springs – two unnamed springs, in Meadow Valley north of Caliente
	Within	Riparian area/stream – corridor crosses and is adjacent to stream and riparian area in Meadow Valley Wash
Meadow Valley to Sand Spring Valley	1.0	Spring – Bennett Spring, 3.2 kilometers southeast of Bennett Pass
	0.05 - 2.6	Springs – group of five springs (Deadman, Coal, Black Rock, Hamilton, and one unnamed) east of White River
	Within	Riparian/river – corridor parallels (and crosses) the White River for about 25 kilometers. August 1997 survey found river to be mostly underground with ephemeral washes above ground.
	0.8	Spring – McCutchen Spring, north of Worthington Mountains
Sand Spring Valley to Mud Lake	0.02	Spring – Black Spring, south of Warm Springs
Mud Lake to Yucca Mountain	Within - 2.5	Springs – numerous springs and seeps along Amargosa River in Oasis Valley
	Within	Riparian Area – designated area east of Oasis Valley, flowing into Amargosa Valley
	0.3 - 1.3	Springs – group of 13 unnamed springs in Oasis Valley north of Beatty
	Within - 0.3	Riparian area/stream – Amargosa River, with persistent water and extensive wet meadows near springs and seeps
Carlin		
Beowawe to Austin	0.5	Spring – Tub Spring, northeast of Red Mountain
	0.8	Spring – Red Mountain Spring, east of Red Mountain
	0.9	Spring – Summit Spring, west of corridor and south of Red Mountain
	0.4	Spring – Dry Canyon Spring, west of Hot Springs Point
	0.8	Spring – unnamed spring on eastern slope of Toiyabe Range, southwest of Hot Springs Point
	1.0	Riparian area – intermittent riparian area associated with Rosebush Creek, in western Grass Valley, north of Mount Callaghan
	Within	Riparian/creek – corridor crosses Skull Creek, portions of which have been designated riparian areas
	Within	Riparian/creek – corridor crosses intermittent Ox Corral Creek; portions designated as riparian habitat. August, 1997 survey found creek dry with no riparian vegetation present
	0.1	Spring – Rye Patch Spring, at north entrance of Rye Patch Canyon, west of Bates Mountain
	Within	Riparian area – corridor crosses and parallels riparian area in Rye Patch Canyon
	0.7	Spring – Bullrush Spring, east of Rye Patch Canyon
Austin to Mud Lake	0.8	Springs – group of 35 unnamed springs, about 25 kilometers north of Round Mountain on east side of Big Smokey Valley
	0.6	Riparian area – marsh area formed from group of 35 springs
	0.6	Spring – Mustang Spring, south of Seyler Reservoir
	0.3	Riparian/reservoir – Seyler Reservoir, west of Manhattan
Mud Lake to Yucca Mountain		See Caliente corridor
Caliente-Chalk Mountain		
Caliente to Meadow Valley		See Caliente corridor
Meadow Valley to Sand Spring Valley		See Caliente corridor
Sand Spring Valley to Yucca Mountain	1.0	Spring – Reitman's Seep, in eastern Yucca Flat, east of BJ Wye
	0.8	Spring – Cane Spring, on north side of Skull Mountain on Nevada Test Site
Jean		None identified
Valley Modified		None identified

a. Source: TRW (1999b, Appendixes E, F, G, H, and I).
b. To convert kilometers to miles, multiply by 0.62137.

Table L-2. Length of each rail corridor implementing alternative.

Rail corridor	Length
Caliente	513 kilometers (319 miles)
Carlin	520 kilometers (323 miles)
Caliente-Chalk Mountain	345 kilometers (214 miles)
Jean	181 kilometers (112 miles)
Valley Modified	159 kilometers (99 miles)

searches or formal delineations of wetlands have been conducted along this route. Black Spring is near the corridor at the north end of the Kawich Range and an unnamed spring is near the corridor at the north end of the North Pahroc Range. An unnamed spring is 0.3 kilometer (0.2 mile) east of the corridor between Mud Lake and the Yucca Mountain site. A group of springs is in the corridor near the Amargosa River in Oasis Valley. The corridor crosses the Meadow Valley Wash south of Panaca. The corridor also crosses the White River between U.S. Highway 93 and Sand Spring Valley and parallels the river for approximately 26 kilometers (16 miles). That portion of the White River normally is dry. The corridor crosses the Amargosa River in the north end of the Oasis Valley, in an area designated as riparian area by the Bureau of Land Management (TRW 1999b, page 3-23).

Biology: The desert tortoise is the only threatened or endangered species found along the Caliente rail corridor. The southern 50 kilometers (30 miles) of this corridor is within desert tortoise habitat. This area is not designated as critical habitat and the abundance of tortoises in the area is low (TRW 1999b, page 3-23). Three other species (Meadow Valley Wash speckled dace [*Rhinichthys osculus* ssp.], Meadow Valley Wash desert sucker [*Catostomus clarki* ssp.], and Nevada sanddune beardtongue) classified as sensitive by the Bureau of Land Management or as protected by Nevada have been found along the Caliente rail corridor. This rail corridor crosses approximately 14 areas designated as game habitat and one area classified as waterfowl habitat (TRW 1999b, page 3-23). Two of these species, the speckled dace and desert sucker, are restricted to the floodplain of the Meadow Valley Wash. The designated waterfowl habitat also is generally restricted to the floodplain of Meadow Valley Wash and adjacent wetlands.

*Archaeolo*gy: There are 97 archaeological sites that have been recorded along the Caliente route.

L.3.2.2 Carlin Rail Corridor

Flooding: The Carlin rail corridor crosses 273 washes en route to the Yucca Mountain site (TRW 1999c, pages 3 to 4). Approximately 10 washes along this route are large enough that bridges would be required to cross them. Floodplains associated with these washes have not been defined at this time.

Wetlands: There are at least three springs or groups of springs, six streams designated as riparian areas by the Bureau of Land Management, and one reservoir that may have associated wetlands within 0.4 kilometer (0.25 mile) of the Carlin rail corridor. However, no field searches or formal delineations of wetlands have been conducted along this route. Rye Patch Spring is on the edge of the corridor at the south end of the Simpson Park Mountains, an unnamed spring is 0.3 kilometer (0.2 mile) east of the corridor between Mud Lake and Yucca Mountain, and a group of springs is in the corridor near the Amargosa River in Oasis Valley. Seyler Reservoir is 0.16 kilometer (0.1 mile) from the corridor in the south end of Big Smoky Valley. There are five riparian areas (Skull, Steiner, and Ox Corral creeks, and Water and Rye Patch canyons) along the section of the route between Beowawe and Austin at the south end of Grass Valley. Two of these (Steiner and Ox Corral creeks, both at the south end of Grass Valley) are ephemeral and have little or no riparian vegetation where the route crosses them. The corridor crosses the Amargosa River in the northern Oasis Valley, in an area designated as a riparian area by the Bureau of Land Management (TRW 1999b, pages 3-25 to 3-26).

Biology: The desert tortoise is the only threatened or endangered species found along the Carlin rail corridor. The southern 50 kilometers (30 miles) of this corridor is within desert tortoise habitat. This area is not designated as critical habitat and the abundance of tortoises in the area is low (TRW 1999b, page 3-25). Three other species (ferruginous hawk [*Buteo regalis*], San Antonio pocket gopher [*Thomomys umbrinus curtatus*], and Nevada sand dune beardtongue [*Penstemom arenarius*]) classified as sensitive by the Bureau of Land Management or as protected by the State of Nevada have been found along the Carlin rail corridor. Additionally, the rail corridor crosses approximately 11 areas designated as game habitat by the Bureau of Land Management (TRW 1999b, page 3-25). None of these species or game habitats are restricted to floodplains or areas that may have wetlands.

Archaeology: There are 110 archaeological sites that have been recorded along the Carlin route.

L.3.2.3 Caliente-Chalk Mountain Rail Corridor

Flooding: The Caliente-Chalk Mountain rail corridor crosses 281 washes en route to the Yucca Mountain site (TRW 1999c, pages 3 to 4). Approximately five washes along this route are large enough that bridges would be required to cross them. Floodplains associated with these washes have not been defined at this time.

Wetlands: One spring and two streams that may have associated wetlands occur within 0.4 kilometer (0.25 mile) of the Caliente-Chalk Mountain rail corridor. However, no field searches or formal delineations of wetlands have been conducted along this route. An unnamed spring is near the corridor at the north end of the North Pahroc Range. The corridor crosses Meadow Valley Wash south of Panaca. The corridor crosses the White River between U.S. 93 and Sand Spring Valley and parallels the river for approximately 26 kilometers (16 miles). That portion of the White River normally is dry.

Biology: The desert tortoise is the only threatened or endangered species found along the Caliente-Chalk Mountain rail corridor. The southern 40 kilometers (25 miles) of this corridor is within desert tortoise habitat. This area is not designated as critical habitat and the abundance of tortoises in the area is low (TRW 1999b, page 3-27). Six species (Meadow Valley Wash speckled dace, Meadow Valley Wash desert sucker, Ripley's springparsley [*Cymopterus ripleyi* var. *saniculoides*], largeflower suncup [*Camissonia megalantha*], Beatley's scorpionweed [*Phacelia beatleyae*], and long-legged myotis [*Myotis volans*]) classified as sensitive by the Bureau of Land Management or protected by Nevada have been found in the Caliente-Chalk Mountain rail corridor. This rail corridor crosses approximately eight areas designated as game habitat and one area of waterfowl habitat (TRW 1999b, page 3-27). Two of these sensitive species, the speckled dace and desert sucker, are restricted to the floodplain of the Meadow Valley Wash. The designated waterfowl habitat also is generally restricted to the floodplain of Meadow Valley Wash and adjacent wetlands.

Archaeology: There are 100 archaeological sites that have been recorded along the Caliente-Chalk Mountain route.

L.3.2.4 Jean Rail Corridor

Flooding: The Jean rail corridor crosses 89 washes en route to the Yucca Mountain site (TRW 1999c, pages 3 to 4). Approximately five washes along this route are large enough that bridges would be required to cross them. Floodplains associated with these washes have not been defined at this time.

Wetlands: No springs, perennial streams, or riparian areas that may have associated wetlands have been identified within 0.4 kilometer (0.25 mile) of the Jean rail corridor (TRW 1999b, page 3-29). However, no field searches or formal delineations of wetlands have been conducted along this route.

Biology: The desert tortoise is the only threatened or endangered species found along the Jean rail corridor. This entire corridor is within desert tortoise habitat, but does not cross any areas designated as critical habitat. The abundance of desert tortoises is low along most of the rail corridor, although there is a higher abundance along some portions in Ivanpah, Goodsprings, Mesquite, and Pahrump valleys (TRW 1999b, page 3-28). One species, the pinto beardtongue (*Penstemon bicolor* spp.) that is classified as sensitive by the Bureau of Land Management has been found within the corridor. This rail corridor crosses approximately 12 areas designated as game habitat by the Bureau of Land Management (TRW 1999b, page 3-28). None of these species or game habitats are restricted to floodplains or areas that may have wetlands.

Archaeology: Six archaeological sites have been recorded along the Jean rail corridor.

L.3.2.5 Valley-Modified Rail Corridor

Flooding: The Valley-Modified rail corridor crosses 95 washes en route to the Yucca Mountain site (TRW 1999c, pages 3 to 4). Approximately three washes along this route are large enough that bridges would be required to cross them. Floodplains associated with these washes have not been defined at this time.

Wetlands: No springs, perennial streams, or riparian areas that may have associated wetlands have been identified within 0.4 kilometer (0.25 mile) of the Valley-Modified rail corridor (TRW 1999b, pages 3-29 to 3-30). However, no field searches or formal delineations have been conducted along this route.

Biology: The desert tortoise is the only threatened or endangered species found along the Valley-Modified rail corridor. This entire corridor is within desert tortoise habitat, but does not cross any areas designated as critical habitat. The abundance of desert tortoises is low along this rail corridor (TRW 1999b, page 3-29). Two plant species (Parish's scorpionweed [*Phacelia parishii*] and Ripley's springparsley) classified as sensitive by the Bureau of Land Management have been found in the rail corridor. None of these species are restricted to floodplains or areas that may have wetlands. The Valley-Modified rail corridor does not cross any Bureau of Land Management-designated game habitat (TRW 1999b, page 3-29).

Archaeology: Nineteen archaeological sites have been recorded along the Valley-Modified rail corridor.

L.3.2.6 Caliente Intermodal Transfer Station

Flooding: The two proposed sites for the Caliente intermodal transfer station are located in the Meadow Valley Wash south of Caliente. Both areas are outside the inundation boundary of the 100-year floodplain, but within the boundary of the 500-year floodplain.

Wetlands: Part of the proposed station location is moist during at least some portions of the year and may be classified as wetlands. The adjacent perennial stream and riparian habitat along Meadow Valley Wash also might be classified as wetlands, although no formal delineation of wetlands has been conducted for this proposed activity (TRW 1999b, page 3-35).

Biology: No game habitat, threatened or endangered species, or species classified as sensitive by the Bureau of Land Management or protected by Nevada occur within the proposed station location (TRW 1999b, page 3-35).

Archaeology: Four archaeological sites have been recorded at the Caliente intermodal transfer station site.

L.3.2.7 Apex/Dry Lake Intermodal Transfer Station

Flooding: The two proposed sites for the Apex/Dry Lake intermodal transfer station are located outside of the 100-year and 500-year floodplain.

Wetlands: There are no springs or riparian areas within the proposed station location (TRW 1999b, page 3-36).

Biology: The only resident threatened or endangered species at this site is the desert tortoise. The abundance of desert tortoises in Dry Lake Valley generally is low, although some areas there have a higher abundance. One plant species, Geyer's milkvetch (*Astragalus geyeri triquetrus*), classified as sensitive by the Bureau of Land Management has been found in the proposed location. Neither of these species are restricted to floodplains or wetlands. No game habitat has been designated there (TRW 1999b, page 3-36).

Archaeology: Two archaeological sites have been recorded at the Apex/Dry Lake intermodal transfer station site.

L.3.2.8 Sloan/Jean Intermodal Transfer Station

Flooding: The southernmost proposed site for the Jean intermodal transfer station is located in the same general area as a 100-year flood inundation zone. The northern site proposed for the Jean intermodal transfer station is not in an inundation zone and is outside the 500-year floodplain. The northernmost proposed site for the Sloan intermodal transfer station is in an area with no printed Federal Emergency Management Agency map and it is outside the 500-year floodplain.

Wetlands: There are no springs or riparian areas within the proposed station location (TRW 1999b, page 3-36).

Biology: The only resident threatened or endangered species at this site is the desert tortoise. The abundance of desert tortoises in Ivanpah Valley generally is moderate to high, relative to other areas within the range of this species in Nevada. One plant species, pinto beardtongue, classified as sensitive by the Bureau of Land Management has been found in the proposed location. Neither of these species are restricted to floodplains or wetlands. No game habitat has been designated there (TRW 1999b, pages 3-36 to 3-37).

Archaeology: Seven archaeological sites have been recorded at the Sloan/Jean intermodal transfer station site.

L.4 Floodplain/Wetlands 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. For actions taken in wetlands, the assessment should evaluate the effects of the proposed action on the survival, quality, and natural and beneficial values of the wetlands. If DOE finds no practicable alternative to locating activities in floodplains or wetlands, DOE will design or modify its actions to minimize potential harm to or in the floodplains and wetlands. The floodplains that are assessed herein are those areas of normally dry washes that are temporarily and infrequently inundated from runoff during 100-year or 500-year floods.

L.4.1 FLOODPLAIN/WETLANDS EFFECTS NEAR YUCCA MOUNTAIN

DOE has not determined if rail casks will be transported in Nevada by heavy-haul trucks on existing highways or whether to construct a branch rail line to bring the spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site. Near Yucca Mountain, however, it is possible that each of the four washes could be affected if a rail line and a road were to access the Yucca Mountain site from different directions. Because of this uncertainty, this assessment examines the configurations that would cause the most disturbances to the four washes and their floodplains, as follows:

- Potential construction of a heavy-haul-capable road west of Fortymile Wash that crosses Busted Butte Wash, Drillhole Wash, and Midway Valley Wash. Cut, fill, and drainage culverts could be used to cross Busted Butte and Drillhole washes. A bridge could be constructed over Midway Valley Wash. Heavy-haul trucks carrying spent nuclear fuel and high-level radioactive waste could travel along this road to the repository.

- Potential construction of a raised rail line through Fortymile Wash with appropriately-sized drainage culverts. The rail line could join the route for heavy-haul trucks north of Drillhole Wash and cross Midway Valley Wash on a separate rail-bridge before entering the repository. Trains carrying spent nuclear fuel and high-level radioactive waste could travel along the rail line to the repository.

- Potential upgrading of the existing road that crosses Fortymile Wash with appropriately-sized drainage culverts. The road could be used by legal-weight trucks to transport spent nuclear fuel and high-level radioactive waste to the repository, as well as transporting various types of hazardous and non-hazardous materials to and from the repository.

Construction in the washes would reduce the area through which floodwaters naturally flow. During large floods, bodies of water could develop on the upstream side of each of the crossings 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 human activities or facilities upstream or downstream that could be affected. A sufficiently large flood in Fortymile Wash could create a temporary large lake up-stream of the raised rail line and the legal-weight road. The water would slowly drain through culverts. If the flood occurred quickly and was sufficiently large, water would flow over the rail line and roads and continue downstream. Some damage to the rail line and the roads would be expected, but neither structure would 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 human activities or facilities downstream that could be affected.

During and after each flood, a large amount of sediment would accumulate on the up-stream side of each crossing. Periodically, this material would have to be removed so that future floods would have sufficient space to accumulate, rather than overflow the structures 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 the flood water 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; all channels across the entire width of each wash would be filled with water (Figure L-1). Therefore, the manmade crossings would not cause preferential flow in a particular channel or alter the velocity or direction of flow on the floodplains.

Potential construction of a route for heavy-haul trucks or rail line would require the removal of desert vegetation in the washes and the disturbance of soil and alluvium. These actions could adversely impact wildlife habitat and individuals, especially the desert tortoise, which is designated as threatened by the Fish and Wildlife Service. Prior to any construction, a biological survey would be conducted to locate and remove tortoises that are in the path of construction and other mitigation measures would be conducted as identified by the Fish and Wildlife Service during consultations under the Endangered Species Act for this action.

Construction in the floodplains could also affect unidentified cultural resources that may be present. Prior to any construction, archaeologists would survey the area following the procedure in DOE's Programmatic Agreement with the Advisory Council on Historic Preservation (DOE 1988, page 5).

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 significantly 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.

There are no perennial sources of surface water at or downstream from the Yucca Mountain site that would be affected by the use of a route for heavy-haul trucks or the construction of a rail line. Two small well ponds with some riparian vegetation occur in Fortymile Wash downstream of the point where Drillhole Wash enters Fortymile Wash. During a 100- or 500-year flood, both riparian areas would likely be damaged or destroyed by floodwaters regardless of the existence of the crossings.

Neither the quality nor the quantity of groundwater that normally recharges through Fortymile Wash would be substantially affected due to the crossings. Water infiltration could increase somewhat after large floods as standing water slowly enters the ground behind the crossings. 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 at 274 meters (900 feet) below the surface.

The use of petroleum, oil, lubricants, and other hazardous materials during construction 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 enter the ground would not affect the groundwater, which is 274 meters (900 feet) below the surface.

The nearest population center is about 19 kilometers (12 miles) to the south, along U.S. 95 at Lathrop Wells a few 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 use of a route for heavy-haul trucks or construction of a rail line compared to natural conditions. Hence, disturbances to the floodplains of Fortymile Wash, Busted Butte Wash, Drillhole Wash, or Midway Valley Wash would have no adverse impacts on lives and property downstream. Moreover, impacts to these floodplains would be insignificant in both the short- and long-term compared to the erosion and deposition that occur naturally and erratically in these desert washes and floodplains.

During operation of the repository it would be extremely unlikely that a truck carrying spent nuclear fuel and high-level radioactive waste would fall into Busted Butte, Drillhole, or Midway Valley washes or that a train would derail in Fortymile Wash. However, even if this occurred, the shipping casks, which are designed to prevent the release of radioactive materials during an accident, would remain intact. The casks would then be recovered and transported to the repository. No adverse impacts to surface water or groundwater quality from such accidents would occur.

Hazardous materials needed during construction and operation of the repository would be transported along the legal-weight access road. If these materials were released during an accident, they would be cleaned-up quickly and the affected soil and alluvium would be remediated. No adverse impacts to groundwater quality from such accidents would occur because cleanup could be completed before contaminants reached the groundwater [the groundwater table is 274 meters (900 feet) below the surface].

There are no positive or beneficial impacts to the floodplains of Busted Butte, Drillhole, Midway Valley, or Fortymile washes that have been identified from the proposed action.

L.4.2 FLOODPLAIN/WETLANDS EFFECTS ELSEWHERE IN NEVADA

L.4.2.1 Effects along Rail Corridors

Potential rail routes would cross many small, and some large, washes. In general, the impacts caused by rail construction in any of these washes and their floodplains would be similar in magnitude to those described for Fortymile, Busted Butte, Drillhole, and Midway Valley washes. Regardless of the route selected, standard mitigation practices used throughout Nevada for highway construction would be used to minimize the impacts to floodplains. Most washes and their floodplains along the five potential rail corridors are in remote areas. Impacts to these floodplains from rail construction and operation would be insignificant in both the short- and long-term compared to erosion and deposition that occurs naturally and erratically in these desert washes and floodplains.

Based on current information, springs and riparian areas that may have associated wetlands occur within three of the rail corridors (Caliente, Carlin, and Caliente-Chalk Mountain). If the rail mode of spent nuclear fuel and high-level radioactive waste transport is selected by DOE, wetlands delineations along the selected route would be conducted and the effects would be described in a more detailed floodplain/wetlands assessment for public review.

L.4.2.2 Effects at Intermodal Transfer Stations

Neither the Dry Lake intermodal transfer station nor the Sloan/Jean intermodal transfer station would have any impacts on floodplains because these station locations are not in a floodplain. The Caliente intermodal transfer station, however, is located in Meadow Valley Wash, separated by the Union Pacific Railroad. If this site were selected, DOE would conduct a more detailed floodplain/wetlands assessment for public review to address the floodplain/wetlands effects at the Caliente intermodal transfer station location. The more detailed floodplain/wetlands assessment would also include potential upgrades to existing roads for heavy-haul use.

L.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. Whenever possible, DOE would avoid disturbing wetlands and floodplains and would minimize impacts to the extent practicable, if avoidance was not possible. This section discusses the floodplain mitigation measures that would be considered in the vicinity of Yucca Mountain and elsewhere in Nevada and, where necessary and feasible, implemented during construction and maintenance in the washes.

Adverse impacts to the affected floodplains 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 the use of a

route for heavy-haul trucks or construction of a rail line near Yucca Mountain would be measurably different compared to existing conditions. Nevertheless, DOE would follow their reclamation guidelines (DOE 1995, pages 2-1 to 2-14) for site clearance, topsoil salvage, erosion and runoff control, recontouring, revegetation, siting of roads, construction practices, and site 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 potential construction could begin, DOE would require pre-construction surveys to make sure that the work would not impact important biological or archaeological resources. In addition, the site's reclamation potential would be determined during these surveys. In the event that construction could threaten important biological or archaeological resources, and modification or relocation of the roads and rail line is not reasonable, mitigation measures would be developed. Mitigation measures developed during the pre-construction surveys would be incorporated into the design of the work. These measures could include relocation of sensitive species, avoidance of archaeological sites, or data recovery if avoidance is not feasible.

If hazardous materials are spilled during construction of the crossings or during transport to the repository, 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.

L.6 Alternatives

According to 1022.12(a)(3), DOE must consider alternatives to the proposed action. Alternative ways to access the Yucca Mountain site are considered in the following paragraphs, along with the no action alternative.

L.6.1 ALTERNATIVES NEAR YUCCA MOUNTAIN

To operate a potential repository at Yucca Mountain, heavy-haul-capable and legal-weight roads and a rail line to the facility would be considered so the spent nuclear fuel and high-level radioactive waste could be unloaded and emplaced underground. It is unreasonable to consider a railroad or heavy-haul-capable and legal-weight roads that access the repository directly from the west over Yucca Mountain because of engineering constraints, environmental damage, and cost associated with construction in such rugged terrain. Because of these concerns, this alternative was eliminated from detailed consideration.

Access to Yucca Mountain from the east side requires that Fortymile Wash be crossed. Alternative sites for these crossings were considered, but the impacts at any alternative site would be virtually identical to the proposed site. Moreover, the proposed sites provide the most direct routes to the repository and would cost less to build and/or upgrade than alternative sites that cross Fortymile Wash at wider locations.

L.6.2 ALTERNATIVE RAIL CORRIDORS AND ALTERNATIVE SITES FOR AN INTERMODAL TRANSFER STATION

Five potential rail corridors were identified by DOE through a winnowing process that considered a host of environmental constraints (see Chapter 2, Section 2.3.3). Other possible rail corridors in Nevada were examined but rejected because of such things as land use, private land, and engineering constraints. Identification of the three intermodal transfer station locations was limited to reasonable sites next to an existing rail line in Nevada. Other sites were considered by DOE, but rejected because of ownership and environmental concerns.

L.6.3 NO-ACTION ALTERNATIVE

Selection of the No-Action Alternative would avoid impacts to floodplains and wetlands. If Yucca Mountain was selected as a site to construct a repository, transport of spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site would be required. In that case there would be no other practicable alternative to taking action in floodplains and wetlands because there would be no way to transport spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site during repository operation without passing through some wetlands areas and floodplains.

L.7 Conclusions

DOE prepared this assessment in compliance with 10 CFR Part 1022. The assessment evaluates the effects to the floodplains near Yucca Mountain (Fortymile Wash, Busted Butte Wash, Drillhole Wash, and Midway Valley Wash) and generically to floodplains and wetlands elsewhere in Nevada from construction of a rail line or an intermodal transfer station and associated upgrades to existing highways for heavy-haul trucks.

Near Yucca Mountain, the closest man-made structure within Fortymile Wash is U.S. 95 more than 19 kilometers (12 miles) south of the confluence of Drillhole and Fortymile washes. Lathrop Wells, the nearest population center to Yucca Mountain, is also about 19 kilometers to the south along U.S. 95 and two miles east of Fortymile Wash. Construction- and operations-related impacts to the 100-year and 500-year floodplains of Fortymile Wash, Busted Butte Wash, Drillhole Wash, and Midway Valley Wash would be small. None of these impacts would 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. There are no positive or beneficial impacts to the floodplains of Busted Butte, Drillhole, Midway Valley, or Fortymile washes from the proposed actions that have been identified.

Elsewhere in Nevada, effects to floodplains and wetlands would probably be small, although a detailed floodplain/wetlands assessment would be conducted by DOE when more information is available upon selection of a rail corridor or route for heavy-haul trucks.

REFERENCES

Blanton 1992 — Blanton, J. O., III, 1992, *Nevada Test Site Flood Inundation Study: Part of a Geological Survey Flood Potential and Debris Hazard Study, Yucca Mountain Site for the U.S. Department of Energy (Office of Civilian Radioactive Waste Management),* Bureau of Reclamation, U.S. Department of the Interior, Denver, Colorado. [230563]

DOE 1988 — DOE (U.S. Department of Energy), 1988, *Programmatic Agreement Between the United States Department of Energy and the Advisory Council on Historic Preservation for the Nuclear Waste Deep Geologic Repository Program, Yucca Mountain, Nevada,* Yucca Mountain Site Characterization Office, Nevada Operations Office, North Las Vegas, Nevada. [HQX.19890426.0057]

DOE 1991 — DOE (U.S. Department of Energy), 1991, *Floodplain Assessment of Surface-Based Investigations at the Yucca Mountain Site, Nye County, Nevada,* YMP/91-11, Yucca Mountain Site Characterization Office, Las Vegas, Nevada. [MOL.19990607.0238]

DOE 1992	DOE (U.S. Department of Energy), 1992, *Floodplain Assessment of Site Characterization Activities at the Yucca Mountain Site, Nye County, Nevada,* YMP/92-30, Yucca Mountain Site Characterization Project Office, Las Vegas, Nevada. [NNA.19921028.0084]
DOE 1995	DOE (U.S. Department of Energy), 1995, *Reclamation Implementation Plan,* YMP/91-14, Revision 1, Las Vegas, Nevada. [MOL.19960222.0218]
DOE 1998a	DOE (U.S. Department of Energy), 1998a, "Potential Rail Alignments," map, YMP-98-104.0, Office of Civilian Radioactive Waste Management, Yucca Mountain Project Office, Las Vegas, Nevada. [MOL.19990526.0034]
DOE 1998b	DOE (U.S. Department of Energy), 1998b, "Nevada Routes for Heavy-Haul Truck Shipments of SNF and HLW to Yucca Mountain," map, YMP 97-263.9, Office of Civilian Radioactive Waste Management, Yucca Mountain Project Office, Las Vegas, Nevada. [MOL.19990526.0035]
FWS 1995	FWS (Fish and Wildlife Service), 1995, *Death Valley Nevada 1:250,000-scale Wetland Map of National Wetlands Inventory,* U.S. Department of the Interior, St. Petersburg, Florida. [244053]
Hansen et al. 1997	Hansen, D. J., P. D. Greger, C. A. Wills, and W. K. Ostler, 1997, *Nevada Test Site Wetlands Assessment,* DOE/NV/11718-124, Ecological Services, Bechtel Nevada Corporation, Las Vegas, Nevada. [242338]
Rautenstrauch, Brown, and Goodwin 1994	Rautenstrauch, K. R., G. A. Brown, and R. G. Goodwin, 1994, *The Northern Boundary of the Desert Tortoise Range on the Nevada Test Site,* Report 11265-1103, EG&G Energy Measurements, Inc., Las Vegas, Nevada. [240498]
Squires and Young 1984	Squires, R. R., and R. L. Young, 1984, *Flood Potential of Fortymile Wash and Its Principal Southwestern Tributaries, Nevada Test Site, Southern, Nevada,* WRI-834001, U.S. Geological Survey, U.S. Department of the Interior, Carson City, Nevada. [203214]
Steen et al. 1997	Steen, D. C., D. B. Hall, P. D. Greger, and C. A. Wills, 1997, *Distribution of the Chuckwalla, Western Burrowing Owl, and Six Bat Species on the Nevada Test Site,* DOE/NV/11718-149, Bechtel Nevada Corporation, Las Vegas, Nevada. [242253]
TRW 1997	TRW (TRW Environmental Safety Systems Inc.), 1997, *The Distribution and Relative Abundance of Desert Tortoises at Yucca Mountain,* B00000000-01717-5705-00033, Las Vegas, Nevada. [MOL.19980123.0643]
TRW 1998a	TRW (TRW Environmental Safety Systems Inc.), 1998a, *Classification and Map of Vegetation at Yucca and Little Skull Mountains,* B00000000-01717-5705-00083, Revision 00B, Las Vegas, Nevada. [MOL.19990211.0519]

TRW 1998b	TRW (TRW Environmental Safety Systems Inc.), 1998b, *Bats of Yucca Mountain, Nevada*, B00000000-01717-5705-00050, Revision 02, Las Vegas, Nevada. [MOL.19981014.0308]
TRW 1998c	TRW (TRW Environmental Safety Systems Inc.), 1998c, *Species Composition and Abundance of Reptile Populations in Selected Habitats at Yucca Mountain, Nevada, with Annotated Checklist*, B00000000-01717-5705-00038, Revision 00, Las Vegas, Nevada. [MOL.199812014.0305]
TRW 1999a	TRW (TRW Environmental Safety Systems Inc.), 1999a, *Environmental Baseline File for Soils*, B00000000-01717-5700-00007, Revision 00, Las Vegas, Nevada. [MOL.19990302.0180]
TRW 1999b	TRW (TRW Environmental Safety Systems Inc.), 1999b, *Environmental Baseline File for Biological Resources*, B00000000-01717-5700-00009, Revision 00, Las Vegas, Nevada. [MOL.19990302.0181; MOL.19990330.0560, map attachments)
TRW 1999c	TRW (TRW Environmental Safety Systems Inc.), 1999c, *Nevada Transportation Engineering File*, Las Vegas, Nevada. [MOL.19990324.0257]
USGS 1983	USGS (U.S. Geological Survey), 1983, *Busted Butte Quadrangle, Nevada-Nye County, 7.5-Minute Series Topographic Map*, U.S. Department of the Interior, Denver, Colorado. [101711]