Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada – Nevada Rail Transportation Corridor

DOE/EIS-0250F-S2

and

Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada

DOE/EIS-0369

Volume II

Rail Alignment EIS - Chapter 3

U.S. Department of Energy
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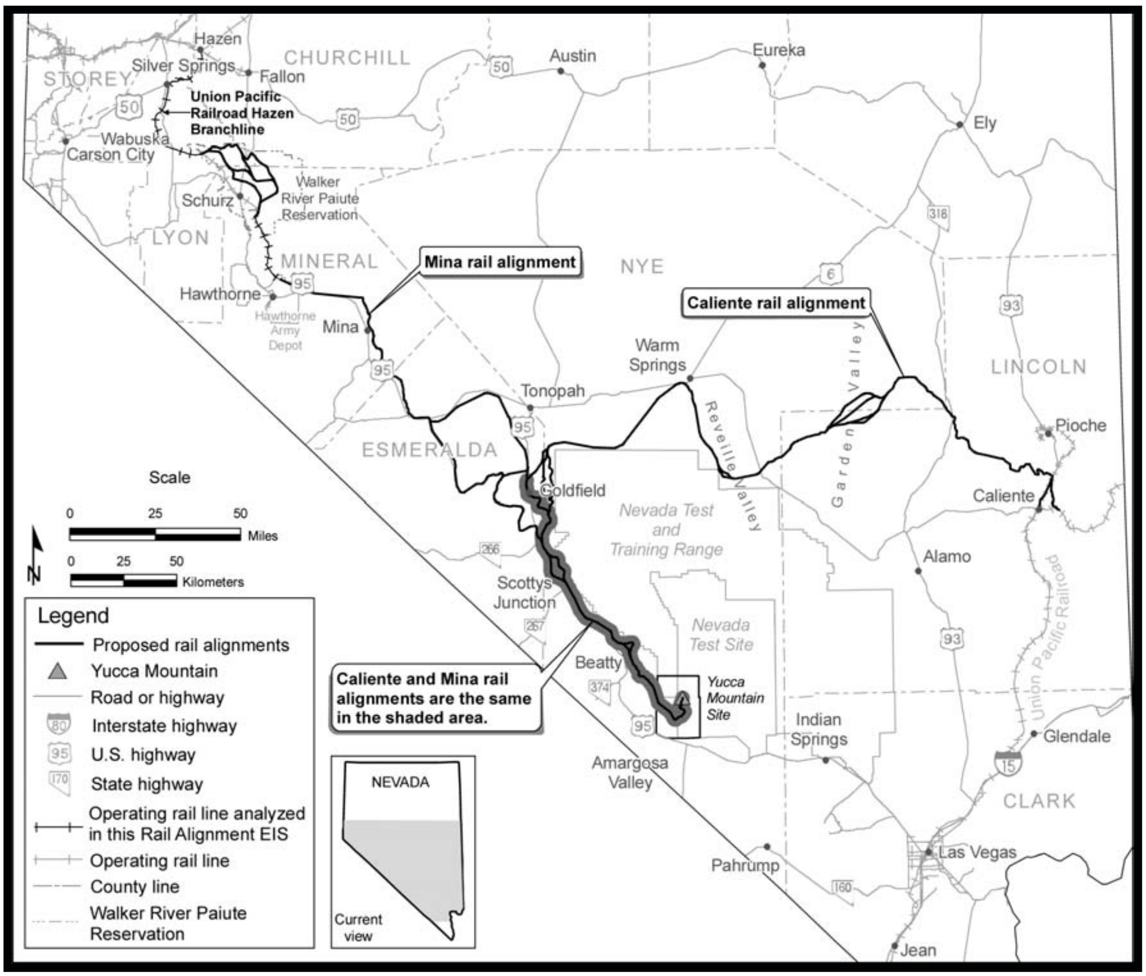
3. AFFECTED ENVIRONMENT

This chapter describes the environmental setting and existing conditions in the areas encompassing Caliente rail alignment and Mina rail alignment alternative segments and common segments; it provides a baseline for use in evaluating the potential project-related environmental impacts of constructing and operating the proposed railroad. Section 3.2 describes the affected environment along the Caliente rail alignment; Section 3.3 describes the affected environment along the Mina rail alignment; and Section 3.4 describes American Indian interests in the affected environment.

Glossary terms shown in ***bold italics***.



3.1 Introduction

The U.S. Department of Energy (DOE or the Department) has compiled extensive information about the environmental resources that could be affected if the Department constructed and operated the proposed ***railroad*** along a ***rail alignment*** within either the Caliente ***rail corridor*** or the Mina rail corridor. DOE used this information to establish the baseline against which it assessed potential ***impacts*** under the ***Proposed Action*** and ***Shared-Use Option*** (see Chapter 4, Environmental Impacts).

DOE obtained baseline environmental information from many sources, including DOE-sponsored reports and studies, other federal agencies (for example, the Bureau of Land Management), the State of Nevada, and local governments.

Descriptions of the ***affected environments*** along the Caliente rail alignment and the Mina rail alignment focus on environmental resources within and adjacent to the ***alternative segments*** and ***common segments***, and the proposed locations of railroad ***construction and operations support facilities*** outside the ***nominal*** width of the rail line ***construction right-of-way***.

This chapter describes the environmental setting and existing conditions for the following resource areas:

- Physical setting (physiography, geology, and soils)
- Land use (grazing, mineral and energy resources, recreation and land access, utility and transportation corridors) and ownership (private and ***public lands***)
- Aesthetic (visual) resources
- ***Air quality*** and climate
- Surface-water resources (streams and ***washes***, ***waters of the United States***, ***wetlands***, ***floodplains***)
- Groundwater resources (***hydrographic areas***, wells, springs)
- Biological resources (vegetation, wildlife, special status species, Nevada game species, wild horses and burros)
- Noise and vibration
- Socioeconomics (employment and income, population and housing, public services, and transportation)
- Occupational and public health and safety (nonradiological and radiological)
- Utilities, energy, and materials (public suppliers of water, ***wastewater treatment***, and electricity; fossil fuels; construction materials)
- Hazardous materials and waste (use of materials and generation of wastes)
- Cultural resources (archaeological, historical, cultural)
- Paleontological resources (***fossils***)
- ***Environmental justice***

Proposed Action: To determine a rail alignment within a rail corridor in which to construct and operate a railroad to transport spent nuclear fuel, high-level radioactive waste, and other materials from an existing railroad in Nevada to a repository at Yucca Mountain, Nye County, Nevada. The Proposed Action includes the construction of railroad construction and operations support facilities.

This Rail Alignment EIS analyzes two alternatives that would implement the Proposed Action: the Caliente rail alignment and the Mina rail alignment.

This Rail Alignment EIS also analyzes a Shared-Use Option for each implementing alternative, under which DOE would allow commercial shippers to use the rail line for transportation of general freight.

Rail corridor: A strip of land 400 meters (0.25 mile) wide through which DOE would identify an alignment for the construction of a rail line in Nevada to a geologic repository at Yucca Mountain.

Rail alignment: An engineered refinement of a rail corridor in which DOE would identify the location of a rail line. A rail alignment is comprised of common segments and alternative segments.

Construction right-of-way: Nominally, 150 meters (500 feet) on either side of the centerline of the rail alignment (a nominal width of 300 meters [1,000 feet]). In some locations along the rail alignment, the nominal width of the construction right-of-way would be greater (for example, to accommodate certain deep cuts and fills and construction of drainage structures) or less (for example, to avoid sensitive environmental resources). The rail line construction right-of-way is generally linear, but also includes specific locations of construction and operations support facilities (such as quarries, some water wells, and access roads) outside the linear construction right-of-way.

3.2 Caliente Rail Alignment

> The **region of influence** is the physical area that bounds the environmental, sociologic, economic, or cultural features of interest for analysis purposes.

This section describes the affected environment along the Caliente rail alignment. The scope of the affected environment reflects the ***region of influence*** for each resource area. DOE expects that most potential impacts would occur within a certain distance from the centerline of the rail alignment and within the ***footprints*** of construction and operations support facilities. However, resource area regions of influence vary, depending on the nature and type of the resource. Each environmental resource section fully describes the region of influence for the resource. Table 3-1 summarizes the regions of influence for the Caliente rail alignment analyzed in this Rail Alignment Environmental Impact Statement (EIS).

Table 3-1. Regions of influence for environmental resource areas – Caliente rail alignment (page 1 of 4).

Resource area	Region(s) of influence
Physical setting	All areas that would be directly or indirectly affected by construction and operation of the proposed railroad. These areas include the nominal width of the rail line construction right-of-way, and the footprints of construction and operations support facilities outside the nominal width of the construction right-of-way. See Section 3.2.1.1.
Land use and ownership	The nominal width of the construction right-of-way, including all private land (including patented mining claims), American Indian lands, and public land fully or partially within this area. Also includes the locations of construction and operations support facilities outside the nominal width of the construction right-of-way. See Section 3.2.2.1.
Aesthetic resources	The ***viewshed*** around all alternative segments, common segments, and proposed locations of construction and operations support facilities. DOE used a conservative region of influence extending 40 kilometers (25 miles) on either side of the centerline of the rail alignment. See Section 3.2.3.1.
Air quality and climate	The air basins bounded by Lincoln, Nye, and Esmeralda Counties. See Section 3.2.4.1.
Surface-water resources	The nominal width of the construction right-of-way for most of the analysis. In cases where surface-water flow patterns (including floodwaters) could be modified or surface-water drainage patterns could carry eroded soil, sedimentation, or spills downstream, the region of influence extends to 1.6 kilometers (1 mile) on either side of the centerline of the rail alignment. See Section 3.2.5.1.
Groundwater resources	***Aquifers*** that would underlie areas of proposed railroad construction and operations, portions of groundwater aquifers DOE would use to obtain water for construction and operations support and that would be affected by these groundwater withdrawals, and nearby springs that might be affected by such groundwater withdrawals. The horizontal extent of the region of influence varies depending on the particular aspects of the specific project activity. See Section 3.2.6.1.

Table 3-1. Regions of influence for environmental resource areas – Caliente rail alignment (page 2 of 4).

Resource area	Region(s) of influence
Biological resources	DOE used two areas of assessment to describe the affected environment for biological resources: a region of influence and a study area. *Region of influence*: Generally, the nominal width of the construction right-of-way. For facilities that would be outside the nominal width of the construction right-of-way (such as quarries), the footprint of the proposed facility. *Study area*: A 16-kilometer (10-mile)-wide area, extending 8 kilometers (5 miles) on either side of the centerline of the rail alignment, for use in database and literature searches to ensure the identification of sensitive ***habitat*** areas near the Caliente rail alignment and transient or migratory wildlife, particularly special status species, that could pass through the region of influence. See Section 3.2.7.1.
Noise and vibration	The nominal width of the construction right-of-way out to variable distances, depending on several analytical factors (***ambient noise*** level, train speed, number of trains per day, and number of railcars). For construction and operations support facilities, the region of influence varies depending on the magnitude of noise those facilities would generate and ambient noise levels, which would affect how far away the noise might be heard. Therefore, the region of influence varies along the rail alignment. Also includes the locations of receptors that might be affected by noise, vibration, or both. See Section 3.2.8.1.
Socioeconomics	*Employment and income, population and housing, and public services:* Lincoln, Nye, Esmeralda, and Clark Counties in Nevada. *Transportation resources:* Public roadways near the Caliente rail alignment and the alignment itself. See Section 3.2.9.1.
Occupational and public health and safety	*Nonradiological region of influence* The region of influence for public nonradiological impacts includes: • The nominal width of the construction right-of-way • Public roads in Lincoln, Nye, and Esmeralda Counties that the workforce would use during railroad construction and operations • Railroad construction and operations support facilities including access roads, water wells, and quarries where workers would perform construction, operations, or maintenance activities *Radiological region of influence* The region of influence for radiological impacts for incident-free transportation includes the area 0.8 kilometer (0.5 mile) on either side of the centerline of the rail alignment. The region of influence for occupational radiological impacts for incident-free operation also includes the physical boundaries of railroad operations support facilities, where workers would perform operations involving ***casks*** and ***cask cars***. Railroad operations support facilities within the radiological region of influence include only the ***Interchange Yard***, the ***Staging Yard***, the ***Rail Equipment Maintenance Facility***, and the ***Cask Maintenance Facility*** because DOE anticipates that ***radioactive*** materials would be managed only at those facilities.

Table 3-1. Regions of influence for environmental resource areas – Caliente rail alignment (page 3 of 4).

Resource area	Region(s) of influence
Occupational and public health and safety (continued)	The region of influence for public radiological impacts includes: • The population within the region of influence of the Caliente rail alignment, including people who live within 0.8 kilometer (0.5 mile) of either side of the centerline of the rail alignment. For the public radiological impacts analysis, DOE evaluated four specific alignments: the alignment that would have the highest population; the shortest alignment; the longest alignment; and the alignment that would have the lowest population. • Individuals at locations such as residences or businesses near the rail alignment. • Individuals within the region of influence for radiological impacts for potential public exposure related to accidents and sabotage. This includes the area 80 kilometers (50 miles) on either side of the centerline of the rail line. See Section 3.2.10.1.
Utilities, energy, and materials	*Regions of influence for utilities and energy* • Public water systems: Systems in Lincoln, Nye, and Esmeralda Counties and communities within those counties. • Wastewater treatment: For wastewater transported offsite for treatment and disposal, the existing permitted treatment facilities in Lincoln, Nye, and Esmeralda Counties and communities within those counties. (Note: For wastewater treated using other methods [for example, on-site portable wastewater-treatment facilities], DOE would recycle treated wastewater, and there is no associated region of influence.) • Telecommunications: For telephone and fiber-optic telecommunications, the southern Nevada region serviced by Nevada Bell Telephone Company (AT&T Nevada), Citizens Telecommunications Company of Nevada, and Lincoln County Telephone System, Inc. • Electricity: Areas serviced by the southern Nevada electrical grid operated by Caliente Public Utilities, Lincoln County Power District No. 1, Nevada Power Company, Sierra Pacific Power Company, and Valley Electric Association, Inc. • Fossil fuels: Regional suppliers within the State of Nevada that could most economically supply the project. *Regions of influence for materials* • The region of influence for cast-in-place concrete and ***subballast*** is limited to the State of Nevada. Subballast, sand, and gravel would be generated from ***overburden*** at quarries and ***borrow sites*** near the rail alignment. There is a high likelihood DOE would also find subballast, sand, and gravel along ***cuts*** for the proposed rail line on ***alluvial fans***. DOE would use some of the natural sand and gravel excavated from cuts and crushed rock from the quarries to make concrete aggregate.

Table 3-1. Regions of influence for environmental resource areas – Caliente rail alignment (page 4 of 4).

Resource area	Region(s) of influence
Utilities, energy, and materials (continued)	*Regions of influence for materials* (continued) • DOE would obtain ballast rock from potential quarry sites close to the construction right-of-way during the construction phase and from commercial quarry sites in southern Utah and in California during the operations phase. Therefore, the region of influence for obtaining ballast rock would encompass the State of Nevada during the construction phase, and Utah and California during the operations phase. • Other materials, including steel, steel rail, general building materials, concrete ties, and other precast concrete could be procured and shipped from various national suppliers. Therefore, the region of influence for these materials is national. See Section 3.2.11.1.
Hazardous materials and waste	*Use of hazardous materials and the generation of hazardous and nonhazardous wastes*: The nominal width of the construction right-of-way, and the locations of construction and operations support facilities outside that area. *Disposal of low-level radioactive waste:* DOE low-level waste disposal sites, sites in ***Agreement States***, and U.S. Nuclear Regulatory Commission-licensed sites. *Disposal of hazardous wastes*: The entire continental United States. *Disposal of nonhazardous waste*: Disposal facilities in Lincoln, Nye, Esmeralda, and Clark Counties in Nevada. See Section 3.2.12.1.
Cultural resources	Two levels of coverage, based on distance from the rail alignment: Level I. The first level of coverage is within the nominal width of the rail line construction right-of-way, the area where ground disturbance could directly or indirectly impact cultural resources. Level II. The second level of coverage is a 3.2-kilometer (2-mile)-wide area centered on the rail alignment. This area includes potential disturbances that could indirectly impact cultural resources. See Section 3.2.13.1.
Paleontological resources	The nominal width of the rail line construction right-of-way, and the footprints of railroad construction and operations support facilities. See Section 3.2.14.1.
Environmental justice	An area encompassing the regions of influence for all other resource areas. Includes populations that could be affected by the project that have cultural or religious ties to the area. See Section 3.2.15.1.

3.2.1 PHYSICAL SETTING

This section describes physiography, geology, and soils along the Caliente rail alignment. Characterization of the physical setting also identifies relationships to other resource areas described in this Rail Alignment EIS, such as aesthetics, land use, biological (vegetation) resources, and surface-water resources.

Section 3.2.1.1 describes the region of influence for physical setting along the Caliente rail alignment; Section 3.2.1.2 describes the general physical setting and characteristics in the region of influence; and Section 3.2.1.3 describes the physical setting in more detail for the Caliente rail alignment alternative segments and common segments.

3.2.1.1 Region of Influence

The region of influence for physical setting along the Caliente rail alignment includes all areas that would be directly or indirectly affected by construction and operation of the proposed railroad. These areas include the nominal width of the ***rail line*** construction right-of-way, and the footprints of facilities outside the nominal width of the construction right-of-way.

3.2.1.2 General Setting and Characteristics

3.2.1.2.1 Physiography

The Caliente rail alignment would cross the Basin and Range Physiographic Province, which is characterized in this area by north-trending, linear mountain ranges separated by broad sediment-filled valleys. Most of the Caliente rail alignment would cross the southern Great Basin, a subdivision of the Basin and Range Province. The mountain ranges are mostly tilted, ***fault***-bounded crustal blocks as much as 80 kilometers (50 miles) long and 24 kilometers (15 miles) wide. Mountain ranges typically rise from 300 to 1,500 meters (980 to 4,900 feet) above the adjacent valley floors and occupy 40 to 50 percent of the total land area. As shown in Figure 3-1, from northeast to southwest, a rail line along the Caliente rail alignment would use gaps, passes, and valleys to cross or travel near the following mountain ranges: Cedar Range, Highland Range, Chief Range, North Pahroc Range, Seaman Range, Golden Gate Range, Quinn Canyon Range, Reveille Range, Kawich Range, Hot Creek Range, and Goldfield Hills.

From east to west, the rail line would cross lowlands in Meadow Valley Wash, Dry Lake Valley, White River Valley, Coal Valley, Garden Valley, Sand Spring Valley, Railroad Valley, Reveille Valley, Stone Cabin Valley, Cactus Flat, Ralston Valley, Mud Lake, Stonewall Flat, Lida Valley, Sarcobatus Flat, Oasis Valley, Crater Flat, and Jackass Flats (Figure 3-1). All lowlands, with the exception of Meadow Valley Wash, Oasis Valley, Crater Flat, and Jackass Flats, have interior drainage to ***playas*** or dry washes and are therefore closed basins. Section 3.2.5 describes surface-water resources in the Caliente rail alignment region of influence. Sediment in the valleys are composed of coarse to fine alluvial debris (boulders, cobbles, sand, silt, and clay) eroded from the adjacent mountains. Large alluvial fans, a common landform in the region, begin from the base of the mountains, and sometimes extend far into the valleys.

> **Alluvial fan:** A low, outspread, relatively flat-to-gently sloping mass of loose rock material, shaped like an open fan or a segment of a cone, deposited by a stream where it issues from a narrow mountain valley on a plain or break valley.
>
> **Playas:** A nearly level area at the bottom of a desert basin that does not drain to a river and is temporarily covered with water from heavy rains or snowmelts. Normally a dry lakebed that may contain water in response to seasonally high runoff.

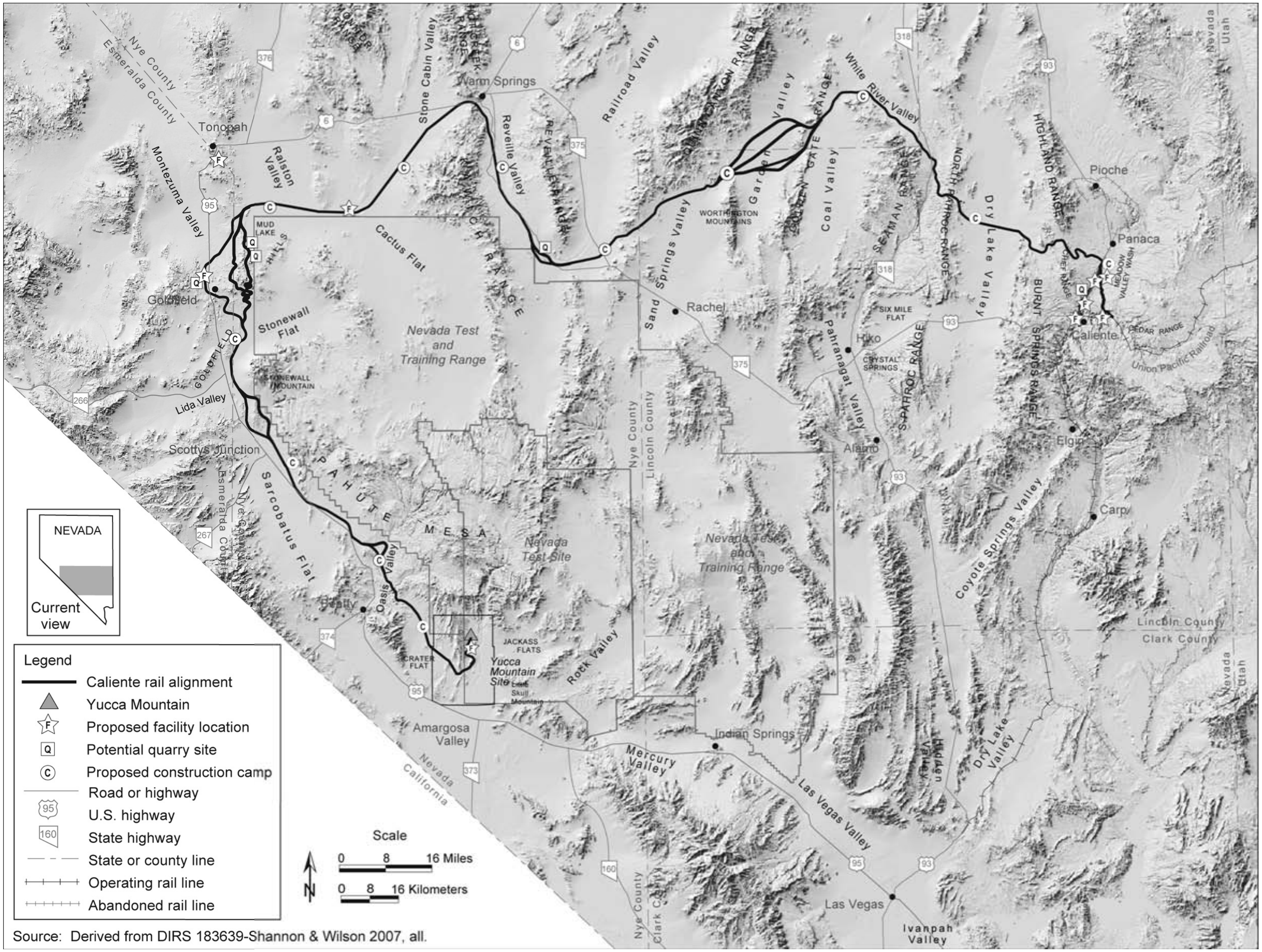


Figure 3-1. Physiographic setting along the Caliente rail alignment.

Playas occur in the lowest parts of some valleys. After heavy rains or snowmelt, the lowlands can fill with water. Evaporation of this water over days or weeks leaves a variety of salts near the surface that limit the growth of vegetation. These valleys are sometimes referred to as closed basins, because no surface water flows out of them.

Elevations along the Caliente rail alignment range from about 980 meters (3,200 feet) above mean sea level at the base of Busted Butte on the west side of Jackass Flats to about 1,900 meters (6,200 feet) above mean sea level at Warm Springs Summit in the Kawich Range (DIRS 182854-Shannon & Wilson 2006, Figure 3, Sheets 36, 70, and 71).

3.2.1.2.2 Geology

This section summarizes regional geology along the Caliente rail alignment. The geotechnical report to support the preliminary design effort (DIRS 183639-Shannon & Wilson 2007, all and 182854-Shannon & Wilson 2006, all) provides a more detailed discussion of regional geology.

The Caliente rail alignment would cross a region of complex stratigraphic and structural elements that includes major north-south trending basins and ranges and broad volcanic uplands. Table 3-2 provides a generalized stratigraphic description and lists rock sequences according to the geologic age during which they were deposited, and their locations from east to west along the Caliente rail alignment. Table 3-2 also defines the geologic periods discussed in the geology sections of this Rail Alignment EIS.

In general, the age and ***lithology*** of rocks exposed to the east and west of the South Reveille Range are quite different. To the east, Tertiary ***volcanic rocks*** and Paleozoic ***sedimentary rocks***, largely of marine origin, are the principal rocks exposed; to the west, Tertiary volcanic rocks are the principal rocks exposed. The Tertiary volcanic rocks in the western area overlie Paleozoic sedimentary rocks, but these sedimentary rocks are compositionally different from the Paleozoic rocks in the eastern area. The Tertiary volcanic rocks, in turn, are covered in many areas by a variety of late Tertiary and Quaternary alluvial deposits.

Soils in the valleys were primarily formed from late Tertiary and Quaternary and some Paleozoic debris eroded from neighboring mountains, wind-blown sand and silt, fine-grained lake deposits, evaporite deposits, marsh and playa sediments, and spring-carbonate deposits. In some areas, alluvial fans are thin and overlie bedrock surfaces. Elsewhere, basin-fill sediments are more than 1,200 meters (4,000 feet) thick (DIRS 183639-Shannon & Wilson 2007, p. 11).

Volcanic rocks are rocks that have been ejected at or near the earth's surface. Tuffs, lava flows, volcanic breccias, basalt, andesite, and rhyolite are types of volcanic rocks that are found in the Great Basin. They are differentiated by chemistry and texture.

Sedimentary rocks are rocks formed by the accumulation of sediment in water or land. Sandstone, chert, limestone, dolomite, shale, siltstone, and mudstone are types of sedimentary rocks that are found in the Great Basin. They are differentiated by chemistry, deposition, and grain size.

Metamorphic rocks are rocks in which the original mineralogy, texture, or composition has changed due to the effects of pressure, temperature, or the gain or loss of chemical components.

The oldest ***outcrops*** in the region are Precambrian Era ***metamorphic rocks***, which are exposed in hills west of Goldfield alternative segment 4 and west of common segment 6. Other than these two exposures, Precambrian rocks are covered by younger rocks.

During the late Paleozoic Era, the area was periodically covered by shallow seas to the east that generally deepened westward. Thick layers of limestone, shale, and sandstone, now exposed widely in the mountains along Caliente common segment 1, are the remains of these Paleozoic seas. By early

Table 3-2. General stratigraphy – Caliente rail alignment.[a]

Geologic period[b]	Eastern portion of the Caliente rail alignment[c]	Central portion of the Caliente rail alignment[d]	Western portion of the Caliente rail alignment[e]	Southern portion of the Caliente rail alignment (southwest Nevada volcanic field)[f]
Cenozoic Era[g] (less than 65 Ma)- Quaternary Period (less than 1.6 Ma)	Stream channel, floodplain, and valley floor alluvium; wind-blown, playa, and landslide deposits; fan alluvium; terrace, marsh, spring, and lake beach deposits.	Stream channel and floodplain alluvium; wind-blown, playa, and landslide deposits; fan alluvium; basin-fill deposits.	Stream channel and floodplain alluvium; wind-blown, playa, and landslide deposits; fan alluvium; basin-fill deposits.	Stream channel and floodplain alluvium; wind-blown, playa, and landslide deposits; fan alluvium; basin-fill deposits. Basalt flows.
Cenozoic Era (less than 65 Ma)- Tertiary Period (65 to 1.6 Ma)	Late Tertiary rocks include conglomerate and sandstone. Mid-Tertiary rocks include tuffs and rhyolitic to basaltic lava flows. Early Tertiary rocks include lake-derived limestone and conglomerate, marine limestone, shale, mudstone, sandstone, and siltstone.	Late Tertiary rocks include basalt flows and andesite flows. Mid-Tertiary rocks include tuffs, dacite lava flows, and andesite lava flows. Early Tertiary rocks include sandstone, conglomerate, and calcareous siltstone and mudstone.	Late Tertiary rocks include conglomerate and sandstone. Mid-Tertiary rocks include tuffs, basalt, and andesite. Early Tertiary rocks are not exposed in the region.	Silicic ash-flow tuffs; minor basalts. Predominantly volcanic rocks of the southwestern Nevada volcanic field.
Mesozoic Era (240 to 65 Ma)	No rocks of this age are exposed along this portion of the alignment.	No rocks of this age are exposed along this portion of the alignment.	Quartz monzonite and granodiorite.	Granitic rocks of late Mesozoic (Cretaceous) age occur. No other rocks of this age are exposed along this portion of the alignment.
Paleozoic Era (570 to 240 Ma)	Alternating marine and terrestrial sediments comprised mostly of shale, quartzite, limestone, and dolomite.	Alternating marine and terrestrial sediments comprised mostly of shale, quartzite, limestone, and dolomite.	Rocks of Late and Middle Paleozoic age are not exposed along this portion of the alignment. Rocks of early Paleozoic (Ordovician and Cambrian) are largely limestone and dolomite.	Alternating marine and terrestrial sediments comprised mostly of shale, quartzite, limestone, and dolomite.
Precambrian Era (greater than 570 Ma)	Rocks of this age are not exposed along this portion of the alignment.	Rocks of this age are not exposed along this portion of the alignment.	Conglomerate, quartzite, sandstone, shale, dolomite, limestone, chert, and diabase overlie old ***igneous*** and metamorphic rocks that form the crystalline "basement."	Conglomerate, quartzite, sandstone, shale, dolomite, limestone, chert, and diabase overlie old igneous and metamorphic rocks that form the crystalline "basement."

a. Source: DIRS 182854-Shannon & Wilson 2006, Tables 2 and 3.
b. Ma = approximate years ago in millions.
c. Includes Meadow Valley Wash; Dry Lake and White River Valleys; and Chief, North Pahroc, and Seaman Ranges.
d. Includes Railroad, Reveille, Stone, and Cabin Valleys; Cactus Flat; Golden Gate, Quinn Canyon, and Kawich Ranges.
e. Includes Goldfield Hills, Stonewall Flat, Lida Valley, and Stonewall Mountain.
f. Includes Sarcobatus Flat, Pahute Mesa, Oasis Valley, Crater Flat, Yucca Mountain, Jackass Flats, Rock Valley, and Yucca Flat.
g. The Cenozoic Era consists of both the Quarternary and the Tertiary periods.

Mesozoic time, the seas had retreated westward across the region for the last time (DIRS 183639-Shannon & Wilson 2007, pp. 8 to 12).

Faulting is movement of the earth's crust that produces relative displacement of adjacent rock masses along a fracture. Generally, the fracture is referred to as a fault.

Splay faults are minor faults that branch off of a primary fault, or interconnect to form a fault zone.

A normal fault is a fault where the block above an inclined fault has moved down relative to the other block.

A thrust fault is a fault that occurs when squeezing forces push the block above an inclined fault up in relation to the other block.

Major east-west compression occurred periodically in the Great Basin between about 350 million and 65 million years ago (DIRS 169734-BSC 2004, p. 2-16). This compression moved large sheets of old rock great distances upward and eastward over young rocks along ***thrust faults*** to produce mountains. Most of the thrust fault traces have eroded away; however, a remnant of the Pahranagat Fault has been identified south of the Garden Valley alternative segments (DIRS 183639-Shannon & Wilson 2007, Plate 4). Range-bounding ***normal faults***, which have developed in response to ***crustal extension*** over the past 20 million years, are conspicuous features in this part of Nevada and are especially visible in parts of Nye County. These faults have surface traces that form distinctive segments 5 to 30 kilometers (3.1 to 19 miles) long (DIRS 174214-Kleinhampl and Ziony 1985, p. 144). Although generally coincident with the range fronts, in places these normal faults, and shorter ***splay faults*** radiating outward from these normal faults, extend into adjacent valleys where they are buried by recent alluvial deposits. Both the exposed and buried parts of active faults could be capable of rupturing the surface.

Crustal extension in the region, which began about 20 million years ago, is still occurring (DIRS 183639-Shannon & Wilson 2007, p. 12). Present-day mountains and valleys were well developed by about 11.5 million years ago. Evidence of recent, continuing crustal extension is based on Holocene-age (about the last 10,000 years) faults, recurring ***earthquakes***, and geothermal features (some of which are used for commercial purposes such as spas and pools). The Holocene-age faults are visible in many valleys in Nye County that the Caliente rail alignment would cross (Figure 3-2).

Evidence of crustal extension is seen in the Walker-Lane Structural Belt, a 96-kilometer (60-mile)-wide deformation zone that parallels the Nevada-California border from Las Vegas to northern California. The belt includes generally northwest-trending faults that were active within the last 20 million years (DIRS 183639-Shannon & Wilson 2007, p. 14). Ruptures along these faults or along buried faults are possible and could cause earthquakes. Section 3.2.1.2.2.1 provides more information on ***seismic*** activity along the Caliente alignment.

The southwestern Nevada volcanic field is a volcanic plateau that developed between 16 and 7 million years ago, with the greatest eruptions occurring between 14 and 11 million years ago (DIRS 183639-Shannon & Wilson 2007, p. 11). The volcanic field encompasses common segment 5, the Oasis Valley alternative segments, and common segment 6 (Sarcobatus Flat, Pahute Mesa, Oasis Valley, Crater Flat, Yucca Mountain, Jackass Flats, and Rock Valley).

The volcanic field has a complex history of volcanism and deformation (DIRS 169734-BSC 2004, pp. 2-4 through 2-15). Eruption of 17 ash-flow ***tuff*** sequences and lava flows occurred from at least seven large, overlapping ***caldera*** complexes to form the southwestern Nevada volcanic field. The youngest caldera-forming events associated with this feature occurred between 7.4 and 9.4 million years ago with

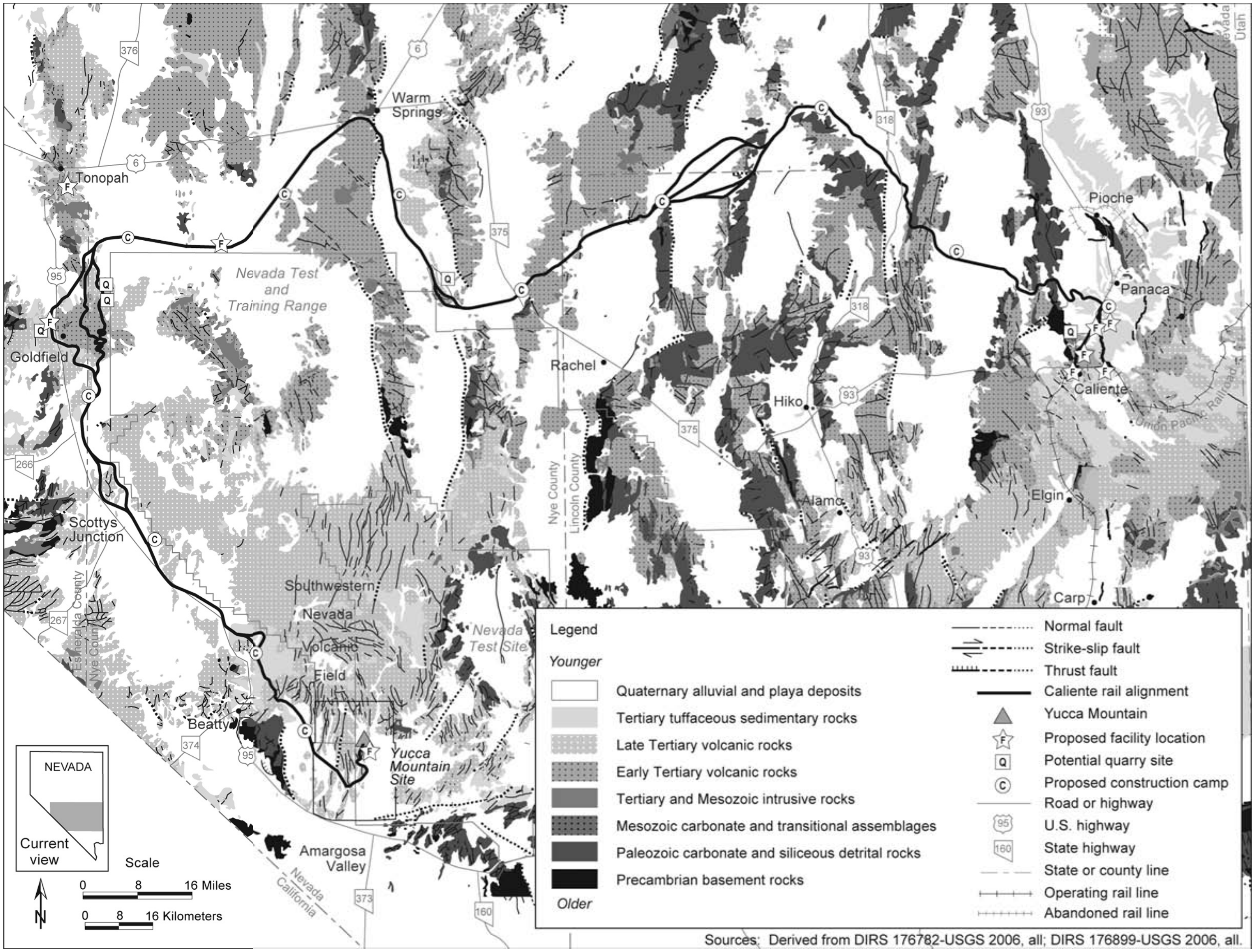


Figure 3-2. Geologic setting along the Caliente rail alignment.

eruptions east of Caliente common segment 4 (DIRS 183639-Shannon & Wilson 2007, p. 11). The mid-Tertiary eruptions deposited ash and created volcanic-ash flows with minor lava flows and reworked materials. Only Tertiary and younger rocks are exposed in the southwestern Nevada volcanic field area.

3.2.1.2.2.1 Faulting and Seismic Activity. Historically, there have been numerous earthquakes in the Great Basin region as a result of ongoing crustal extension (see Figure 3-3). Consistent with geologic evidence, the historical record of Holocene-age ***seismicity*** (occurring within the last 10,000 years) suggests that seismic activity was concentrated in the western part of the Great Basin, and to a lesser extent, in the eastern part (DIRS 183639-Shannon & Wilson 2007, p. 15 and Plate 4). Modern earthquakes in the southern Great Basin predominantly occur at depths of 2 to 12 kilometers (1.2 to 7 miles) below Earth's surface (DIRS 169734-BSC 2004, p. 4-35).

The southern Great Basin contains many Quaternary fault traces; however, there are few instances of surface rupture within the last 10,000 years (DIRS 183639-Shannon & Wilson 2007, p. 15). These faults are characterized by discontinuous scarps (vertical displacement along a fault), from surface displacement. Studies of Holocene faults in the Great Basin have calculated slip rates of 0.001 to 0.01 millimeter (0.000039 to 0.00039 inch) per year, with a surface-rupturing recurrence interval of about 100 years (DIRS 176905-Workman et al. 2002, p. 18). Studies of fractures other than ***block-bounding faults*** around Yucca Mountain determined that fault displacements of about 0.10 centimeter (0.039 inch) would have an exceedance ***probability*** of once every 100,000 years (DIRS 169734-BSC 2004, p. 4-64).

Figure 3-3 shows the number and locations of earthquakes of magnitude 3.0 and greater on the Richter scale based on available historical and recorded data from 1852 to 2004. Most of the earthquakes around the Caliente rail alignment fall within a magnitude range of 3.0 to 3.9, the range that most people begin to feel ground shaking (DIRS 180969-USGS 2006, all). As magnitude increases, the potential for damage from ground shaking also increases.

Five seismic events with a magnitude 5.0 or greater occurred within 30 kilometers (19 miles) of the Caliente rail alignment, several occurring on the Nevada Test Site north of Yucca Mountain. Most seismic events on the Nevada Test Site are associated with historical underground testing, not natural ***faulting***. Seismic activity from manmade tests has not activated local faults (DIRS 169734-BSC 2004, pp. 4-33 and 4-35). A magnitude 6.0 earthquake was also recorded within the Chief Range southeast of the City of Caliente. A 1992 earthquake near Little Skull Mountain is the largest recorded earthquake in the vicinity of Yucca Mountain. The 5.6 magnitude event was apparently triggered by a 7.3 magnitude earthquake at Landers, California, which occurred 300 kilometers (190 miles) southwest of Yucca Mountain, and 20 hours earlier (DIRS 169734-BSC 2004, pp. 4-38 and 4-39). Since 1978, DOE has monitored seismic activity in the area around Yucca Mountain to pinpoint seismic events (DIRS 155970-DOE 2002, p. 3-32). In the area around the Caliente rail alignment, earthquakes with a magnitude of 6.1 to 6.4 are predicted to have a return period of 2,500 years (DIRS 174296-Shannon & Wilson 2005, p. 14).

Through the National Earthquake Hazard Reduction Program, national and regional shaking-hazard maps are used to determine the probability of seismic-related damage based on regional earthquake occurrence rates and how far the shaking travels horizontally (DIRS 174194-USGS 2005, all). These maps are used to meet modern seismic design provisions for the construction of buildings, bridges, highways, and utilities. Shaking-hazard maps, also known as peak acceleration maps, show the levels of horizontal shaking that have a certain probability of being exceeded in a 50-year period (see Figure 3-4). When an earthquake occurs, the forces caused by the shaking can be measured as a percentage of the constant known as *g*, which is the acceleration of a falling object due to gravity. The resulting map uses contour lines to show the amount of shaking a location would experience during any area earthquake, regardless of its distance to the epicenter.

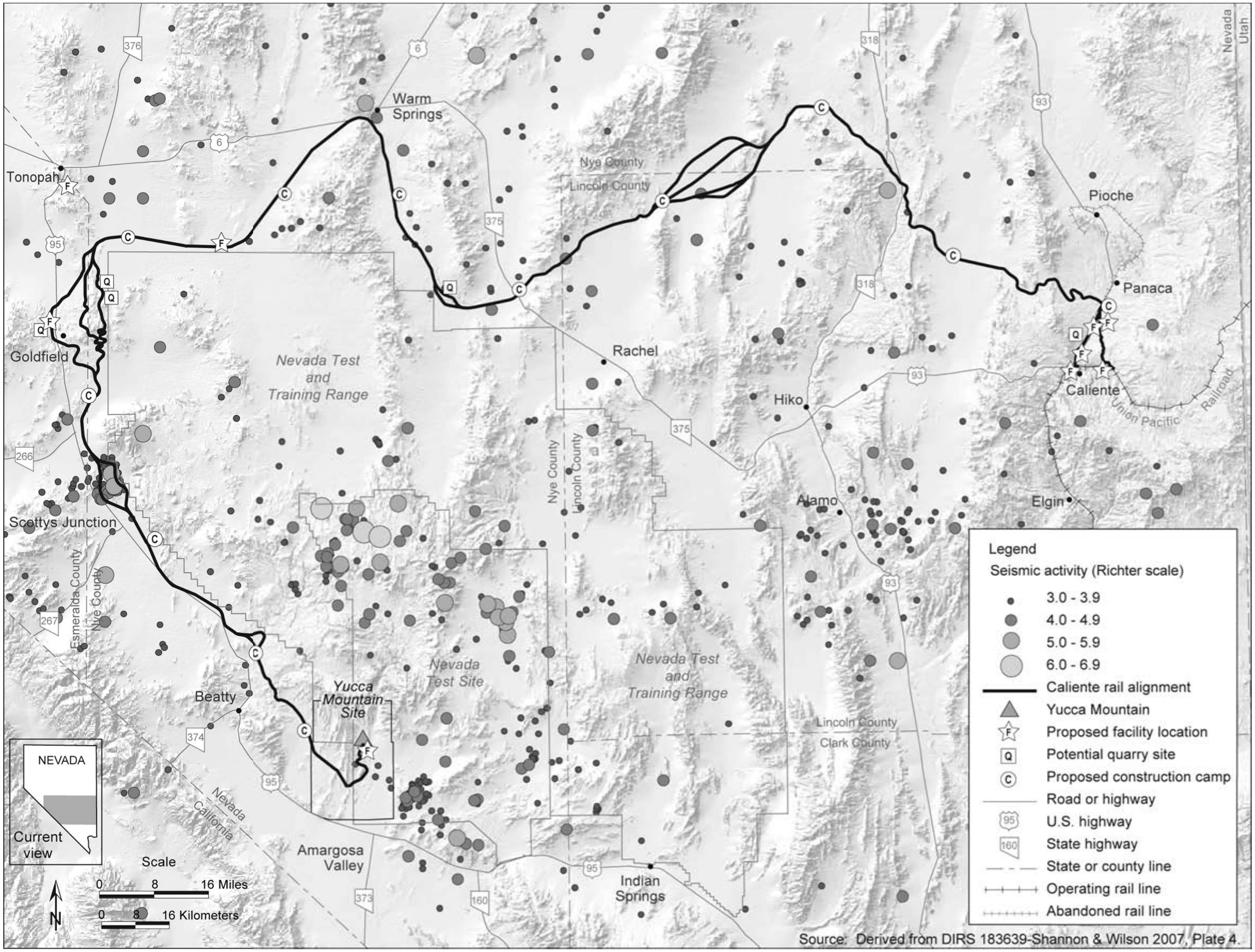


Figure 3-3. Seismic activity in Nevada along the Caliente rail alignment from 1852 to 2004.

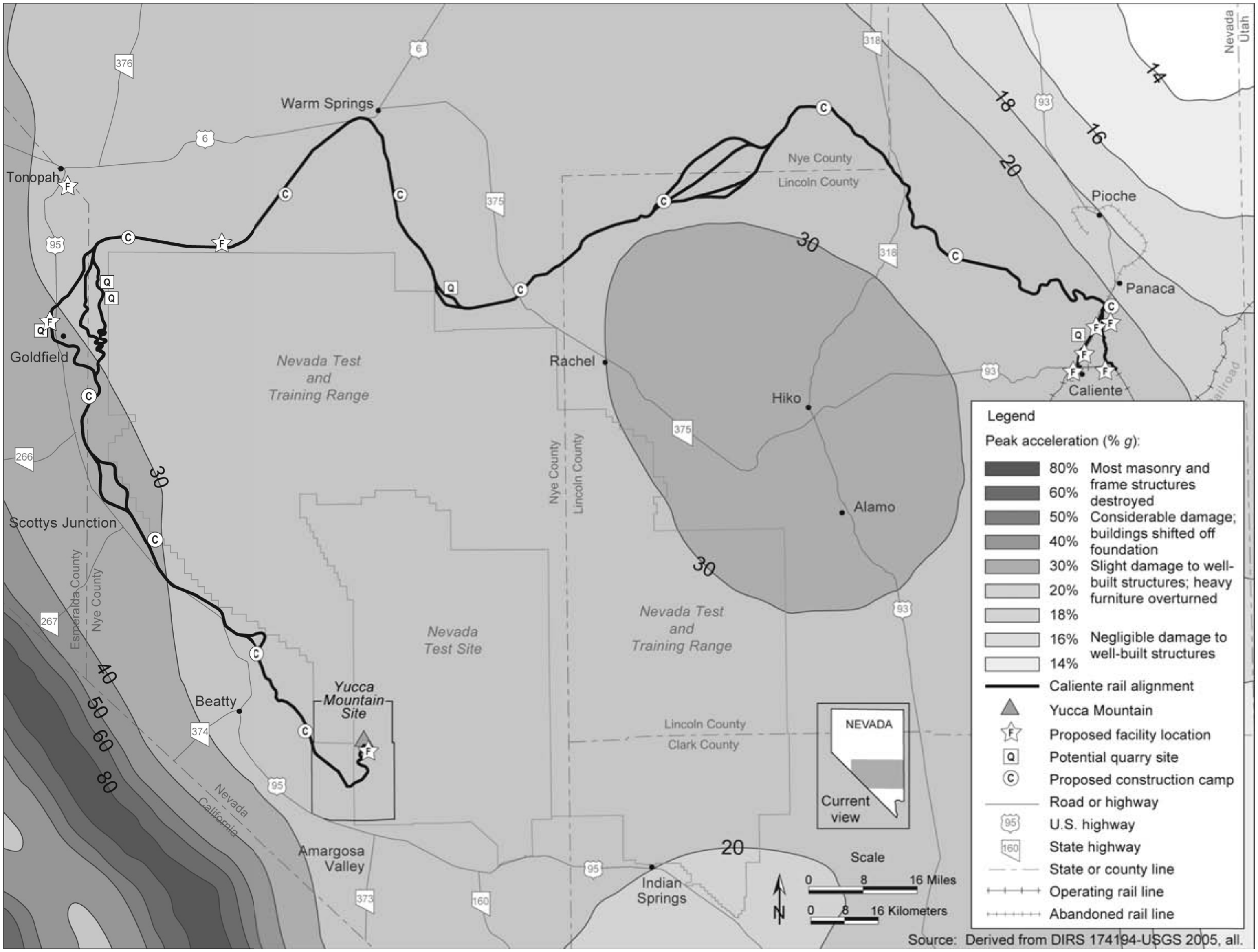


Figure 3-4. Seismic hazards along the Caliente rail alignment: peak acceleration (percent *g*) with 2-percent probability of exceedance in 50 years.

The predicted peak horizontal accelerations tend to decrease from west to east across the Caliente rail alignment. Most of the Caliente rail alignment would have a 2-percent probability of exceeding a peak horizontal acceleration of 30-percent *g* within a 50-year period (see Figure 3-4) and a 10-percent probability of exceeding a peak horizontal acceleration of 10-percent *g* within a 50-year period (DIRS 174296-Shannon & Wilson 2005, Figure 3). The southern section of Goldfield alternative segment 4, Caliente common segment 4, the Bonnie Claire alternative segments, and the northern section of common segment 5 would have a 2-percent probability of exceeding a peak ground acceleration range 40-percent *g* in 50 years. In other words, the alignment would experience shaking of 40 percent *g* or less from a seismic event with a return period of about 2,500 (DIRS 174296-Shannon & Wilson 2005, p. 14). A peak horizontal acceleration of 10-percent *g* could cause minor structural damage to normal buildings, while 40-percent *g* could cause damage to most structures.

3.2.1.2.2.2 Mineral and Energy Resources. For more than 100 years, parts of the southern Great Basin have produced substantial amounts of base and precious metals, particularly gold and silver (DIRS 183644-Shannon & Wilson 2007, p. 15). Parts of the Caliente rail alignment, especially in the vicinity of the Goldfield and Clifford Mining Districts, have been intensely mined and have extensive surface and underground mine workings. Energy resources reported along and near the rail alignment include low-temperature geothermal water and indications of small areas with petroleum resources. Section 3.2.2, Land Use and Ownership, describes ***mining districts*** and associated land claims along the Caliente rail alignment in more detail.

3.2.1.2.2.3 Potential Sources of Construction Materials. As described in Chapter 2, there would be local sources for some rail line construction materials. The estimated quantity of ***ballast*** required for construction of a rail line along the Caliente rail alignment would range from 3.12 to 3.19 million metric tons (3.44 to 3.52 million tons) (DIRS 180922-Nevada Rail Partners 2007, p. 3-1). DOE has identified six potential ballast quarry sites along the Caliente rail alignment with topographic and geologic characteristics suitable to accommodate excavation and preparation facilities. Figures 2-24 through 2-27 show the potential quarry locations along the Caliente rail alignment (South Reveille alternative segment 2, South Reveille alternative segment 3, Goldfield alternative segment 3, and Goldfield alternative segment 4). The topography and geology of potential quarry sites are described in more detail in the discussion of the alternative segment with which they are associated (Sections 3.2.1.3.1.2, 3.2.1.3.5.2, and 3.2.1.3.7.2). There is also a high likelihood the Department would find suitable sands and gravels on the alluvial fans within the rail line construction right-of-way for use as ***subballast***. A final determination of subballast suitability would be made if DOE decided to implement the Proposed Action along the Caliente rail alignment. Section 3.2.11, Utilities, Energy, and Materials, describes the regional supply chains for other construction materials.

3.2.1.2.3 Soils

DOE used soil survey databases from the U.S. Department of Agriculture, Natural Resources Conservation Service (DIRS 184079-Natural Resources Conservation Service 2007, all), to identify soil types and characteristics along the Caliente rail alignment. Approximately 95 percent of the project area has been surveyed. However, soil surveys around the Nevada Test and Training Range have not been completed. For areas with no available soils data, the Department does not consider the unavailable data critical to the design and construction of a railroad along the Caliente rail alignment because soils are expected to be similar to those already surveyed. In addition, as part of the final design, DOE would place geotechnical borings along the entire rail alignment to obtain site-specific soils data.

This Rail Alignment EIS identifies the specific soil characteristics relevant to railroad construction and operations. From a potential impact perspective, soil designated as supporting ***prime farmland*** is considered one of the relevant characteristics. The Natural Resources Conservation Service (DIRS 181427-NRCS 2007, Part 622.04(a)) defines prime farmland as:

> Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or ***alkalinity***, an acceptable content of salt or sodium, and few or no rocks. Its soils are ***permeable*** to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

The prime farmland soil label is applied to the soil types and associations that the National Resources Conservation Service identifies as satisfying this definition. Three percent, or about 1.8 square kilometer (440 acres), of the rail line construction right-of-way would contain soils classified as prime farmland (see Figure 3-5). Lincoln County has about 1,600 square kilometers (400,000 acres) and Nye County has 610 square kilometers (150,000 acres) of prime farmland soils (DIRS 184079-Natural Resources Conservation Service 2007, all). Esmeralda County does not have any soils classified as prime farmland. The amount of prime farmland soils within the Caliente rail alignment construction right-of-way would be less than 0.1 percent of the total prime farmland soils in Lincoln and Nye Counties. DOE has also contacted the Nevada Natural Resources Conservation Service office to collaborate on the identification of prime, unique statewide, or locally important farmland along the alignment. This correspondence is described further in Section 4.2.1.2.1.3, and in the individual segment discussions in Section 4.2.1.2.2.

Table 3-3 lists the prime farmland and quantity of soils with other characteristics along the Caliente rail alignment. The table lists the percentage of the area within the nominal width of the construction right-of-way that contains soils with a particular characteristic. In some locations along the rail alignment, DOE would occupy and disturb less of the construction right-of-way to avoid sensitive environmental resources and private property. Because different combinations of alternative segments and common segments would be different lengths and have different disturbed areas, DOE judged the impacts from soil erosion based on the acreage of specific soil types that would be affected by construction-related disturbance. Section 4.2.1.2.1.3 provides a more detailed discussion of how railroad construction and operations could affect topsoil.

Other soil characteristics that are particularly relevant to railroad construction and operations are classified in Table 3-3 as ***erodes easily*** and ***blowing soil***. Soil with either of these characteristics can be quite susceptible to erosion. As seen in Table 3-3, these soil types are found in similar amounts within each group of alternative segments.

The erodes easily characteristic is a measure of the susceptibility of bare soil to be detached and moved by water. These soils, which tend to contain relatively high amounts of silts and ***loams***, tend to erode easily when disturbed. About 15 percent of the entire Caliente rail alignment has soils with this characteristic (DIRS 184079-Natural Resources Conservation Service 2007, all).

The blowing soil characteristic is based on the soil survey classification of susceptibility of a given soil to wind erosion. This classification method uses eight groupings. Soils assigned to Group 1 are the most susceptible to wind erosion and those assigned to Group 8 are the least susceptible. Soils listed in Table 3-3 with the blowing soil characteristic are those assigned to erodibility Group 1 or 2 (DIRS 181427-NRCS 2007, Exhibit 618-16). The blowing soil characteristic identifies areas where fine-textured, sandy materials predominate and where uncontrolled soil disturbance could result in increased wind erosion. Depending on combination of alternative segments and common segments, between 7.6 and 8.2 percent of

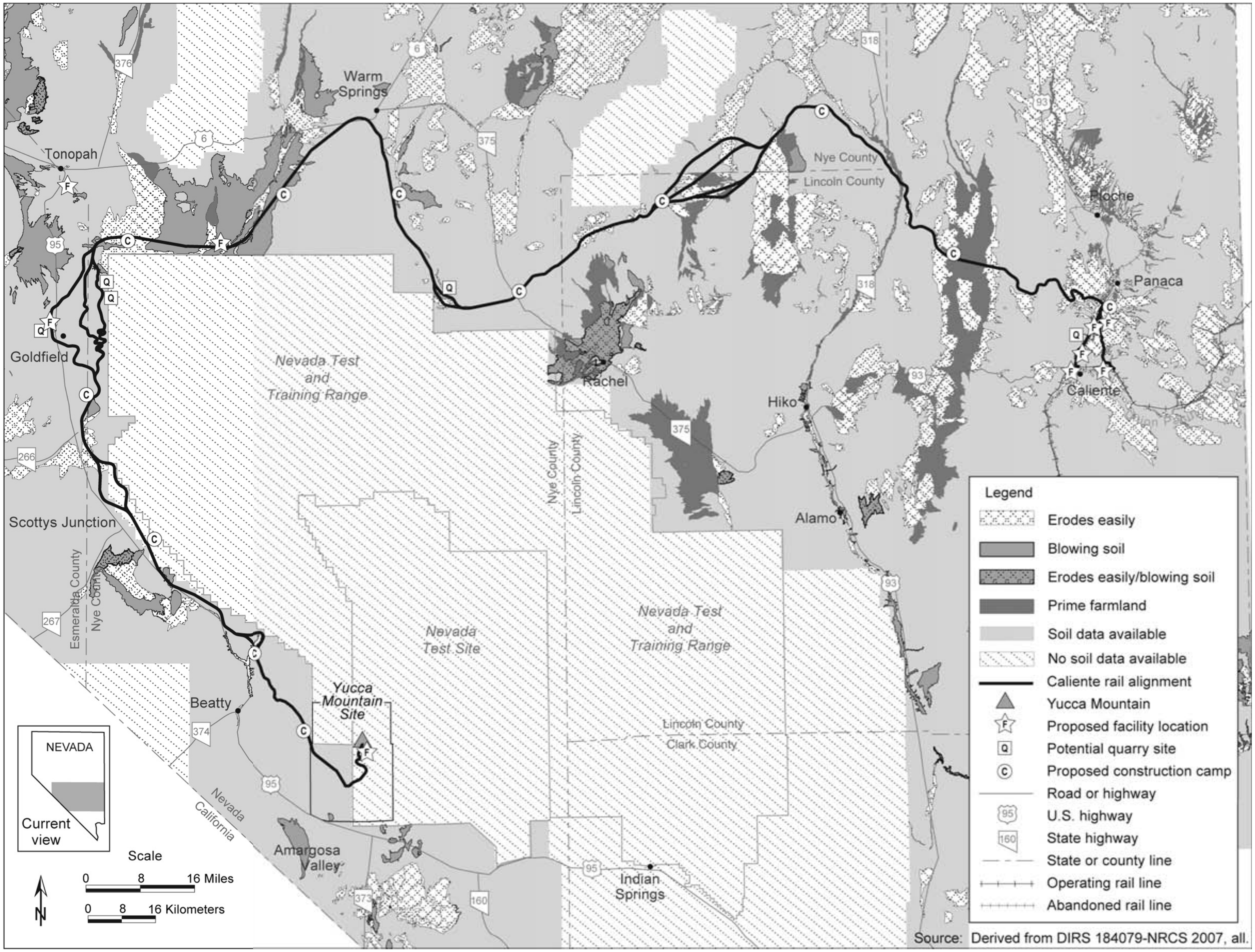


Figure 3-5. Soils with prime farmland, erodes easily, and blowing soil characteristics along the Caliente rail alignment.

Table 3-3. Percent of soil characteristics within the Caliente rail alignment construction right-of-way.[a]

Rail line segment	Percent prime farmland	Percent blowing soil	Percent erodes easily	Percent soil survey coverage[b]
Caliente alternative segment	5.2	c	74	100
Eccles alternative segment	4.8	c	71	100
Caliente common segment 1	10	c	18	100
Garden Valley alternative segment 1	8.4	5.7	13	100
Garden Valley alternative segment 2	11	6.1	22	100
Garden Valley alternative segment 3	c	2.1	12	100
Garden Valley alternative segment 8	9.8	6	14	100
Caliente common segment 2	c	10	16	100
South Reveille alternative segment 2	c	6.3	19	100
South Reveille alternative segment 3	c	c	15	100
Caliente common segment 3	c	32	17	100
Goldfield alternative segment 1	c	8.8	c	100
Goldfield alternative segment 3	c	9.5	c	100
Goldfield alternative segment 4	c	7.7	c	100
Caliente common segment 4	c	1.4	41	100
Bonnie Claire alternative segment 2	c	c	27	27
Bonnie Claire alternative segment 3	c	c	25	77
Common segment 5	c	2.6	c	73
Oasis Valley alternative segment 1	c	13	c	100
Oasis Valley alternative segment 3	c	4.8	c	100
Common segment 6	c	c	c	74

a. Source: DIRS 184079-Natural Resources Conservation Service 2007, all.
b. There are data gaps around the Nevada Test and Training Range because those soil surveys have not been completed.
c. Characteristic not present. Soil percentages do not add up to 100 percent.

the entire Caliente rail alignment would have soils with the blowing soil characteristic (DIRS 184079-Natural Resources Conservation Service 2007, all). Figure 3-5 identifies the locations of prime farmland, erodes easily, and blowing soils.

3.2.1.3 Setting and Characteristics along Alternative Segments and Common Segments

3.2.1.3.1 Alternative Segments at the Interface with Union Pacific Railroad Mainline

3.2.1.3.1.1 Physiography. The physiography of the area where the Caliente rail alignment would interface with the Union Pacific Railroad Mainline is dominated by Meadow Valley Wash, the Cedar Range to the east, and the Chief Range to the west (see Figures 2-5 and Figure 3-6). There are terraces and alluvial fans on both sides of Meadow Valley Wash (DIRS 156091-Borup and Bagley 1976, pp. 5 and 6). The Caliente and Eccles alternative segments would start at different locations near Clover Creek, which is dry most of the year, and extend north, crossing Meadow Valley Wash. Elevations range from about 1,340 meters (4,400 feet) above mean sea level in the areas of Clover Creek and Meadow Valley Wash to just over 1,520 meters (5,000 feet) above mean sea level in the more rugged area north of Clover Creek.

3.2.1.3.1.2 Geology. The area where the Caliente rail alignment would interface with the Union Pacific Railroad Mainline is largely composed of recent sedimentary deposits and some volcanic rocks.

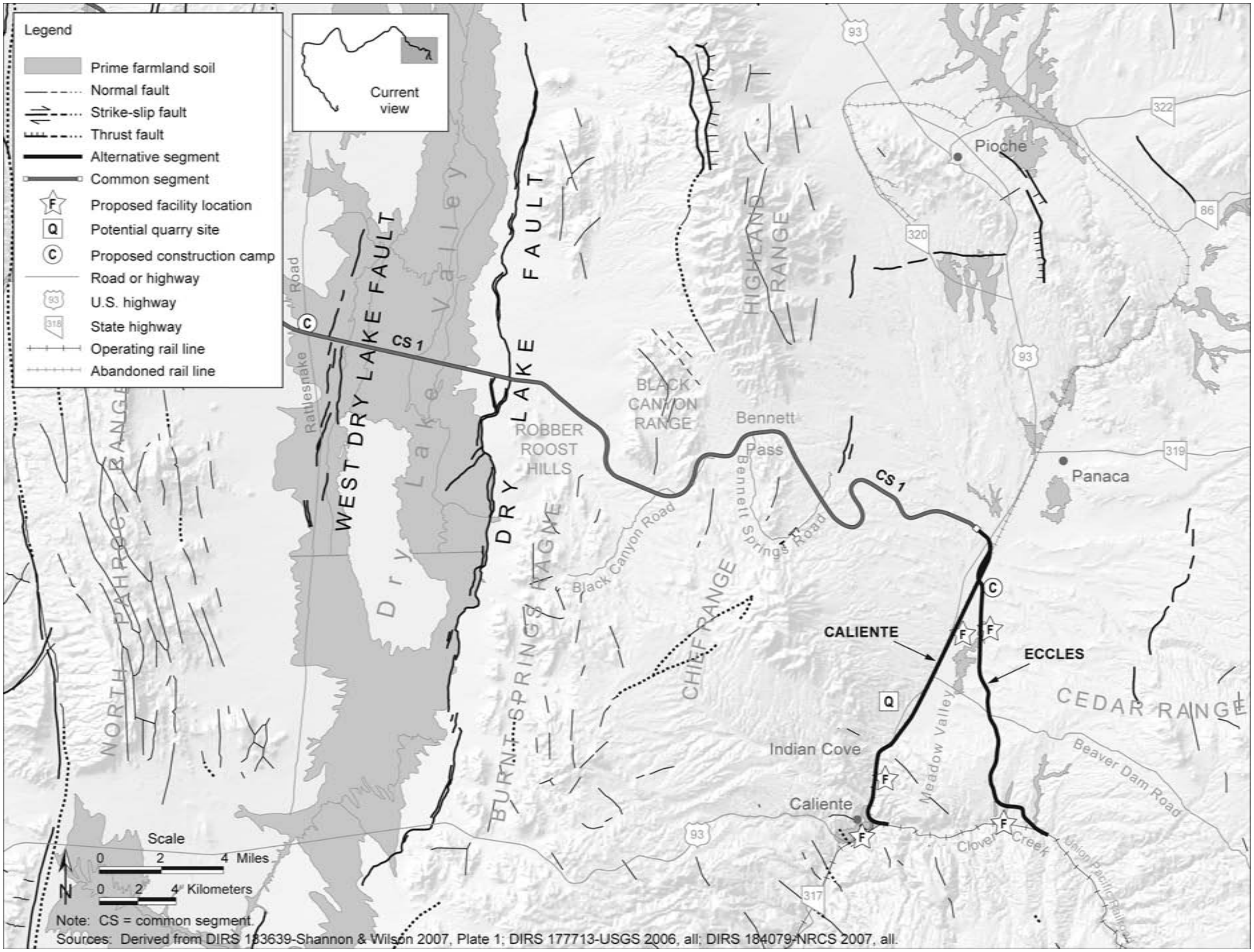


Figure 3-6. Physiographic features of common segments and alternative segments within map area 1.

The Caliente and Eccles alternative segments would not cross known Quaternary fault traces. Nonmetallic minerals (perlite, a glassy volcanic rock with high water content that can be used for insulation and acoustic tiles, and quartzite, a hard rock made up almost entirely of the mineral quartz) found within these rocks have been commercially mined in the vicinity of the Caliente alternative segment. Section 3.2.2, Land Use and Ownership, provides additional information about the mining districts around the Caliente rail alignment.

Neither the Caliente nor the Eccles alternative segment would cross Quaternary faults. There was a magnitude 6.0 earthquake in the Chief Range area southeast of the City of Caliente. Otherwise, there have been few earthquakes in the area within the past 150 years.

The site of potential quarry CA-8B is in hilly terrain north of the City of Caliente, west of the Caliente alternative segment. ***Basalt*** would be excavated from the Cobalt Canyon formation (DIRS 180922-Nevada Rail Partners 2007, Figure 3-C).

Geothermal resources close to the proposed Caliente rail alignment in the Caliente area are being used commercially in a hotel spa and for space heating (DIRS 183644-Shannon & Wilson 2007, p. 112). Hot springs in the Caliente area are indicative of high heat flow within the Earth, and are related to the crustal extension of the southern Great Basin. There are no other energy resources along the Caliente or Eccles alternative segments.

3.2.1.3.1.3 Soils. Soils in the area of the Interface with the Union Pacific Railroad Mainline occur mainly on floodplains, low terraces, and alluvial fans (DIRS 156091-Borup and Bagley 1976, all). Most of these soils are on nearly level to moderate slopes, are very thick, and are well drained to moderately well drained. Other soils are very thin to moderately thick, are well drained, and gently slope to steep soils and rock outcrops.

About 5.2 and 4.8 percent of the soils along the Caliente and Eccles alternative segments, respectively, are classified as prime farmland (see Table 3-3). Along the Caliente alternative segment, soil associations classified as prime farmland are within the Caliente city limits, and are primarily on private residential land. Along the Eccles alternative segment, the southern prime farmland soils are on alluvial fan deposits in the Little Mountain ***Grazing Allotment***. The northern prime farmland soils are on alluvial fans in the Peck Grazing Allotment. Section 3.2.2, Land Use and Ownership, provides additional information about grazing allotments. About 74 and 71 percent of the soil along the Caliente and Eccles alternative segments, respectively, are classified as erodes easily. There are no soils anywhere along the Caliente or Eccles alternative segments with the blowing soil characteristic.

3.2.1.3.2 *Caliente Common Segment 1 (Dry Lake Valley Area)*

3.2.1.3.2.1 Physiography. From east to west, Caliente common segment 1 would cross between, through, or around the Chief, Highland, and Black Canyon Ranges, Dry Lake Valley, the North Pahroc Range, White River Valley, the Seaman Range, Coal Valley, and the Golden Gate Range (see Figures 3-6 and 3-7). Bennett Pass, at an elevation of about 1,730 meters (5,700 feet) above mean sea level, separates the Highland and Black Canyon Ranges to the north from the Chief Range to the south. This segment of the Caliente rail alignment would travel through Bennett Pass, then south of the Black Canyon Range and curve around Robber Roost Hills and the Burnt Springs Range. The segment would then cross Dry Lake Valley, a wide, nearly flat depression with elevations generally ranging from 1,400 to 1,420 meters (4,600 to 4,660 feet) above mean sea level.

Turning northwest, Caliente common segment 1 would enter the northern section of the North Pahroc Range. In this area, elevations generally range from 1,600 to 1,700 meters (5,200 to 5,600 feet) above mean sea level. The segment would then head north along the east side of the White River Valley for about 10 kilometers (6.2 miles) and would cross the dry White River and proceed northwest of State Route 318, north of the Seaman Range, in the vicinity of Timber Mountain. The northern portion of the Seaman Range trends northwesterly and merges at the north end of Coal Valley with the Golden Gate Range, which trends north-northeasterly. North of this point, the Golden Gate Range merges with the broad expanse of White River Valley (see Figure 3-7). The Caliente rail alignment would go around the rugged Seaman Range. In this area, Caliente common segment 1 would encounter elevations ranging from 1,500 to 1,650 meters (5,000 to 5,400 feet) above mean sea level.

3.2.1.3.2.2 Geology. Bedrock at the surface along Caliente common segment 1 is quite variable. The segment would cross old sedimentary rocks in the eastern mountain passes and more recent volcanic rocks around the North Pahroc and Golden Gate Ranges (DIRS 182854-Shannon & Wilson 2006, Table 5). The valleys are covered with modern-day ***alluvium***, and most contain playas.

Most earthquakes in the area have been of magnitude 3.0 or less, with the exception of the Timber Mountain area, where there was an earthquake of magnitude 5.0 (see Figure 3-3). Caliente common segment 1 would cross three prominent faults in the area, the Dry Lake and the West Dry Lake faults (Figure 3-6) and faults of the North Pahroc Range (Figure 3-7). These discontinuous faults are identified by offset bedrock or alluvial deposits, and were last active more than 11,000 years ago.

The Quaternary deposits in Dry Lake Valley also contain naturally occurring surface fissures of a variety of lengths and widths (DIRS 183639-Shannon & Wilson 2007, pp. 43 and 44).

Pozollan deposits are known mineral resources in the vicinity of Caliente common segment 1 (DIRS 183644-Shannon & Wilson 2007, p. 108 and Plate 1). Warm springs are the only known energy resources near the common segment. Section 3.2.2, Land Use and Ownership, describes mining districts and mineral and energy resources along the segment.

3.2.1.3.2.3 Soils. Soils along Caliente common segment 1 are predominantly very thick, well-drained, silty loams, with some thin, well-drained, gravelly sandy loams (DIRS 184079-Natural Resources Conservation Service 2007, all). In this area, there are also badlands, semi-***arid*** areas with steeply gullied topography caused by rapid erosion, where runoff occurs rapidly and erosion is severe. There is a wide range of soil types along Caliente common segment 1 (DIRS 184079-Natural Resources Conservation Service 2007, all). Soil depths vary from thin to very thick. Most of the well-drained soils in the White River area occur on ***fan piedmonts***, ***fan remnants***, and ***fan skirts***.

> **Fan piedmonts, fan remnants, and fan skirts** refer to locations within a large alluvial fan. Fan piedmonts refer to the area along the base of a mountain slope. Fan remnants refer to parts of an older alluvial fan that remain after erosion has removed most of the fan. Fan skirts refer to the area along the base of the alluvial fan in a valley.

Soils classified as prime farmland make up 10 percent of the soils along Caliente common segment 1. Soils with the erodes easily characteristic comprise 18 percent of the soils. None of the available soils data include soils with the blowing soil characteristic.

3.2.1.3.3 *Garden Valley Alternative Segments*

3.2.1.3.3.1 Physiography. All of the Garden Valley alternative segments would cross the Golden Gate Range and pass through Garden Valley, which is a broad, nearly flat depression. From north to south along the Golden Gate Range, there are two unnamed gaps and two named gaps (Water Gap and Murphy Gap). Garden Valley alternative segments 1 and 3 would cross the Golden Gate Range through the northernmost unnamed gap. This gap, a relatively gentle pass, has an elevation of about 1,600 meters

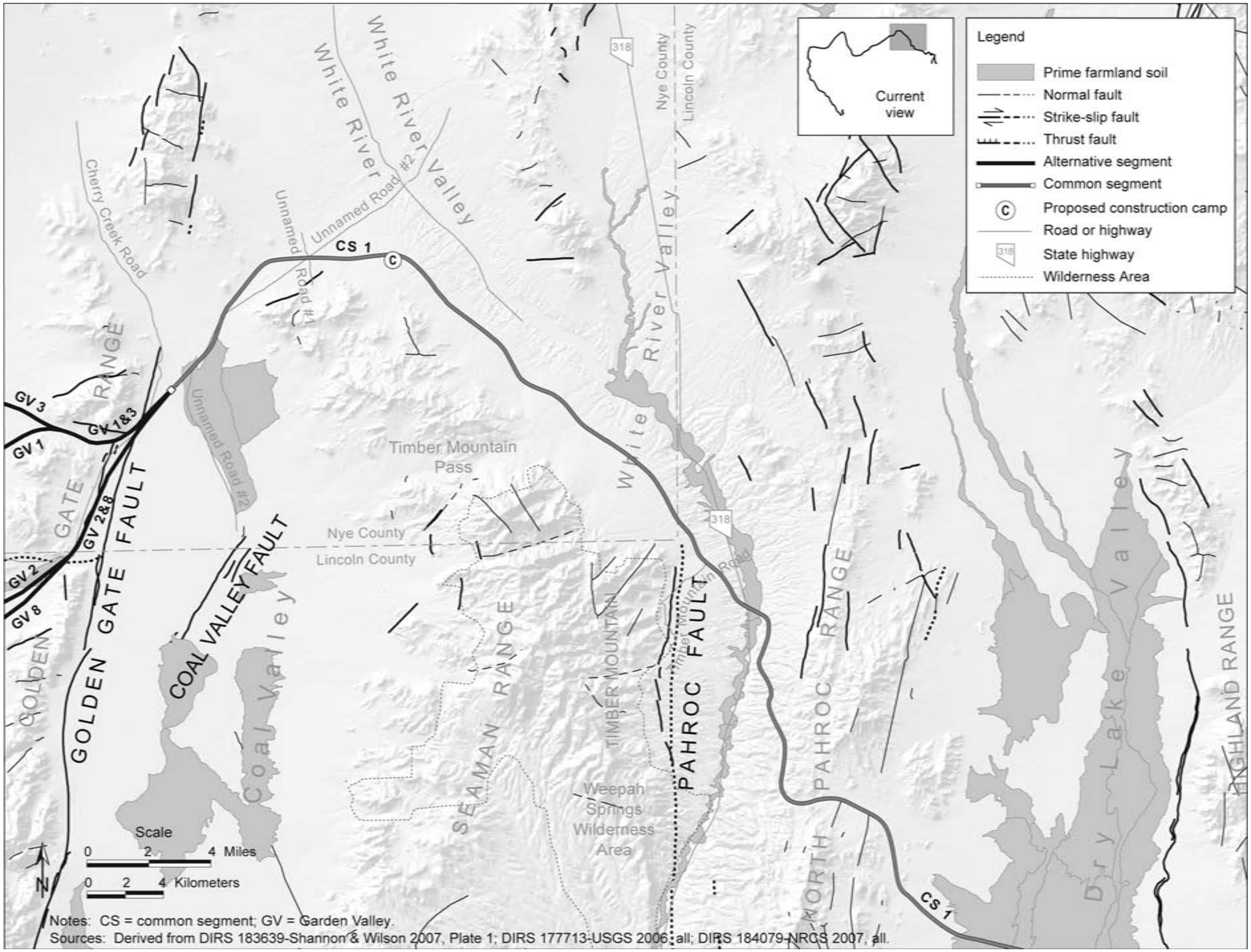


Figure 3-7. Physiographic features of common segments and alternative segments within map area 2.

(5,200 feet) above mean sea level. Garden Valley alternative segments 2 and 8 would cross Golden Gate Range farther to the south at Water Gap, which has an elevation of 1,580 meters (5,200 feet) (Figure 3-8).

3.2.1.3.3.2 Geology. The Garden Valley alternative segments would cross a variety of sedimentary and volcanic rocks in gaps of the Golden Gate Range. The floor of Garden Valley is covered with thick alluvial sediments. The Garden Valley alternative segments would cross the northernmost exposure of the Golden Gate Fault. This fault is a complex zone that consists of discontinuous traces extending along the eastern border of the Golden Gate Range. It is uncertain when this fault was last active; however there is record of movement occurring about 15,000 years ago (DIRS 177713-MO0607LFAFUS96.000, Fault Number 1393).

Other than gravel and alluvial materials present on the floor of Garden Valley, the Garden Valley alternative segments would not cross any known commercial mineral deposits.

3.2.1.3.3.3 Soils. The Nye and Lincoln County soil surveys indicate that soils in the area of Garden Valley are mostly very thick and well-drained, and occur on fan piedmonts (DIRS 184079-Natural Resources Conservation Service 2007, all).

Some soils classified as prime farmland are found along the alternative segments. Approximately 8.4 percent of soils along Garden Valley 1 are prime farmland, 11 percent of soils along Garden Valley alternative segment 2, 9.8 percent along Garden Valley alternative segment 8, and no prime farmland soils along Garden Valley alternative segment 3. Soils with the erodes easily characteristic range from 13 percent for Garden Valley alternative segment 1, 22 percent for Garden Valley alternative segment 2, 12 percent for Garden Valley alternative segment 3, to 14 percent for Garden Valley alternative segment 8 (Table 3-3). The alternative segments also contain blowing soils, 5.7 percent along Garden Valley alternative segment 1, 6.1 percent along Garden Valley alternative segment 2, 2.1 percent along Garden Valley alternative segment 3, and 6 percent along Garden Valley alternative segment 8.

3.2.1.3.4 *Caliente Common Segment 2 (Quinn Canyon Range Area)*

3.2.1.3.4.1 Physiography. The area of Caliente common segment 2 is dominated by the Worthington Mountains to the south and east and the rugged Quinn Canyon and Reveille Ranges to the north (see Figures 3-8 and 3-9). This common segment would pass from Garden Valley to Sand Springs Valley and through foothills of the Quinn Canyon Range to Railroad Valley. Elevations in this area generally range from 1,620 to 1,800 meters (5,300 to 5,900 feet) above mean sea level.

3.2.1.3.4.2 Geology. Caliente common segment 2 would primarily cross recent alluvial deposits through the valleys, and sedimentary bedrock along the southern tip of the Quinn Canyon Range. There are few recorded earthquakes within the vicinity of the rail alignment in this area. The alignment would not cross recent fault traces or approach any energy resources. Other than gravel used for construction purposes, there is no commercial production in the area.

3.2.1.3.4.3 Soils. Caliente common segment 2 contains soils composed largely of fine sand underlain by ***hardpan*** (a layer of hard subsoil that prevents the ***infiltration*** of water or roots). The soils are thick to moderately thick and fine-textured (DIRS 184079-Natural Resources Conservation Service 2007, all). The soils are formed on alluvium derived from volcanic rocks.

About 16 percent of the soils have the erodes easily characteristic and 10 percent contain the blowing soil characteristic. The data indicate that there are no prime farmland soils in this area.

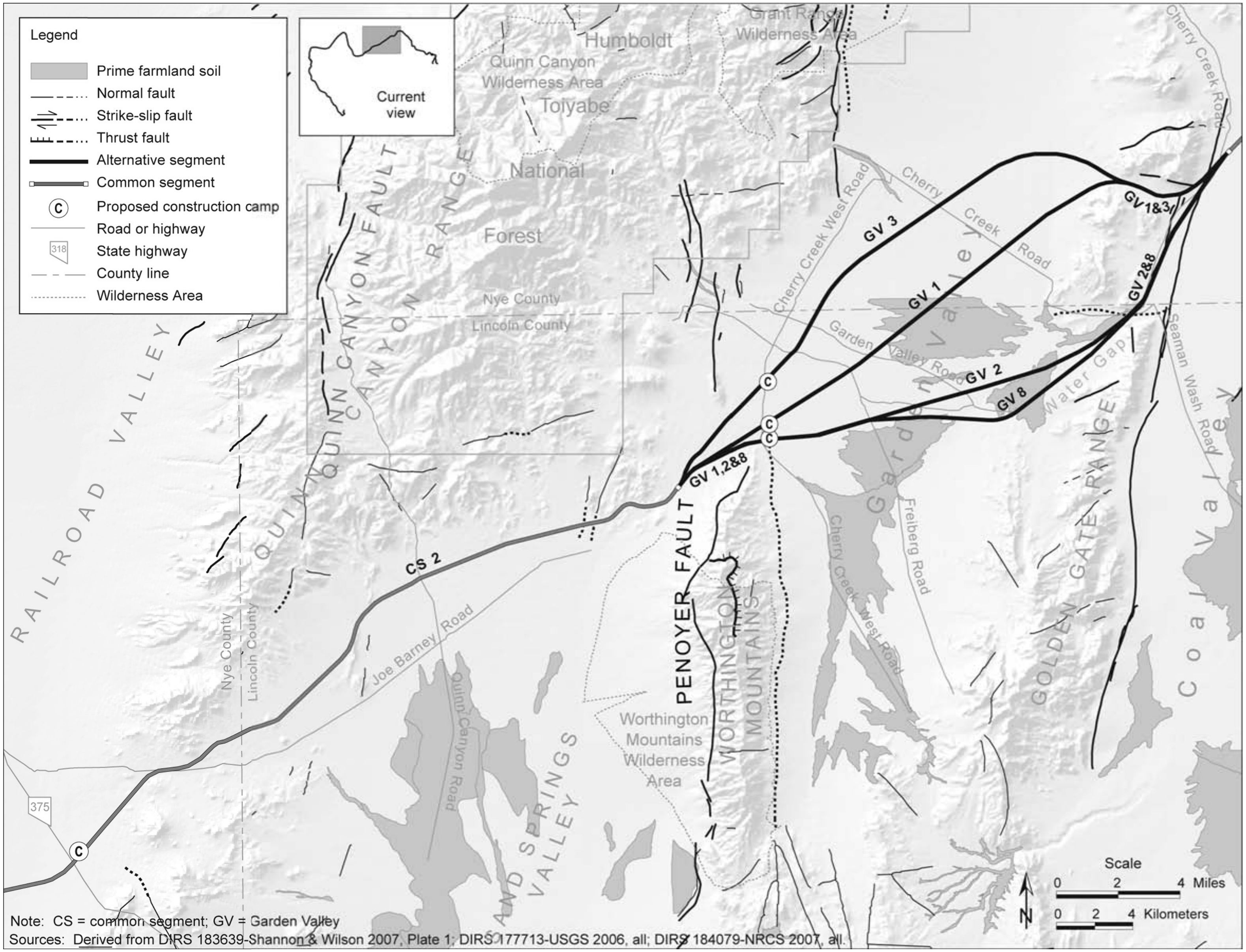


Figure 3-8. Physiographic features of common segments and alternative segments within map area 3.

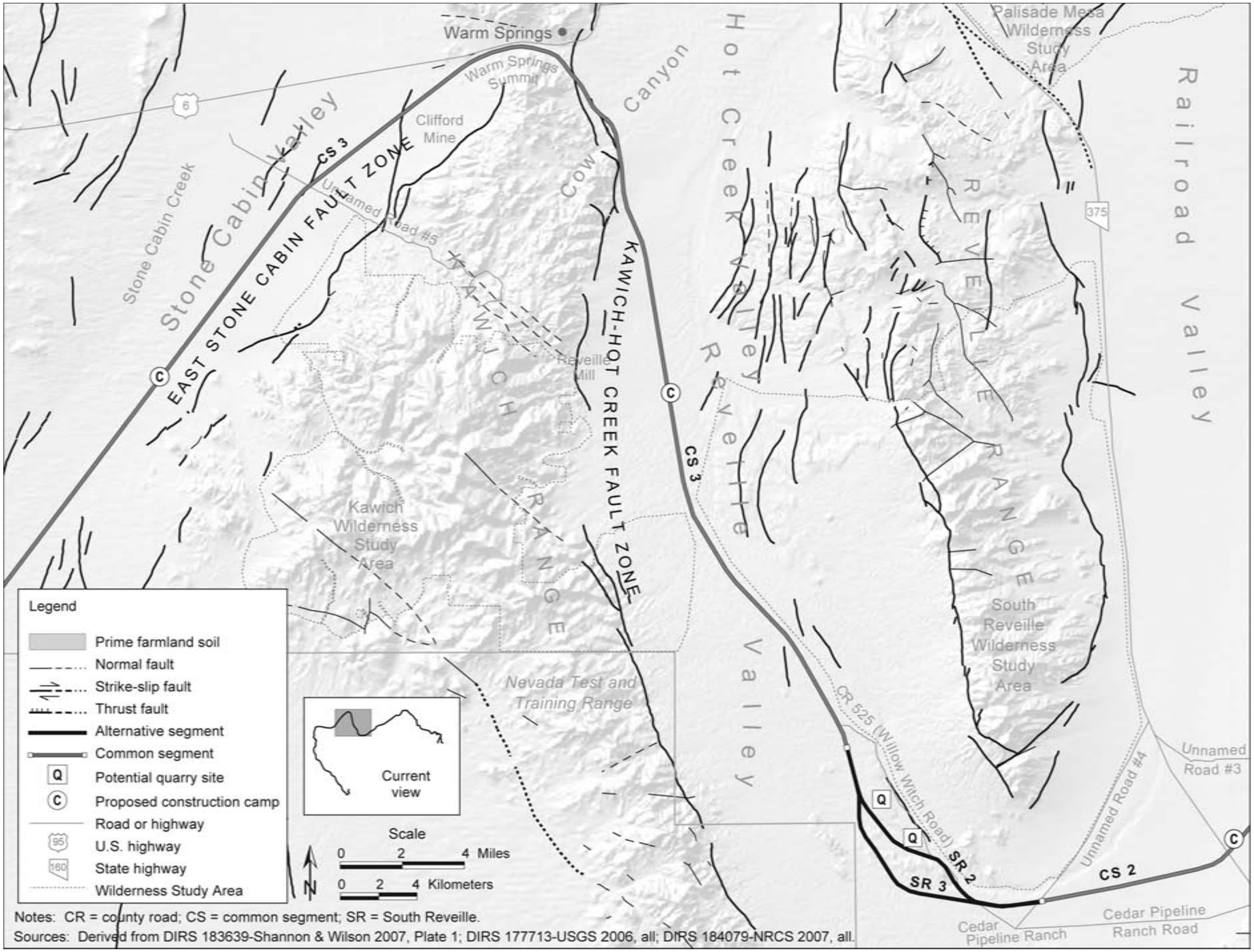


Figure 3-9. Physiographic features of common segments and alternative segments within map area 4.

3.2.1.3.5 *South Reveille Alternative Segments*

3.2.1.3.5.1 Physiography. South Reveille alternative segments 2 and 3 would enter Reveille Valley south of the Reveille Range (see Figure 3-9). The valley floor is relatively uniform, with elevations ranging from about 1,700 to 1,830 meters (5,700 to 6,000 feet) above mean sea level.

3.2.1.3.5.2 Geology. The South Reveille alternative segments would cross recent alluvium and volcanic flows. The alternative segments would not cross any Quaternary fault scarps, and there have been few earthquakes recorded in the area within the last 150 years. Recently, there has been some prospecting for gold and silver in the area around the alternative segments. However, there is a low potential for mineral resources in the area. Section 3.2.2, Land Use and Ownership, describes land uses, including mineral exploration. There are no known energy resources around the alternative segments.

Potential quarry NN-9A would be in the southern portion of Reveille Valley. The site would be about 32 to 48 kilometers (20 to 30 miles) from State Route 375, the nearest paved road. The quarry pit would mine a basalt ridge and the plant facilities would be in the valley below (DIRS 180922-Nevada Rail Partners 2007, Figure 3-D).

Potential quarry NN-9B also would be in the southern portion of Reveille Valley, about 2 kilometers (1.2 miles) southeast of the site of potential quarry NN-9A. The quarry pit would mine a separate basalt ridge, with the plant facilities in the valley below, next to the South Reveille alternative segment 2 rail ***siding*** (DIRS 180922-Nevada Rail Partners 2007, Figure 3-D).

3.2.1.3.5.3 Soils. South Reveille Valley is dominated by very thick, well-drained, fan piedmont soils. These soils are derived from volcanic breccia and tuff. Nineteen percent of the soils along South Reveille alternative segment 2 have soils with the erodes easily characteristic; 15 percent of the soils along South Reveille alternative segment 3 have that characteristic. Additionally, 6.3 percent of South Reveille alternative segment 2 soils have the blowing soils characteristic; South Reveille alternative segment 3 contains none. There are no prime farmland soils along either of the South Reveille alternative segments.

3.2.1.3.6 Caliente Common Segment 3 (Reveille Valley to Mud Lake)

3.2.1.3.6.1 Physiography. The physiography of Caliente common segment 3 is characterized, from east to west, by the Reveille Valley, Stone Cabin Valley, Cactus Flat, Ralston Valley, and Mud Lake (see Figures 3-9 and 3-10). The Reveille Range would border the common segment on the east. The Hot Creek Range (the extension of the Kawich Range north of Warm Springs Summit) would border this common segment to the north. Caliente common segment 3 would cross Cow Canyon near Warm Springs Summit. Warm Springs, a cluster of hot springs, discharges just east of Warm Springs Summit in the Kawich Range.

Rail alignment elevations would range from 1,650 to 1,900 meters (5,400 to 6,200 feet) above mean sea level at Warm Springs Summit and 1,600 to 1,700 meters (5,200 to 5,600 feet) above mean sea level around Mud Lake.

3.2.1.3.6.2 Geology. Caliente common segment 3 would cross the length of Reveille Valley. Reveille Valley, a ***graben*** (a basin formed between normal faults), developed from displacements along the West Reveille fault and the western Hot Creek Reveille fault. At Warm Springs Summit, the common segment would cross young volcanic rocks that make up most of the Kawich Range. Stone Cabin Valley, Cactus Flat, and Ralston Valley consist of Quaternary alluvial materials, with some playa deposits in the lowest elevations of northern Cactus Flat and southern Ralston Valley. Runoff in southern Ralston Valley flows to Mud Lake, another playa. Some Quaternary alluvial deposits in Reveille Valley have been displaced by these faults, indicating movement within the past 1.6 million years.

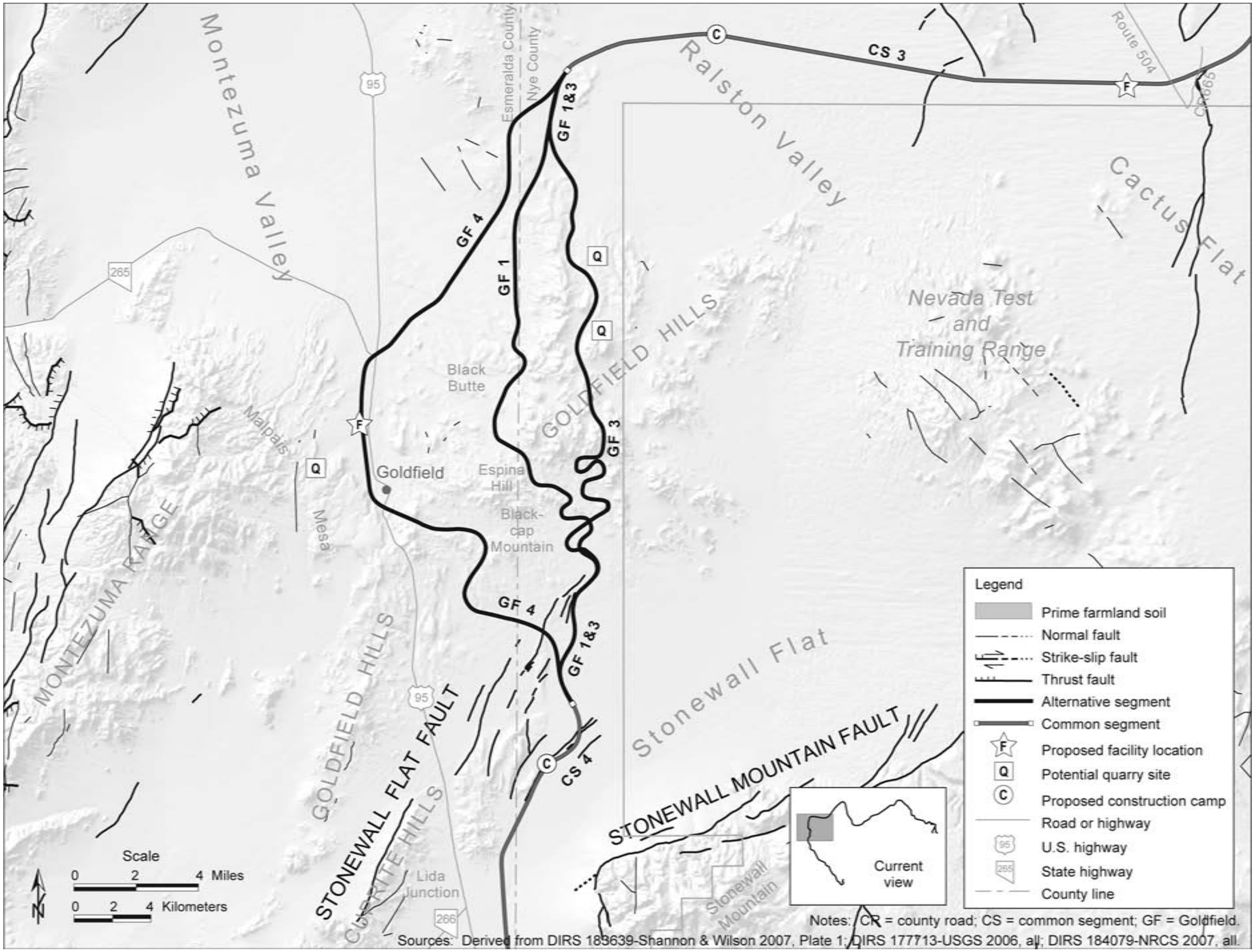


Figure 3-10. Physiographic features of common segments and alternative segments within map area 5.

Caliente common segment 3 would parallel the Kawich-Hot Creek fault zone along the eastern side of the Hot Creek and Kawich Ranges. Displacement along this fault has occurred throughout the Quaternary, most recently about 130,000 years ago (DIRS 177713-MO0607LFAFUS96.000, Fault Number 1355). The common segment would both parallel and cross the East Stone Cabin fault zone, which forms the northwestern border of the Kawich Range with Stone Cabin Valley (see Figure 3-9). The most recent movement along this fault was also about 130,000 years ago (DIRS 177713-MO0607LFAFUS96.000, Fault Number 1354).

There are several commercial minerals found in the area around Caliente common segment 3 (DIRS 183644-Shannon & Wilson 2007, Plate 1). The Warm Springs summit area has documented sources of gold, silver, base metals, barite, and turquoise. As described in Section 3.2.2, Land Use and Ownership, there are also several mining districts in the area. There are also hot springs in the Warm Springs Summit area. Other than gravel and alluvial materials present on the floor of Stone Cabin Valley, Cactus Flat, and Ralston Valley, Caliente common segment 3 would not cross any known commercial mineral deposits.

3.2.1.3.6.3 Soils. Soils along Caliente common segment 3 occur on alluvial fan remnants, skirts, piedmonts, and in the eastern portion, on alluvial flats (DIRS 184079-Natural Resources Conservation Service 2007, all). They are derived from various sources, including wind-blown sand, mixed alluvium, and fine-grained playa deposits.

Soils with the erodes easily characteristic comprise about 17 percent of the soils, and soils with the blowing soil characteristic comprise about 32 percent of the soils (see Table 3-3). As part of the pre-construction process, stability tests would ensure that fine-grained playa soils would be suitable for construction. The proposed rail alignment would not cross any soils considered to be prime farmland.

3.2.1.3.7 Goldfield Alternative Segments

3.2.1.3.7.1 Physiography. The physiography of the Goldfield area is dominated by the Goldfield Hills (see Figure 3-10) and the extensive surface and underground mine workings associated with the mining district. The Goldfield area also includes part of the Mud Lake basin to the north and Montezuma Valley and Malpais Mesa to the west. There are several prominent hills, ridges, and plateaus in the area, which the Goldfield alternative segments would either cross or go around. The central Goldfield alternative segment, Goldfield 1, would wind through the central part of Goldfield Hills, coming within about 1.9 kilometers (1.2 miles) of Black Butte, Espina Hill, and Blackcap Mountain. Goldfield alternative segments 3 and 4 would weave through the western section of the Goldfield Hills, using passes and valleys to maintain an appropriate ***grade*** (see Figure 3-10). The alternative segments would reach elevations ranging from 1,800 to 1,900 meters (6,000 feet to 6,200 feet) above mean sea level.

If DOE were to select Goldfield alternative segment 1 or 3, then it would construct a Maintenance-of-Way Headquarters Facility south of Tonopah and a Maintenance-of-Way Trackside Facility along Caliente common segment 3. If DOE were to select Goldfield alternative segment 4, then it would construct a single Maintenance-of-Way Facility along Goldfield alternative segment 4, north of Goldfield.

3.2.1.3.7.2 Geology. In the Goldfield area, the principal outcrops consist of young volcanic rocks. A combination of heat, water, and fractures in the bedrock contributed to the alteration and mineralization of the area's volcanic rocks. This has resulted in an area with metallic mineral deposits (DIRS 183644-Shannon & Wilson 2007, pp. 66 to 69). The Goldfield Mining District has been extensively mined for gold, silver, and copper ore since the early 1900s. Nonmetallic minerals such as zeolite are also found in the area. Section 3.2.2, Land Use and Ownership, describes the local mining districts. There are no geothermal or other energy resources near the Goldfield alternative segments.

Potential quarry NS-3A would be on the basalt hills and surrounding valley northeast of Goldfield along Goldfield alternative segment 3. The quarry pit would encompass two hills on either side of a wash, with the plant facilities located in the valley below. Potential quarry NS-3B would be next to the site of NS-3A along Goldfield alternative segment 3 in a valley flanked by hills. The quarry pit would be adjacent to the rail alignment, and the plant facility would be to the east in the valley (DIRS 180922-Nevada Rail Partners 2007, Figure 3-E). Potential quarry ES-7 would be on Malpais Mesa, west of Goldfield along Goldfield alternative segment 4 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-F).

All of the Goldfield alternative segments would cross the northeastern edge of the Stonewall Flat fault zone. These faults offset bedrock in the Cuprite Hills, and are generally not well understood. The last fault movement was calculated to have occurred within the last 130,000 years (DIRS 177713-MO0607LFAFUS96.000, Fault Number 1089).

3.2.1.3.7.3 Soils. Soils along the Goldfield alternative segments include those derived from loose volcanic rock alluvium (DIRS 184079-Natural Resources Conservation Service 2007, all). This area has well drained to excessively drained soils on mountains, hills, and fan piedmonts.

Soils with the blowing soil characteristic range from about 7.7 percent along Goldfield alternative segment 4 to 9.5 percent along Goldfield alternative segment 3; there are no soils with the erodes easily characteristic along any of the Goldfield alternative segments (see Table 3-3). None of the Goldfield alternative segments would cross prime farmland soils.

3.2.1.3.8 *Caliente Common Segment 4 (Stonewall Flat Area)*

3.2.1.3.8.1 Physiography. The physiography of Caliente common segment 4 is characterized by Stonewall Flat and Lida Valley, both depressions with numerous alkali flats (see Figures 3-10 and 3-11), and elevations between 1,400 and 1,500 meters (4,700 and 4,900 feet) above mean sea level. Stonewall Mountain is also a prominent feature that borders the common segment on the east.

3.2.1.3.8.2 Geology. In Stonewall Flat, a graben formed in part by the northeast-trending Stonewall Mountain Fault, Caliente common segment 4 would mostly cross fan and stream-channel alluvium, in addition to a small outcrop of volcanic rocks of Stonewall Mountain (DIRS 182854-Shannon & Wilson 2006, Table 5). There has been some seismic activity around the Cuprite Hills and at Stonewall Mountain within the past 150 years (see Figure 3-3).

There are metallic minerals, including copper, silver, and gold, along this common segment. The deposits occur in sedimentary and volcanic rocks that have been altered by hot fluids. Quartz veins are also mined for silica. Drilling in the Cuprite Hills suggests the existence of a large geothermal system in the area, with multiple warm heat-flow wells drilled in the Cuprite Hills (DIRS 183644-Shannon & Wilson 2007, Plate 1). Except for alluvium, there are no construction materials along the common segment.

3.2.1.3.8.3 Soils. Soils along Caliente common segment 4 are derived from alluvium and occur on fan piedmonts, fan skirts, and drainage ways (DIRS 184079-Natural Resources Conservation Service 2007, all). Soils with the blowing soil characteristic comprise 1.4 percent of the soils along this common segment. Soils with the erodes easily characteristic comprise about 41 percent of the soils. Caliente common segment 4 would not cross any prime farmland soils.

3.2.1.3.9 *Bonnie Claire Alternative Segments*

3.2.1.3.9.1 Physiography. The physiography of the Bonnie Claire area is characterized by the southern boundary of Lida Valley and the northern portion of Sarcobatus Flat, which are depressions with numerous alkali flats. Pahute Mesa would be to the east of the alternative segments; Stonewall Mountain

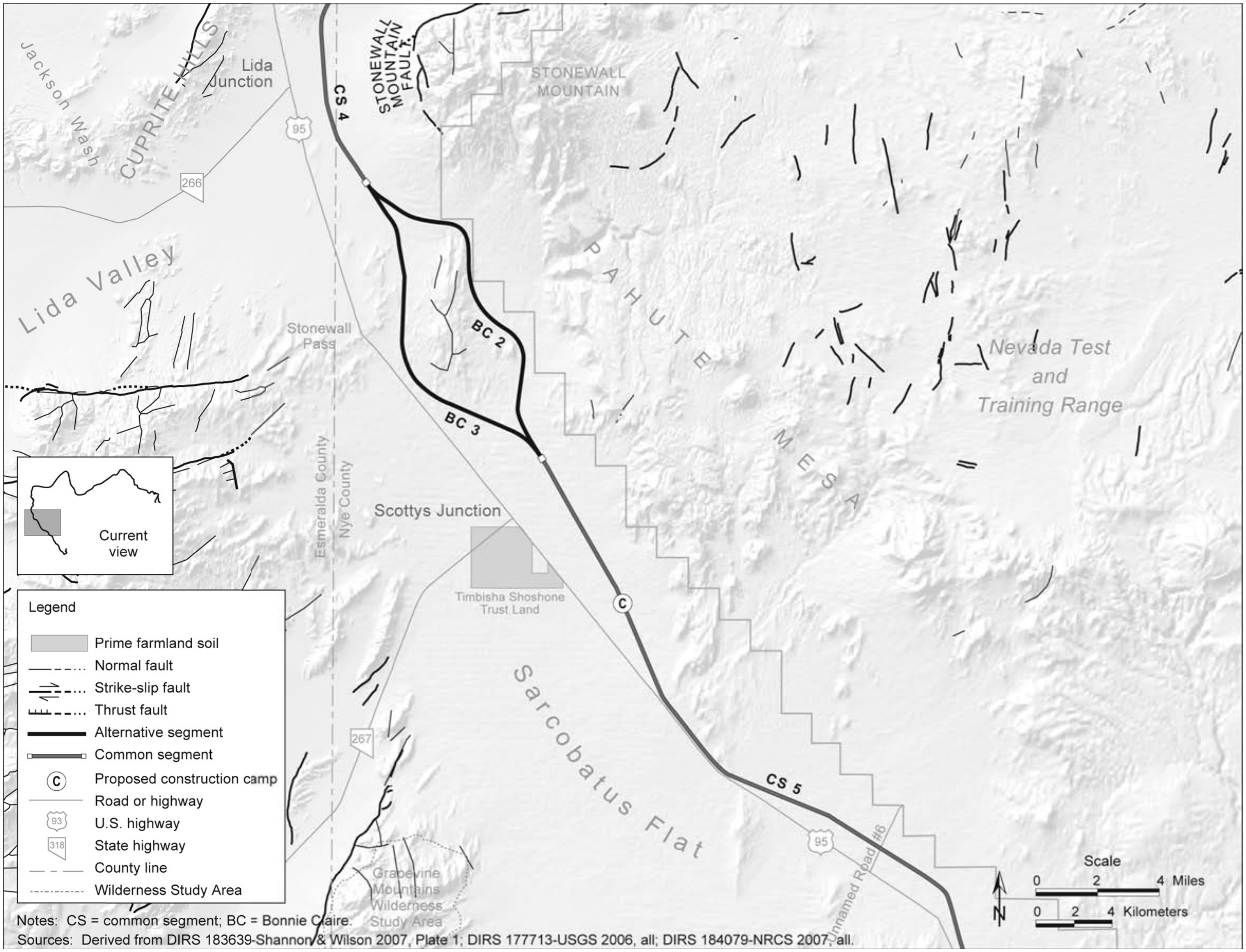


Figure 3-11. Physiographic features of common segments and alternative segments within map area 6.

would be to the northeast (see Figure 3-11). Bonnie Claire alternative segment 2 would pass to the east of an unnamed 1,500-meter (4,900-foot)-high bedrock knoll that separates Sarcobatus Flat and Lida Valley; Bonnie Claire alternative segment 3 would pass this knoll to the west (DIRS 182854-Shannon & Wilson 2006, Figure 3, Sheet 57). Elevations in this area range from about 1,250 to 1,400 meters (4,100 to 4,600 feet) above mean sea level.

3.2.1.3.9.2 Geology. The Bonnie Claire alternative segments would cross the eastern portion of the southwestern Nevada volcanic field. Bonnie Claire 3 would cross a mixture of young volcanic rocks and ash-flow sedimentary rocks, while Bonnie Claire 2 would primarily cross alluvium on the western edge of Sarcobatus Flat (DIRS 182854-Shannon & Wilson 2006, Table 5).

The two alternative segments would bypass a sequence of interconnected unnamed faults. These faults are not well studied, although recent seismic activity has been recorded in the area. In 1999, there was a magnitude 5.3 earthquake in the area between the Bonnie Claire alternative segments. As seen in Figure 3-3, many aftershocks were recorded in the area, most between magnitudes 2.0 and 3.5. Since then, earthquakes immediately around the Bonnie Claire alternative segments have been below magnitude 3.0 (DIRS 183639-Shannon & Wilson 2007, Plate 4).

Metallic minerals such as gold and copper have been found within the volcanic rocks around the Bonnie Claire alternative segments. The Wagner Mining District is in this area, and is discussed in more detail in Section 3.2.2, Land Use and Ownership.

There are no energy or geothermal resources in the area surrounding the Bonnie Claire alternative segments, and other than gravel and alluvial materials present on the floor of Lida Valley, the Bonnie Claire alternative segments would not cross any known mineral deposits.

3.2.1.3.9.3 Soils. Soils along Bonnie Claire alternative segments 2 and 3 are derived from alluvium and ***colluvium***, and are found on hills, alluvial fan piedmonts, and fan skirts. Soils are mainly identified for Bonnie Claire alternative segment 3, because soil data are not available for the area around the Nevada Test and Training Range.

Soils with the erodes easily characteristic comprise 27 and 25 percent of the soils for Bonnie Claire alternative segments 2 and 3, respectively. Available data do not indicate any soils with the blowing soil or prime farmland characteristic.

3.2.1.3.10 Common Segment 5 (Sarcobatus Flat Area)

3.2.1.3.10.1 Physiography. The physiography of common segment 5 consists of most of Sarcobatus Flat. Pahute Mesa would be to the northeast (see Figure 3-11). Coba Mountain is a prominent feature in the area, and extends from common segment 5 to the southwest (see Figure 3-12). Rail alignment elevations in the Sarcobatus Flat area would range from 1,200 to 1,250 meters (3,900 feet to 4,100 feet) above mean sea level.

3.2.1.3.10.2 Geology. Common segment 5 would cross Quaternary alluvium and mid-Tertiary ash-flow tuffs, minor lava flows, and reworked materials associated with the southwestern Nevada volcanic field. The common segment would not cross Quaternary faults (see Figures 3-11 and 3-12). Commercial minerals found within the area include gold and silver (DIRS 183644-Shannon & Wilson 2007, pp. 49 to 51). Additionally, an actively mined, relatively large gravel pit at the alluvial fan boundary between Pahute Mesa and Sarcobatus Flat would be within 0.8 kilometer (0.5 mile) of the rail alignment in this area.

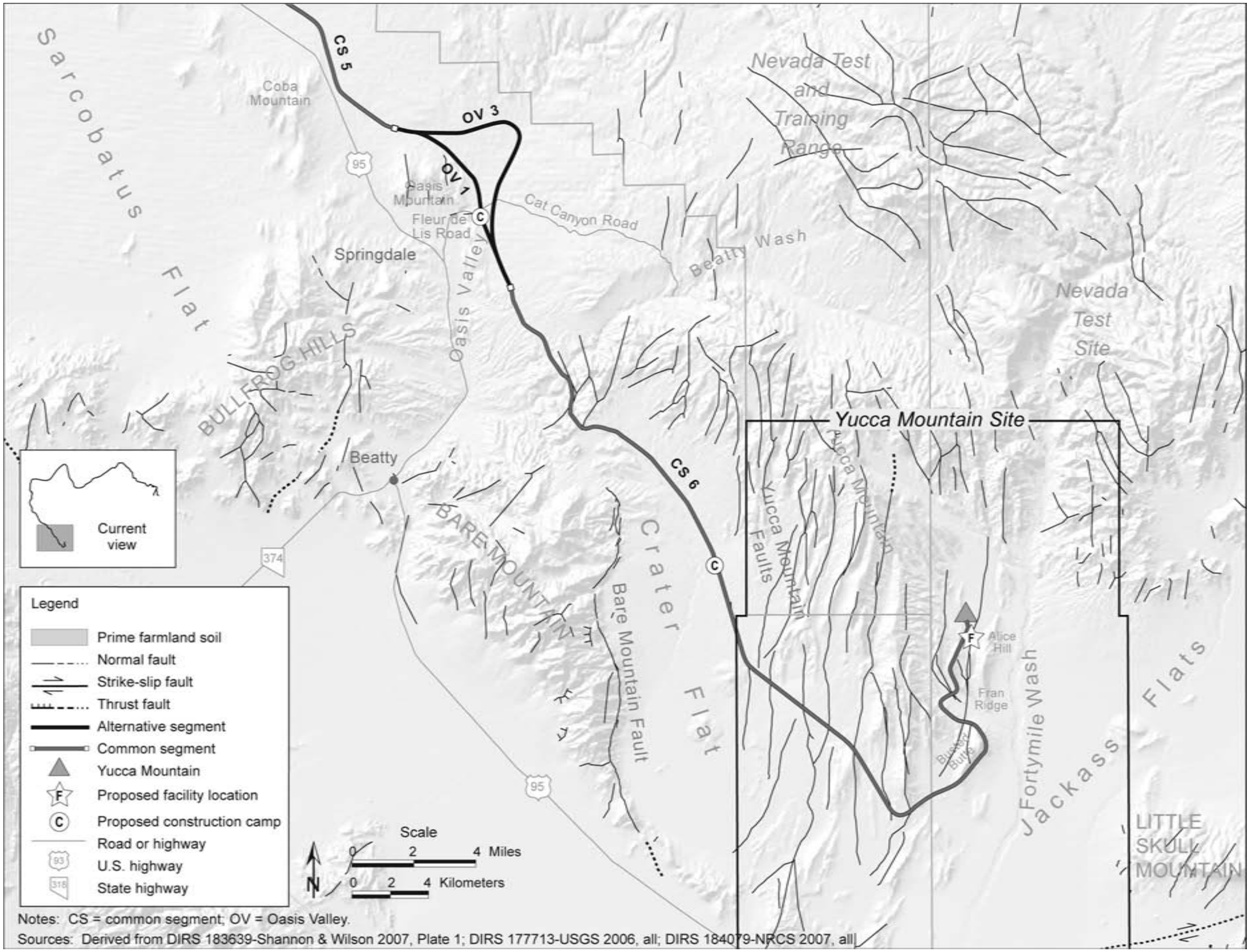


Figure 3-12. Physiographic features of common segments and alternative segments within map area 7.

Geothermal occurrences in Sarcobatus Valley include one warm spring and one hot well, which would be about 0.20 kilometer (0.12 mile) from the rail alignment.

3.2.1.3.10.3 Soils. Area soils are derived from alluvial deposits and are well drained. They occur on alluvial flats and fan piedmonts. Soils with the blowing soil characteristic comprise about 2.6 percent of the soils. There are no soils along common segment 5 with the erodes easily or prime farmland characteristics.

3.2.1.3.11 *Oasis Valley Alternative Segments*

3.2.1.3.11.1 Physiography. Oasis Valley alternative segments 1 and 3 would be in Oasis Valley, which is incised by the Amargosa River, an ***ephemeral stream***, and tributary washes (see Figure 3-12). Elevations range from about 1,200 to 1,300 meters (3,900 to 4,200 feet) above mean sea level. At the northwest end, the alternative segments would cross alluvial fans extending from Pahute Mesa on the north and Oasis Mountain (in Bullfrog Hills) on the south.

3.2.1.3.11.2 Geology. The two Oasis Valley alternative segments would cross sedimentary rocks overlain in part by recent sediment from alluvial fans and Amargosa River floodplain deposits. Small outcrops of young volcanic rocks from the southwestern Nevada volcanic field area are also exposed. The rail alignment would not cross Quaternary faults, commercial mineral operations, geothermal resources or materials suitable for construction purposes.

3.2.1.3.11.3 Soils. Soils along Oasis Valley alternative segments 1 and 3 are derived from alluvium and are well drained to somewhat excessively drained. Soils occur on fan skirts and fan piedmonts. Oasis Valley 1 contains approximately 13 percent soils with the blowing soil characteristic, while Oasis Valley 3 contains approximately 4.8 percent of blowing soils. There are no prime farmland or erodes easily soils along either of the Oasis Valley alternative segments.

3.2.1.3.12 Common Segment 6 (Yucca Mountain Approach)

3.2.1.3.12.1 Physiography. The physiography of common segment 6 is characterized by Beatty Wash, Crater Flat, and several ridges and valleys that make up Yucca Mountain, Busted Butte, and Jackass Flats (see Figure 3-12). The common segment would go around the east side of Busted Butte, with Fortymile Wash and most of Jackass Flats to the east. North of Busted Butte, it would cross a series of washes and valleys flanked by multiple ridges, where it would terminate near Yucca Mountain. Rail alignment elevations would range from about 1,300 meters (4,300 feet) at Tram Ridge to 1,000 meters (3,300 feet) above mean sea level at the base of Busted Butte (DIRS 182854-Shannon & Wilson 2006, Figure 3, Sheets 70 and 71).

3.2.1.3.12.2 Geology. This area is in the southern edge of the southwestern Nevada volcanic field. Common segment 6 would cross a variety of alluvial deposits and sedimentary rocks, and young volcanic rocks. Faults in the area increase in number closer to the Yucca Mountain uplands. The fault traces generally trend to the north, including the Bare Mountain Fault and the eastern and western Yucca Mountain fault groups. Displacements along faults are characterized in terms of the amount of movement per seismic event. For the set of block-bounding faults of primary significance to the ***Yucca Mountain Site***, these surface values range from 0 to 1.7 meters (0 to 5.6 feet) per event (DIRS 155970-DOE 2002, Table 3-8).

DOE has monitored seismic activity at the Nevada Test Site since 1978. The largest recorded earthquake within 50 kilometers (30 miles) of Yucca Mountain was the Little Skull Mountain earthquake in 1992 (DIRS 169734-BSC 2004, p. 4-34 and Figure 4-19), which had a magnitude of 5.6 (DIRS 169734-BSC 2004, p. 4-38). DOE buildings on the Nevada Test Site were damaged and there was also damage in

Beatty, Town of Amargosa Valley, and Mercury, Nevada. DOE would continue to monitor the seismic activity around Yucca Mountain with an array of monitoring stations spread throughout the area.

The bedrock around common segment 6 contains metallic minerals, such as gold and silver, and nonmetallic deposits, including fluorspar and silica (DIRS 183644-Shannon & Wilson 2006, pp. 41 to 45). There are also several hot springs around the Beatty Wash area, some of which are used by a hotel (DIRS 183644-Shannon & Wilson 2006, Plate 1).

3.2.1.3.12.3 Soils. Soils along common segment 6 occur on fan piedmonts, skirts, and fan remnants. The soils derived from Tertiary volcanic rocks and Quaternary alluvium are well drained to somewhat excessively drained. Soils on alluvial flats are derived from lake deposits and are well drained. None of the soils along common segment 6 contain prime farmland, blowing soil, or soils with the erodes easily characteristic.

3.2.2 LAND USE AND OWNERSHIP

This section describes the affected environment for land use and ownership along and adjacent to the Caliente rail alignment. At the recommendation of the U.S. Bureau of Land Management (BLM; a cooperating agency in the preparation of this Rail Alignment EIS), DOE organized this section by types of land uses rather than by rail line segments to enable the reader to quickly review issues of concern to them. The section provides an overview of land uses on private, American Indian, and public lands. The BLM and DOE manage public land the Caliente rail alignment would cross. The uses of public land discussed in detail in this section include grazing (within BLM-designated ***grazing allotments***), mineral and energy extraction, and recreation. This section also discusses land access and existing utility rights-of-way. Based on the construction right-of-way of the longest possible Caliente rail alignment, the BLM manages 157.3 square kilometers (38,800 acres) of the land the rail line would cross, DOE manages 4.1 square kilometers (1,020 acres), and up to 0.78 square kilometer (190 acres) is privately owned.

Section 3.2.2.1 describes the region of influence for land use and ownership; Section 3.2.2.2 describes private land, including relevant land-use plans; Section 3.2.2.3 describes American Indian land; Section 3.2.2.4 describes public lands, BLM ***resource management plans***, and project-related land ***withdrawals***; and Section 3.2.2.5 describes the general environmental setting and land-use characteristics along the Caliente rail alignment.

Other sections of this Rail Alignment EIS describe additional subjects related to land use. Section 3.2.1, Physical Setting, describes farmland and prime farmland in more detail; Section 3.2.7, Biological Resources, describes ***herd management areas***; and Section 3.2.11, Utilities, Energy, and Materials, addresses utilities. Section 3.4 describes American Indian interests in and views on the Proposed Action.

3.2.2.1 Region of Influence

The region of influence for land use and ownership is the width of the rail line construction right-of-way, and includes all private land (including patented ***mining claims***), American Indian lands, and public land that would be fully or partially within the construction right-of-way. The land use and ownership region of influence also includes the locations of proposed railroad construction and operations support facilities outside the nominal width of the rail line construction right-of-way.

Although the nominal width of the railroad ***operations right-of-way*** would be narrower than the nominal width of the construction right-of-way, DOE evaluated the construction right-of-way as the basis for identifying potential land-use impacts because:

- It provides a more conservative estimate of the amount of land that would be utilized than the operations right-of-way, providing an upper bound for analysis.
- The construction phase encompasses the most intensive land use in terms of noise, human activity, and disruptions to land access.
- The construction footprint would be the basis for the initial right-of-way applications submitted to the BLM for the project.

3.2.2.2 Private Land

Private lands in Lincoln, Nye, and Esmeralda Counties are either clustered in towns and along highways, or they are widely scattered. Private land makes up a very small portion of these counties. Figure 3-13 provides an overview of privately owned lands near the Caliente rail alignment.

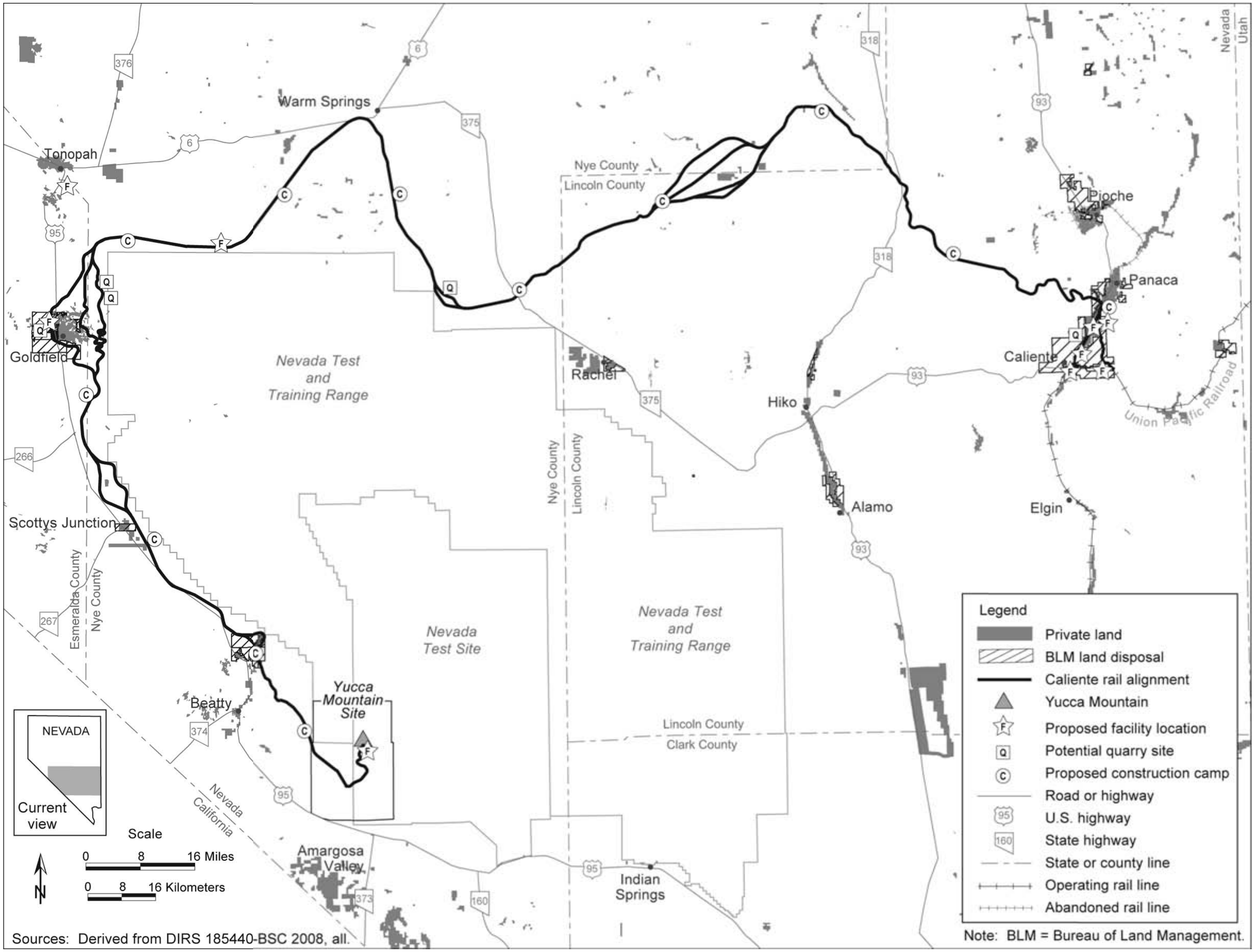


Figure 3-13. Private land along the Caliente rail alignment.

3.2.2.2.1 County Land-Use Plans

The Caliente rail alignment would cross parts of Lincoln, Nye, and Esmeralda Counties. County plans that affect land use along the rail alignment include the *Lincoln County Master Plan* (DIRS 185538-Lincoln County 2007, all), *Nye County Comprehensive Plan* (DIRS 147994-McRae 1994, all), and *Esmeralda County Master Plan* (DIRS 176770-Duval et al. 1976, all).

3.2.2.2.1.1 Lincoln County. The *Lincoln County Master Plan* guides the county's growth, management of natural resources, provisions for public services and facilities, and the protection of public health, safety, and welfare. Lincoln County is the third largest county in Nevada, covering approximately 28,000 square kilometers (10,650 square miles), and the Federal Government manages more than 97 percent of that land (DIRS 185538-Lincoln County 2007, p. 7). The BLM manages most public land in the county; the U.S. Forest Service manages the portions of the Humboldt-Toiyabe National Forest that fall within the county. Lincoln County is primarily rural and most residents live in Pioche (also the county seat), Panaca, Alamo, the City of Caliente, and the communities of Rachel, Hiko, Ash Springs, Richardville, Caselton, and Ursine. The rest of Lincoln County is sparsely settled.

3.2.2.2.1.2 Nye County. Nye County has an area of approximately 47,000 square kilometers (18,000 square miles) and is the largest county in Nevada. The Federal Government manages almost 93 percent of the county's land. Federally owned or managed lands in Nye County include the Nevada Test and Training Range, the Nevada Test Site, BLM-administered public land, a portion of Death Valley National Park, and portions of the Humboldt-Toiyabe National Forest. Private lands in Nye County are used for residential, commercial, and industrial purposes largely, but not exclusively, within the boundaries of unincorporated towns, and agricultural and mining uses both inside and outside these towns. The *Nye County Comprehensive Plan* guides growth and development, but is not equivalent to a zoning ordinance, nor does it regulate the use of land. However, the Nye County Board of Commissioners may choose to enact a zoning ordinance or other growth-management mechanisms to accomplish certain objectives of the plan. The plan also serves as a framework for local land-use plans and other growth-management mechanisms (DIRS 147994-McRae 1994, all).

3.2.2.2.1.3 Esmeralda County. The BLM manages more than 92 percent of the approximately 9,300 square kilometers (3,600 square miles) in Esmeralda County. Two percent of the land in Esmeralda County is national forest land, and a small portion of the county falls within Death Valley National Park. Less than 5 percent of the land in the county is privately owned. The two most heavily populated areas in Esmeralda County at the issuance of the *Esmeralda County Master Plan* were Goldfield and Silver Peak (DIRS 176770-Duval et al. 1976, p. 25). Goldfield is the county seat for Esmeralda County; there are no incorporated cities in the county. Under the *Esmeralda County Master Plan*, land use has been divided into three basic categories: multiple use, agriculture, and urban expansion. The multiple-use category is suggested for those areas where federal or state ownership is expected to remain. Grazing, mining and prospecting, and recreation activities are recommended under the multiple-use concept. The plan also recommends that residential and commercial development be concentrated in the existing communities of Goldfield and Silver Peak, where public facilities can be most economically concentrated (DIRS 176770-Duval et al. 1976, p. 73).

3.2.2.2.2 Local Land-Use Planning

The initial design phase for the Caliente rail alignment emphasized avoiding towns and populated areas wherever feasible. Caliente and Goldfield are the most densely populated places along the Caliente rail alignment. Zoning and land use within Caliente is governed by the *City of Caliente Master Plan* (Caliente Master Plan) (DIRS 157312-Sweetwater and Anderson 1992, all). Goldfield does not have a master plan or zoning plan.

3.2.2.2.2.1 City of Caliente. The Caliente alternative segment would pass through the City of Caliente, which is in Lincoln County along U.S. Highway 93. The City of Caliente encompasses approximately 5.5 square kilometers (1.9 square miles) (DIRS 176855-U.S. Census Bureau 2003, p. 5). City services include restaurants, gas stations, motels, a small casino, and a variety of stores. Land uses within the City of Caliente include residential, governmental (administrative), commercial, industrial, agricultural, and recreational.

Commercial and industrial uses comprise approximately 11 percent of the land use and residential areas encompass approximately 9 percent of the land in the city (DIRS 157312-Sweetwater and Anderson 1992, p. 27). There are agricultural operations on approximately 0.3 square kilometer (80 acres) of land (approximately 8 percent) within Caliente, primarily within floodplains (DIRS 157312-Sweetwater and Anderson 1992, p. 24). Roads and utilities make up approximately 17 percent of land use in Caliente. Though vacant land occupies approximately 44 percent of the city land base, steep slopes and floodplains have limited the city's development potential.

Union Pacific Railroad Mainline tracks (Caliente Line) cross Caliente in approximately a northeast to south direction. Caliente has long been a central maintenance and switching center for railroad operations. The Caliente Line, at full capacity, operates 25 to 30 trains a day (DIRS 176807-Union Pacific 2005, all).

The Caliente Master Plan outlines strategies for both steady and rapid growth. Overall the plan fosters the following key development concepts (DIRS 157312-Sweetwater and Anderson 1992, p. 49):

- Caliente's role will continue to be residential, with tourism, the service industry, the [existing] railroad, and associated activities as primary economic activities.
- Residential expansion should occur primarily on open land to the north of U.S. Highway 93 (toward the cemetery) and should be predominantly single-family.
- The existing commercial core should be rehabilitated and continue as the commercial hub of Caliente.
- Small-scale, clean industrial uses should be promoted. A large site for major economic centers should be located north of the city out of the mouth of Antelope Canyon.
- Caliente should develop and improve recreational and tourist attractions.

One goal outlined in the master plan that could be specifically relevant to the Caliente rail alignment because it addresses rail operations is (DIRS 157312-Sweetwater and Anderson 1992, p. 54):

> If Caliente is to be a distribution point for goods brought into the county, trains should be switched onto the Pioche Spur Line and materials unloaded at a location north of the City. This will reduce disruption to the community due to noise, traffic, dust, or trains blocking the vehicle crossing.

The *Lincoln County Master Plan* states that the NTS Development Corporation is cooperating with the City of Caliente in the development of the Meadow Valley Industrial Park, to be located along U.S. Highway 93 and the Union Pacific Railroad in Caliente (DIRS 185538-Lincoln County 2007, p. 51).

The City of Caliente has an undated zoning map developed by Design Concepts West showing zones for residential areas, administrative and professional areas, commercial areas, industrial areas, and parks and recreational areas. Most of the land adjacent to the Union Pacific Railroad tracks is zoned general commercial or industrial. There are exceptions adjacent to the former Pioche and Prince Branchline north of the Caliente Hot Springs, where the Lincoln County Hospital, senior citizens apartments, and a trailer court are immediately west of U.S. Highway 93. There is no zoning designation for the land that encompasses the former Pioche and Prince Branch (DIRS 180121-DC West [n.d.], all).

3.2.2.2.2.2 Goldfield. Goldfield alternative segment 4 would pass through Goldfield. Goldfield, an unincorporated town, is the county seat for Esmeralda County. The Goldfield census county division encompasses an area of more than 3,900 square kilometers (1,500 square miles) (DIRS 176855-U.S. Census Bureau 2003, p. 5). During its most prominent mining period at the beginning of the 20th century, a number of passenger and freight railroad lines served Goldfield. The Goldfield Historic District, listed on the *National Register of Historic Places* in 1982 and entered onto the *Nevada State Register of Historic Places* on December 7, 2005, is in Goldfield and roughly bounded by Fifth Street, Miner Avenue, Spring Street, Elliot Street, and Crystal Avenue (DIRS 176854-National Register of Historic Places 1982, all). Although there is no zoning plan for Goldfield, the historic nature of its buildings and features are generally protected by the designation of its historic district. The Goldfield Historic District would be about 0.7 kilometer (0.4 mile) northwest of the Goldfield alternative segment 4 construction right-of-way.

3.2.2.2.3 Private Parcels

Most of the privately owned lands closest to the Caliente rail alignment are in or near Caliente and Goldfield. Figure 3-13 shows privately owned lands in or near the Caliente rail alignment. Note that patented mining claims are also private land, and are reflected in this private land information.

Table 3-4 lists the number of privately owned parcels of land that would be within the construction right-of-way of each Caliente alternative segment and common segment. Figures 3-14 through 3-25 show privately owned land along the Caliente rail alignment. Figures 3-15 through 3-19 show detailed land parcel maps for the Caliente and Eccles alternative segments.

3.2.2.2.4 Pioche and Prince Branchline

There is an abandoned rail line from the former Union Pacific Railroad, Pioche and Prince Branchline in Caliente, which runs north generally parallel to U.S. Highway 93 (see Figure 3-14). The Union Pacific

Table 3-4. Private land that would be within or intersect the Caliente rail alignment construction right-of-way.

Rail line segment[a]	Number of parcels	Total area across parcels (acres)[b]
Eccles alternative segment	At least 5[c]	74[c]
Caliente alternative segment	30[c]	160[c]
Potential quarry CA-8B – Indian Cove option	3	39
Potential quarry CA-8B – Upland option	2	49
Staging Yard at Caliente-Indian Cove	6	180
Staging Yard at Caliente-Upland	17	110
Goldfield alternative segment 1[d]	At least 2 patented mining claims	150
Goldfield alternative segment 3[d]	2 patented mining claims	46
Goldfield alternative segment 4[e]	33 plus at least 2 patented mining claims	120
Oasis Valley alternative segment 1	2	0.9

a. No other segments would intersect private land.
b. To convert acres to square kilometers, multiply by 0.0040469.
c. Includes land located in former Pioche and Prince Branchline existing right-of-way.
d. All parcels are patented mining claims.
e. Four of the parcels are patented mining claims.

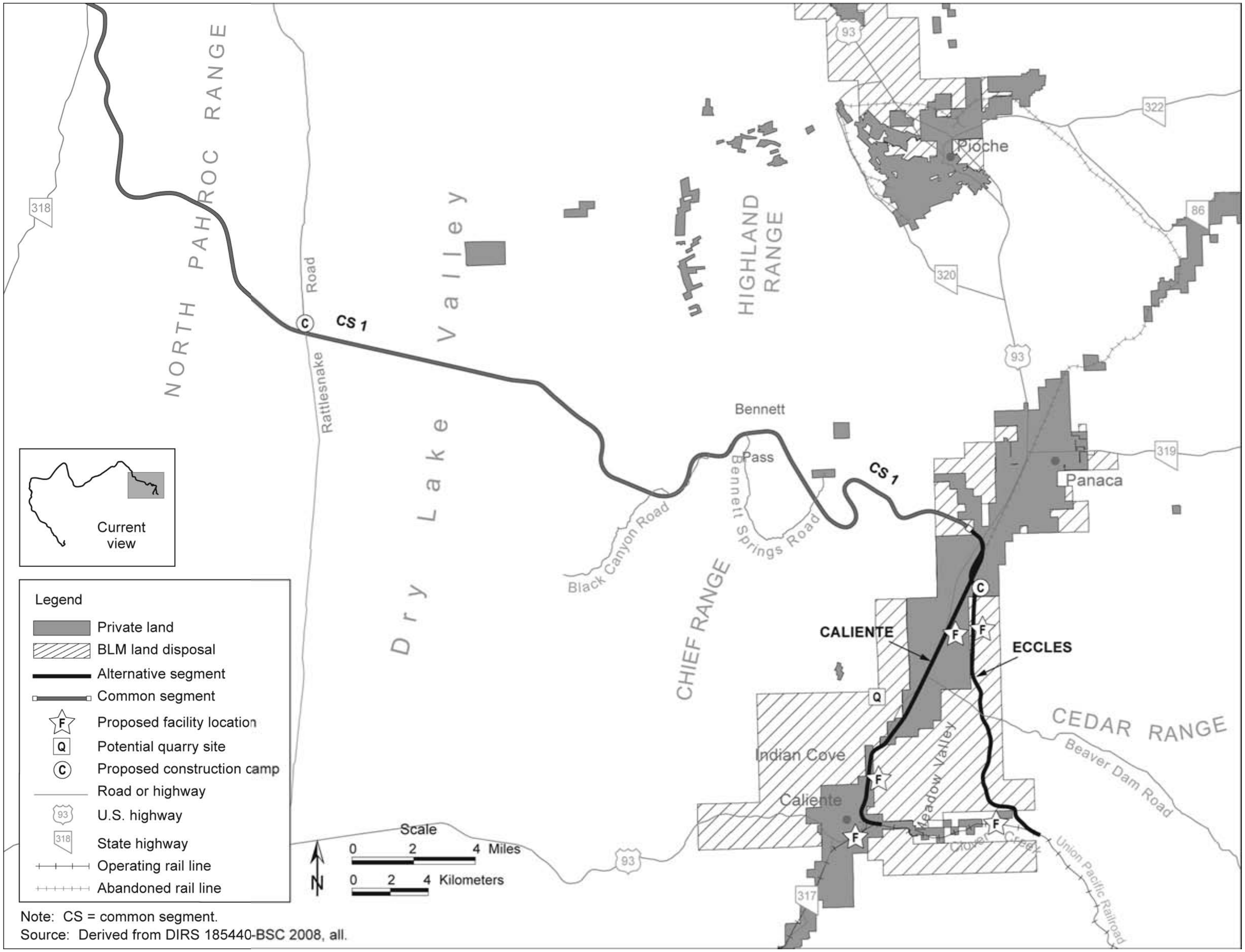


Figure 3-14. Private land within map area 1.

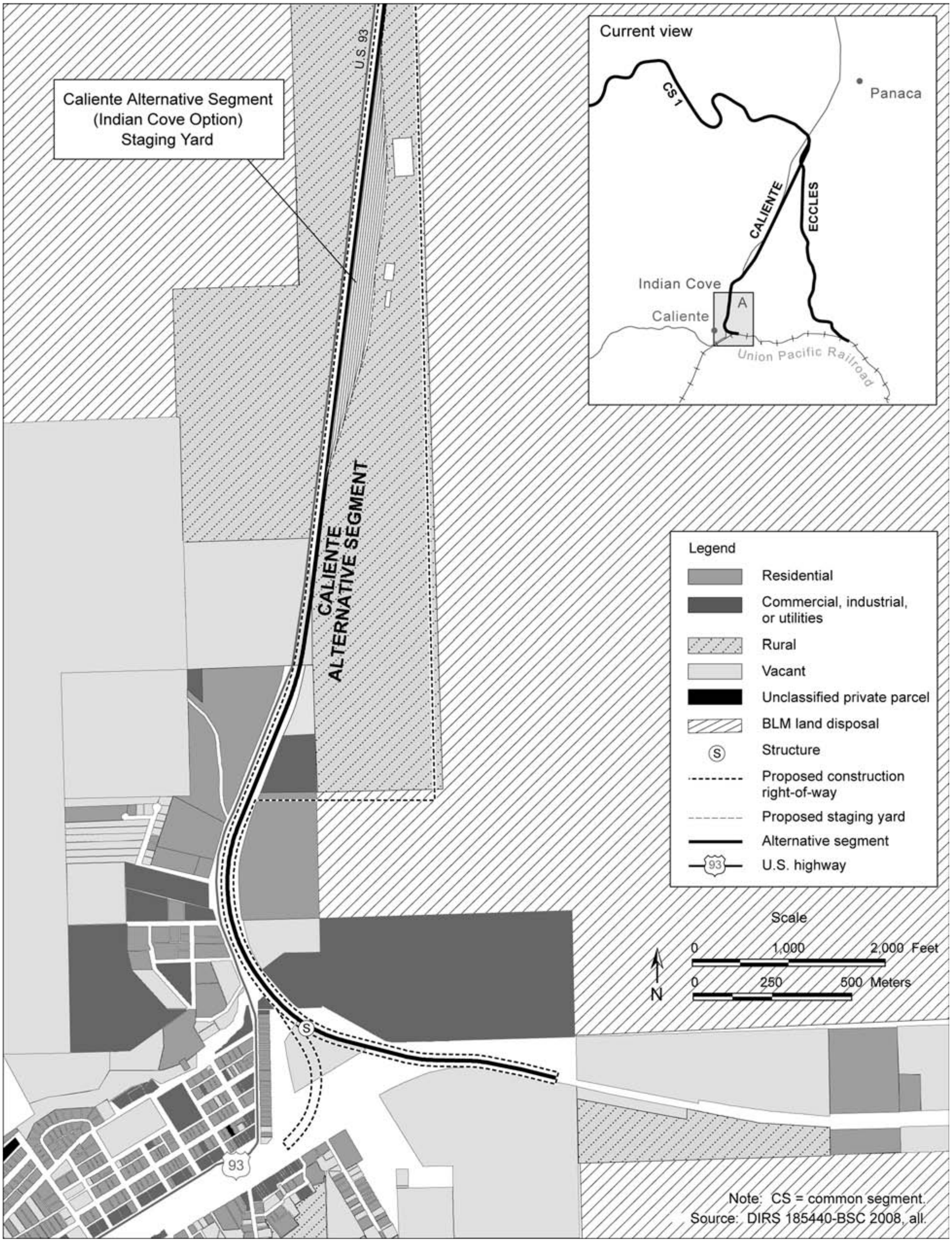


Figure 3-15. Private land, Caliente alternative segment map view A.

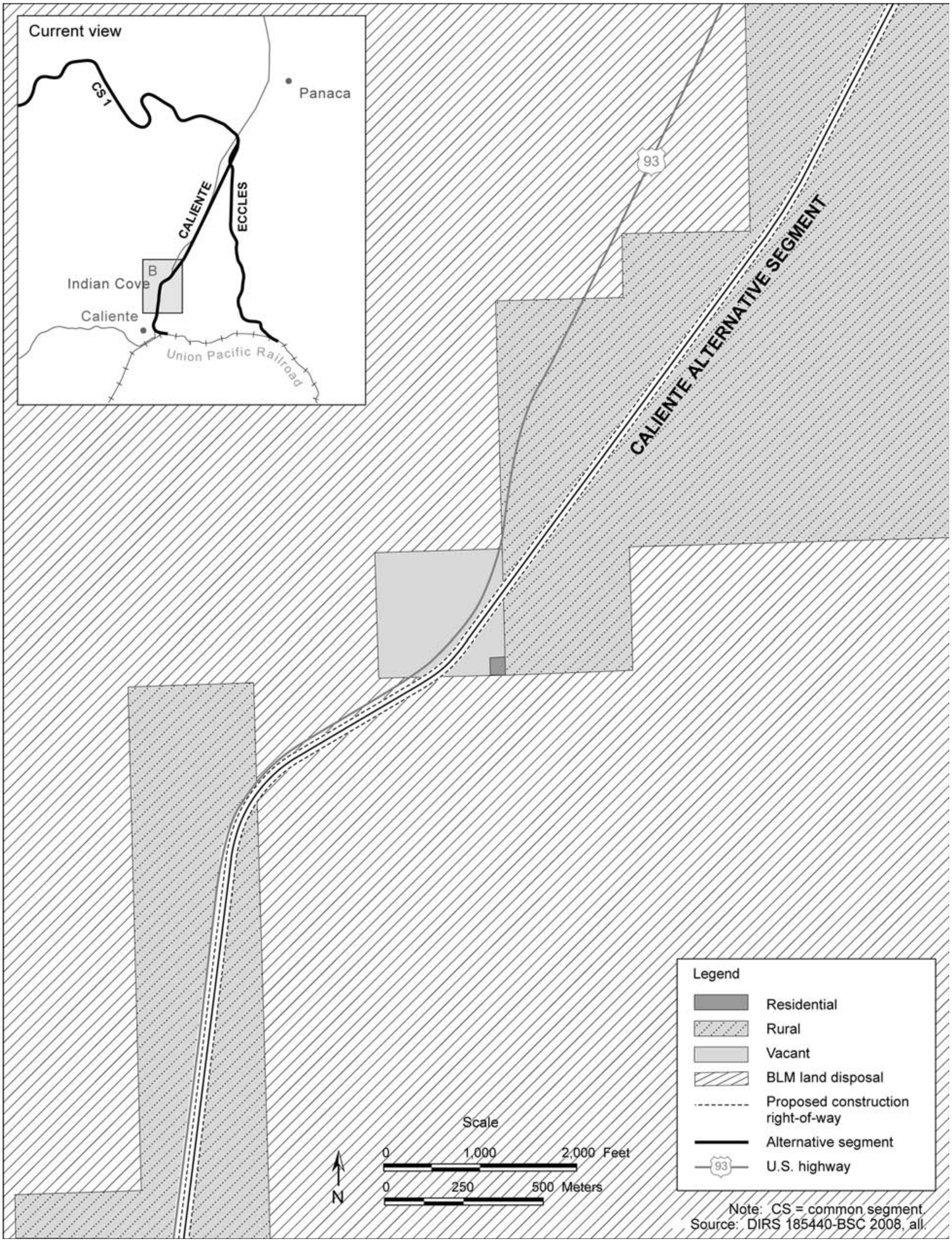


Figure 3-16. Private land, Caliente alternative segment map view B.

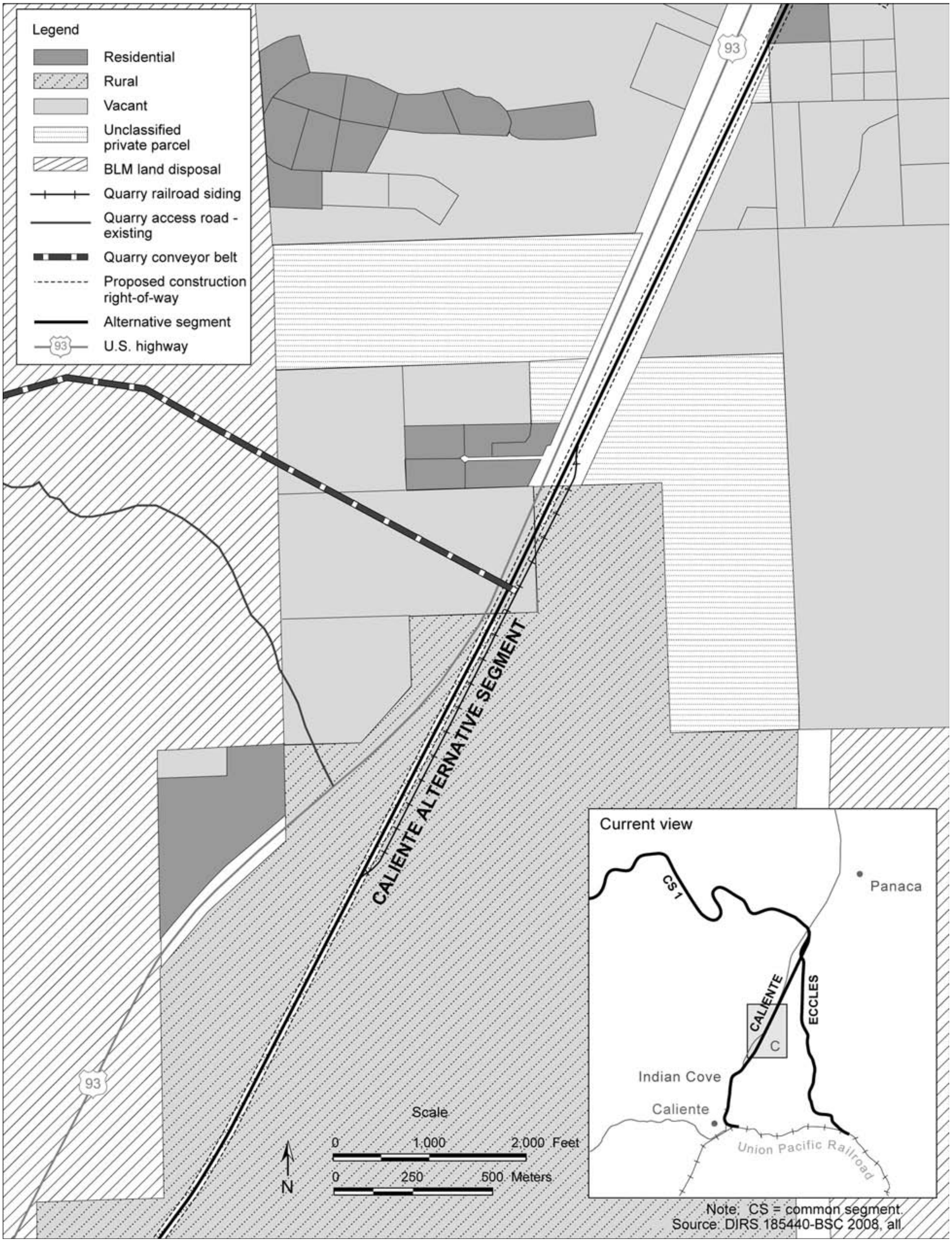


Figure 3-17. Private land, Caliente alternative segment map view C.

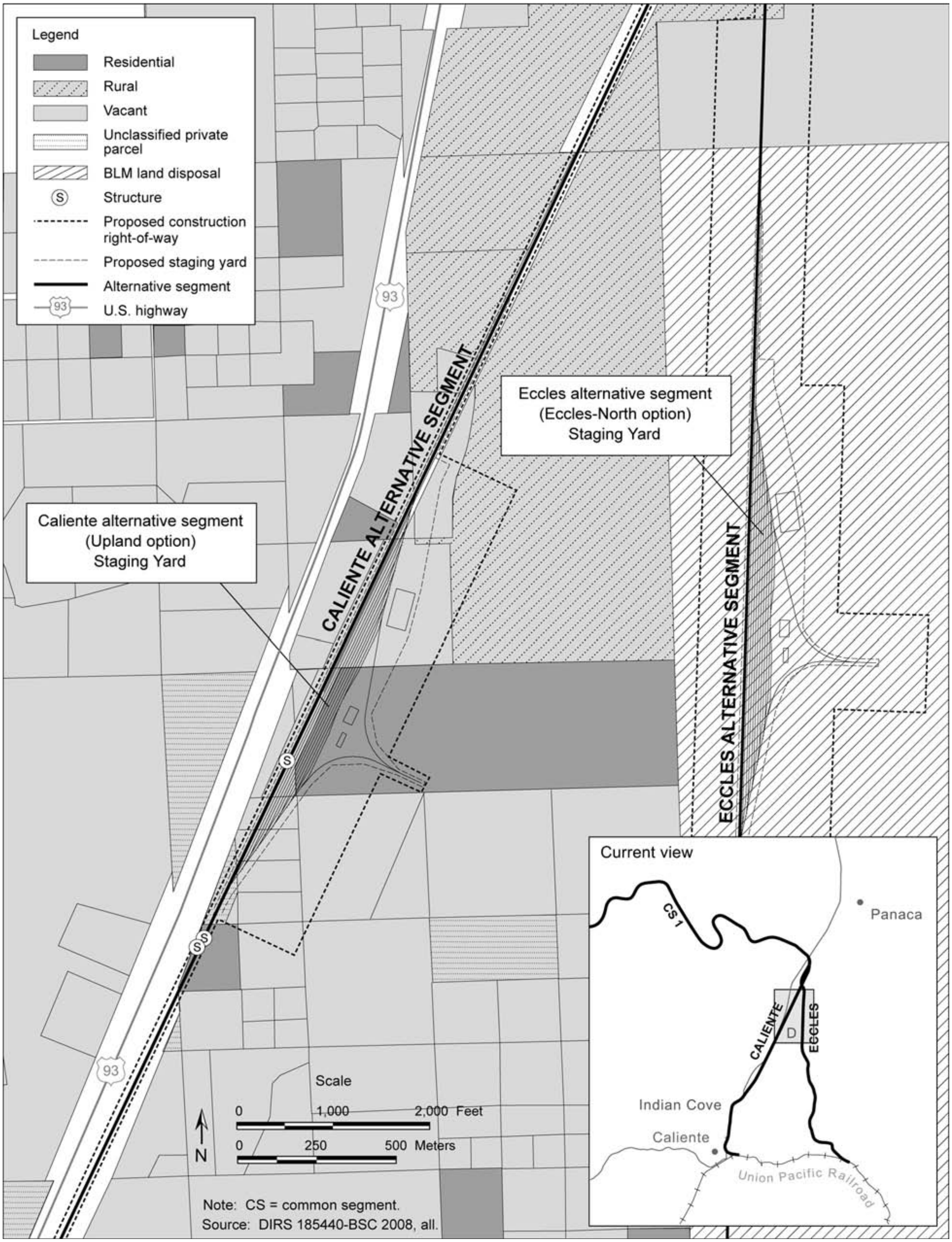


Figure 3-18. Private land, Caliente and Eccles alternative segments map view D.

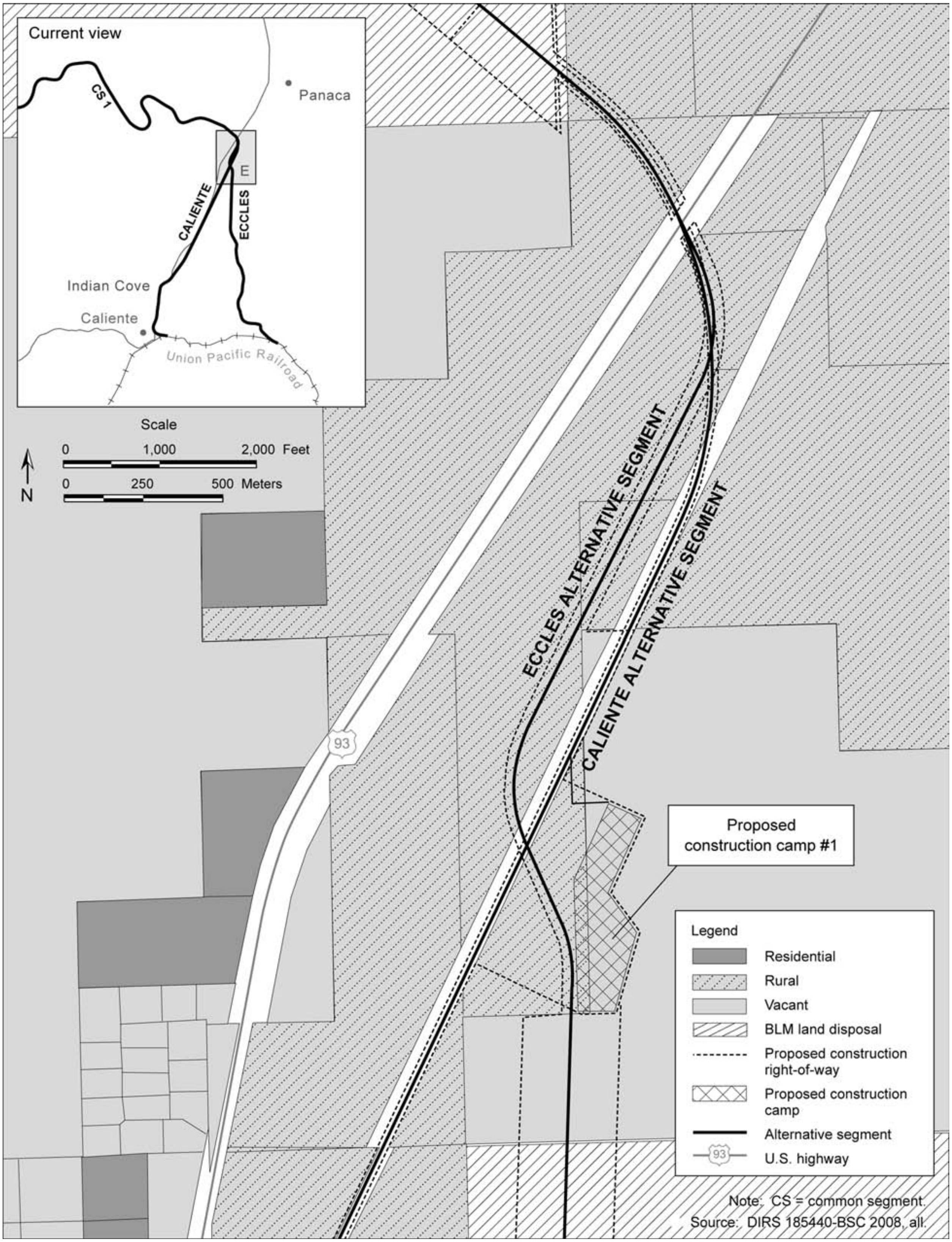


Figure 3-19. Private land, Caliente and Eccles alternative segments map view E.

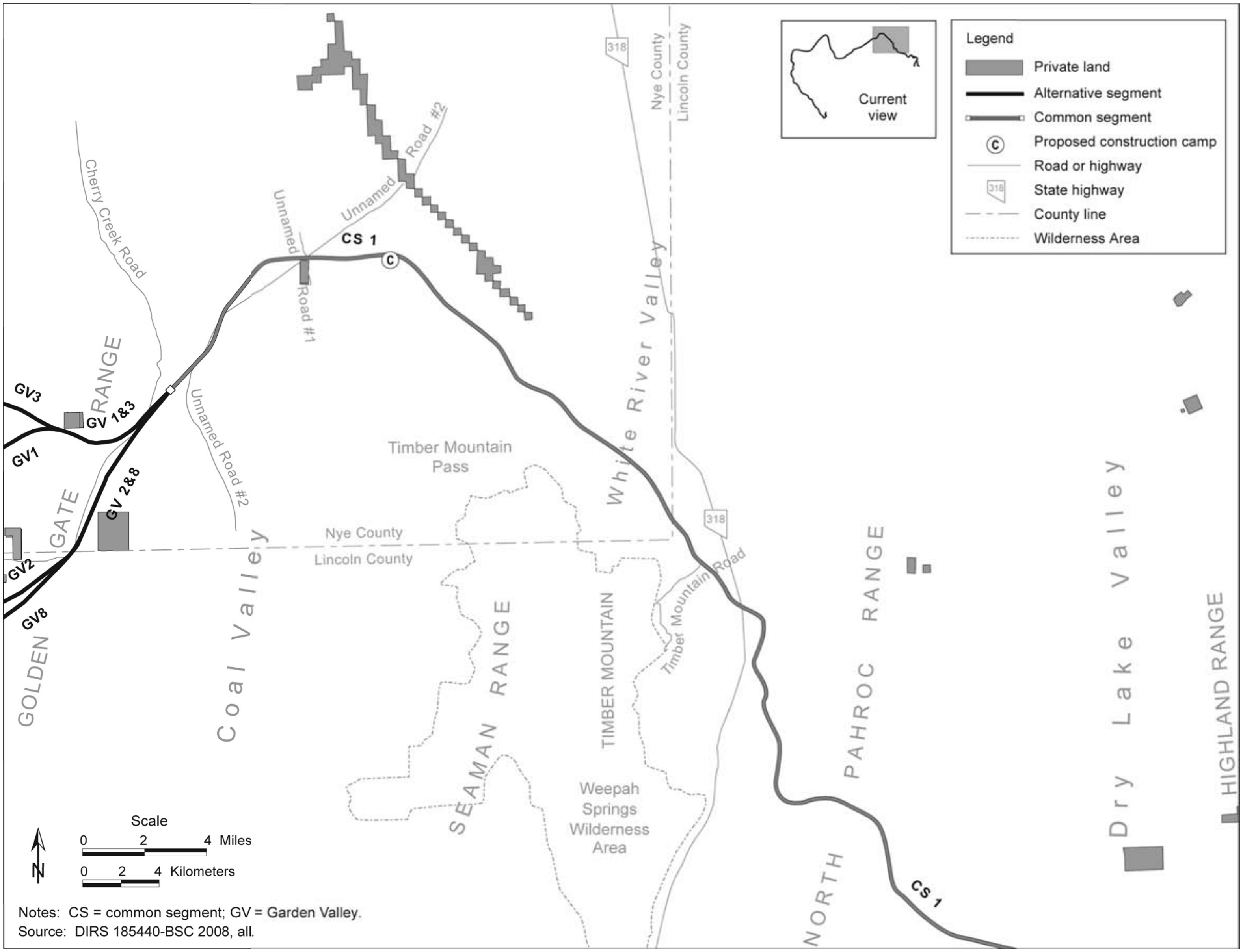


Figure 3-20. Private land within map area 2.

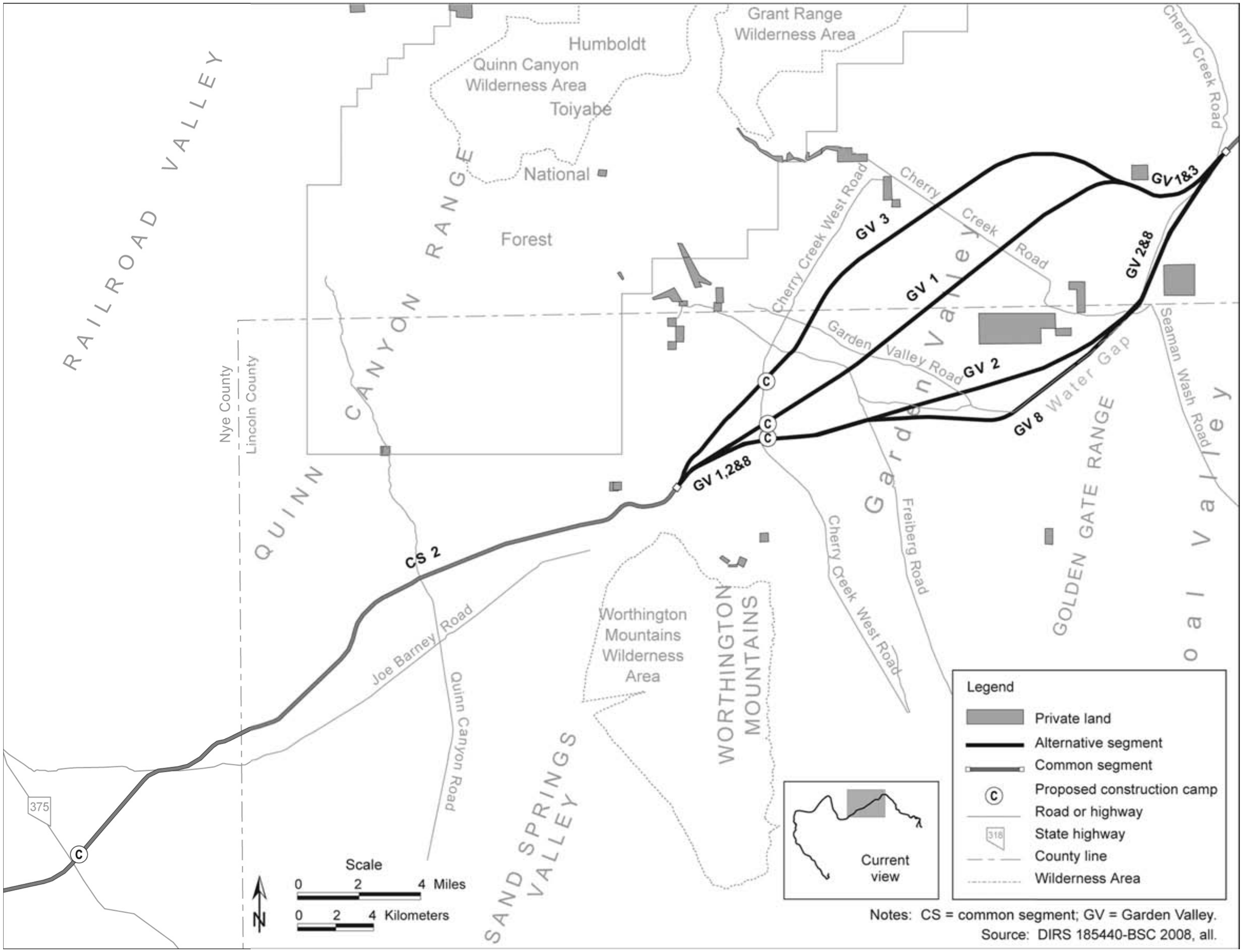


Figure 3-21. Private land within map area 3.

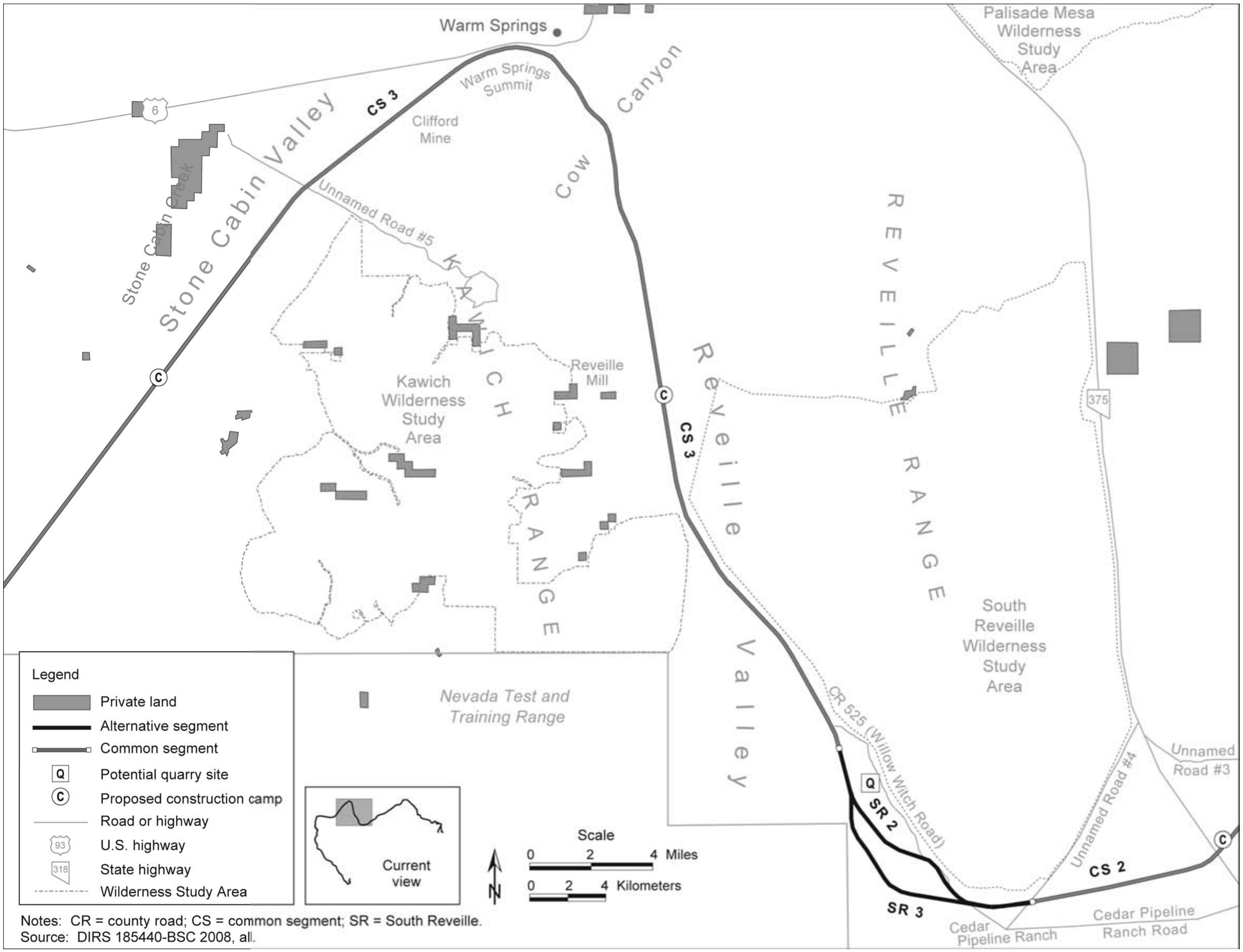


Figure 3-22. Private land within map area 4.

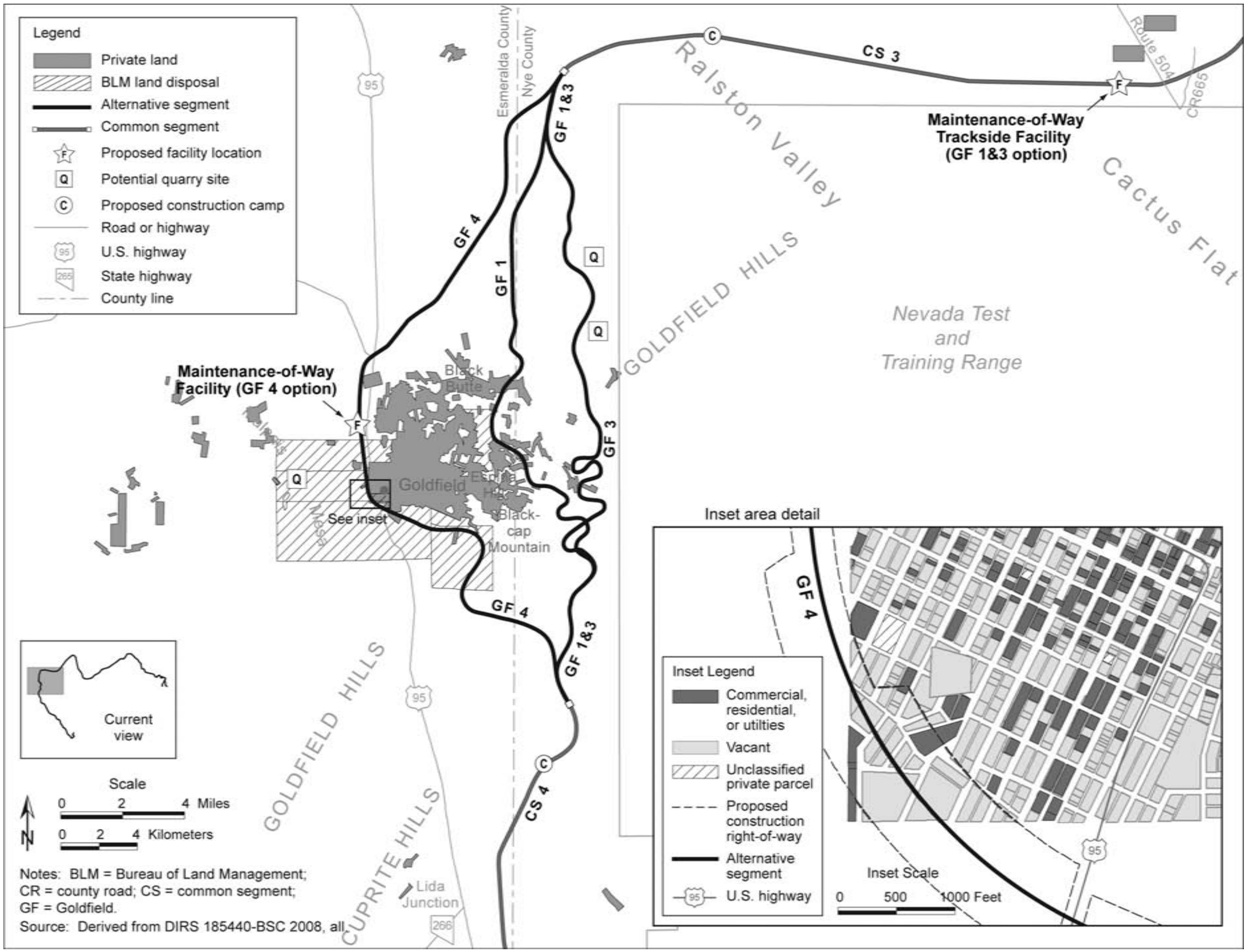


Figure 3-23. Private land within map area 5.

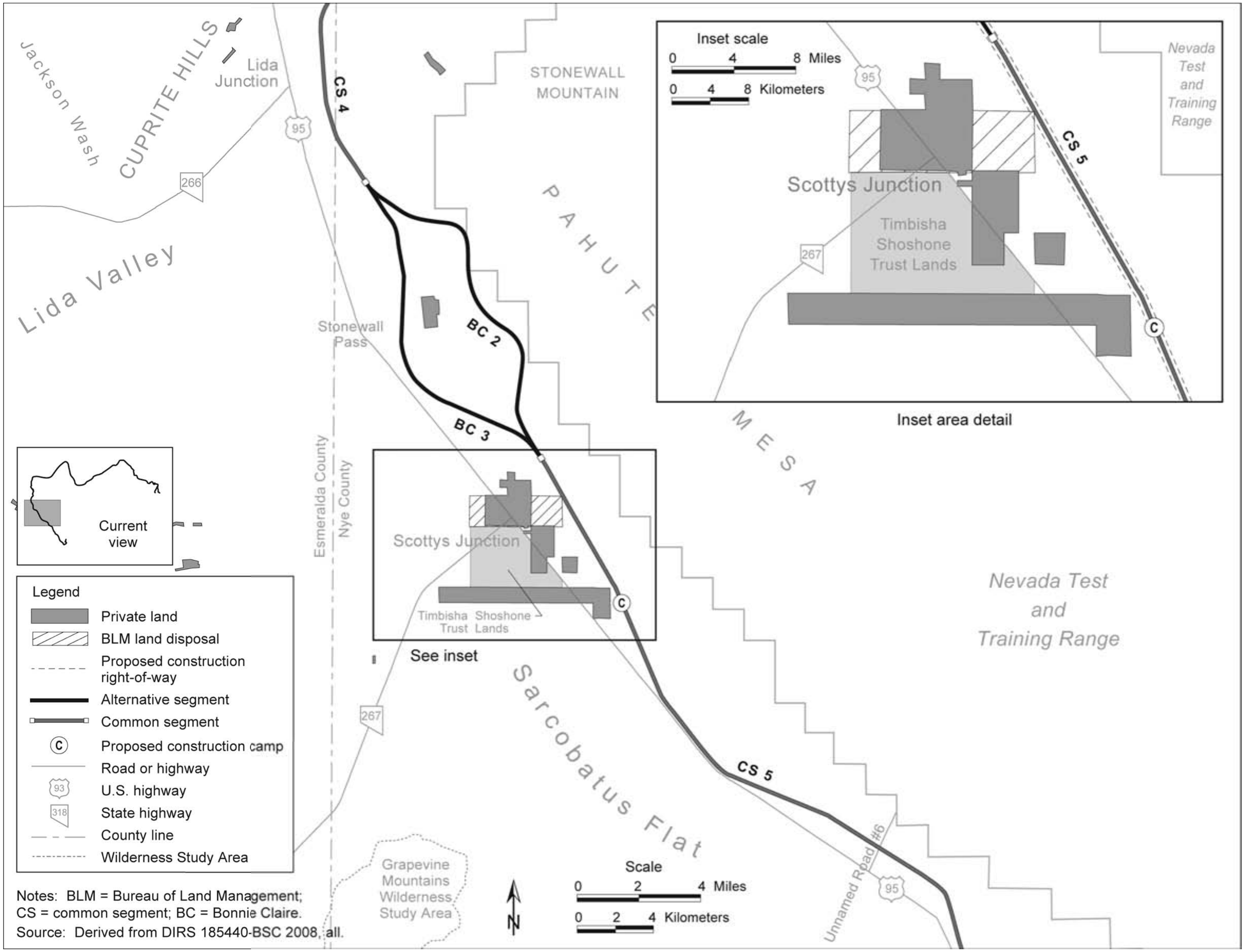
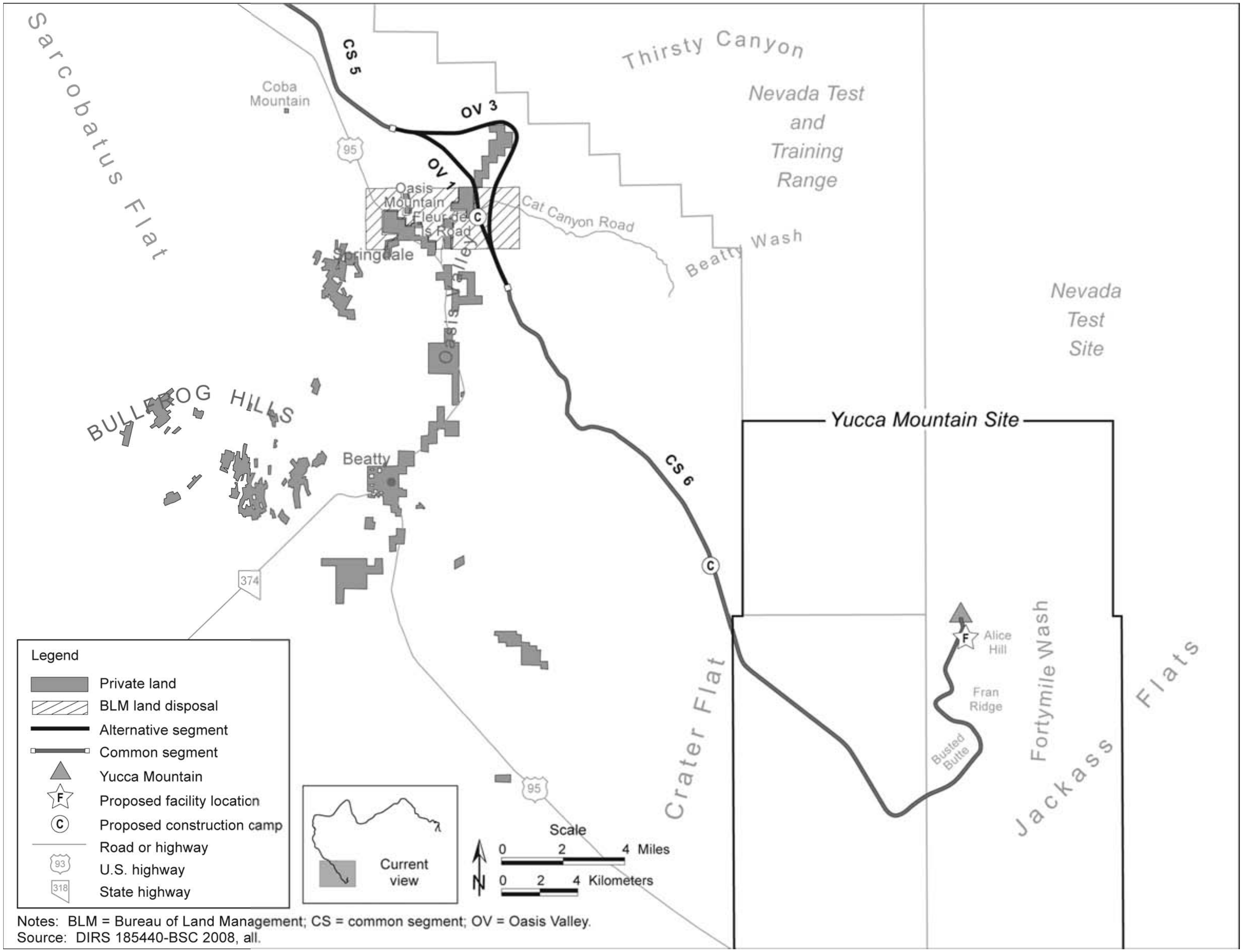


Figure 3-24. Private land within map area 6.



Notes: BLM = Bureau of Land Management; CS = common segment; OV = Oasis Valley.
Source: DIRS 185440-BSC 2008, all.

Figure 3-25. Private land within map area 7.

Railroad acquired the primary segments of right-of-way comprising the Pioche and Prince Branchline between 1901 and 1907. The Railroad retired the line on February 11, 1984, and received a certification of abandonment from the Interstate Commerce Commission to discontinue part of its operation in Nevada on the spur (DIRS 182814-IDT Services 2006, p. 7).

To be conservative in the assessment of potential land-use impacts, DOE assumed that all of the land underlying this abandoned rail line is privately owned. However, it is important to note that DOE is considering using this abandoned rail line for the proposed rail line to minimize potential impacts to environmental resources, such as wetlands.

3.2.2.3 American Indian Land

The closest American Indian land to the Caliente rail alignment would be the Timbisha Shoshone Trust Lands. The Timbisha Homeland Act transferred 31.4 square kilometers (7,754 acres) of land into trust for the Timbisha Shoshone Tribe. The land is not contiguous; it is made up of five separate parcels in California and Nevada. The parcel near Scottys Junction covers approximately 11.39 square kilometers (2,800 acres).

During the first public scoping period for this Rail Alignment EIS, the Timbisha Shoshone Tribe requested that DOE alter the Caliente rail alignment to avoid their land (DIRS 174558-Sweeney 2004, all). DOE adjusted the proposed ***rail route*** based on this request, and the segment nearest the Timbisha Shoshone Trust Lands near Scottys Junction, common segment 5, would be more than 3 kilometers (2 miles) east, as shown in Figure 3-24.

3.2.2.4 Public Land

Several agencies manage public lands near or encompassing the Caliente rail alignment, including the BLM, DOE, the U.S. Department of Defense, and the U.S. Forest Service.

The BLM and DOE manage approximately 159 square kilometers (39,000 acres) and 4.1 square kilometers (1,100 acres), respectively, of land that would be within the rail line construction right-of-way. The U.S. Department of Defense and the U.S. Forest Service manage lands near the Caliente rail alignment, but those lands would be outside the rail line construction right-of-way.

3.2.2.4.1 BLM-Administered Land

Approximately 97 percent of the lands along the Caliente rail alignment are BLM-administered public lands. Therefore, the proposed railroad project would in large part be subject to BLM land-use plans. The BLM manages public lands under the multiple-use concept, which balances the present and future needs of the American people. The BLM implements this concept through resource management plans, which are long-range, comprehensive land-use plans intended to provide for multiple uses and identify planning objectives and policies for designated areas. Resource management plan objectives are implemented through activity plans, such as allotment management plans and wildlife habitat management plans.

BLM resource management plans that apply to the Caliente rail alignment are included in the following:

- *Ely Proposed Resource Management Plan/Final Environmental Impact Statement* (Ely Resource Management Plan; DIRS 184767-BLM 2007, all)
- *Tonopah Resource Management Plan and* ***Record of Decision*** (Tonopah Resource Management Plan; DIRS 173224-BLM 1997, all)

- *Record of Decision for the Approved Las Vegas Resource Management Plan and Final Environmental Impact Statement* (Las Vegas Resource Management Plan; DIRS 176043-BLM 1998, all)

The BLM issued the Ely Proposed Resource Management Plan in November 2007. While this plan has not been finalized with a Record of Decision, DOE evaluated the Proposed Action and alternatives against this plan with the approval of BLM, as it represents the best available information relating to the existing environment and reflects the anticipated BLM management actions and goals for this district.

The Caliente and Eccles alternative segments, all of Caliente common segment 1, all of the Garden Valley alternative segments, and the beginning of Caliente common segment 2 would be within the area covered by the Ely Proposed Resource Management Plan. Most of the rail alignment would then pass through lands covered by the Tonopah Resource Management Plan. A portion of common segment 6 would pass through lands covered by the Las Vegas Resource Management Plan; the section of common segment 6 that would be on the Nevada Test Site also falls within the BLM Las Vegas area but is managed by DOE. Table 3-5 lists the distances each Caliente rail alignment segment would pass through lands administered by the various BLM districts.

To construct and operate the proposed railroad along the Caliente rail alignment, DOE would apply for a BLM ***right-of-way grant***. Section 503 of the Federal Land Policy and Management Act (DIRS 181386-BLM 2001, all; 43 United States Code [U.S.C.] 1761) authorized the BLM to grant, issue, or renew rights-of-way over, upon, under, or through public lands. BLM policy is to encourage prospective applicants to locate their proposals within existing corridors. Resource management plans describe these corridors and right-of-way avoidance areas – areas for which the BLM would avoid granting new rights-of-way unless there are no other options. ***Areas of Critical Environmental Concern*** are generally considered right-of-way avoidance or exclusion areas.

Areas of Critical Environmental Concern are places within the public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, and other natural systems or processes, or to protect life and safety from natural hazards (DIRS 181386-BLM 2001, p. 2).

Resource management plans also designate areas of potential land disposal (sale) within their management areas. Therefore, DOE must assess whether a railroad along the Caliente rail alignment would conflict with or adversely affect BLM land-disposal plans. Section 203(a) of the Federal Land Policy and Management Act allows for public land to be sold (disposed of) if it meets one of the following criteria:

- The land is difficult or uneconomic to manage as a part of the public lands.
- The land is not suitable for management by another federal department or agency.
- The land was acquired for a specific purpose and it is no longer required for that, or any other, federal purpose.
- Disposal of the land will serve important public objectives that can be achieved prudently or feasibly only if the land is removed from public ownership and these objectives outweigh other public objectives or values that will be served by maintaining the land in federal ownership.

Sections 3.2.2.4.1.1 through 3.2.2.4.1.3 describe the planning areas and objectives of the applicable resource management plans in relation to lands and realty, corridors, and access and recreation.

Table 3-5. Caliente rail alignment crossing distances within each BLM resource management plan area.

Rail line segment	Ely District/Proposed Resource Management Plan area (miles)[a,b]	Battle Mountain District/Tonopah Resource Management Plan area (miles)	Las Vegas District/Resource Management Plan area (miles)
Caliente alternative segment	11	0	0
Eccles alternative segment	12	0	0
Caliente common segment 1	71	0	0
Garden Valley alternative segment	22	0	0
Garden Valley alternative segment	22	0	0
Garden Valley alternative segment	23	0	0
Garden Valley alternative segment	23	0	0
Caliente common segment 2	19	12	0
South Reveille alternative segment	0	12	0
South Reveille alternative segment	0	12	0
Caliente common segment 3	0	70	0
Goldfield alternative segment 1	0	29	0
Goldfield alternative segment 3	0	31	0
Goldfield alternative segment 4	0	33	0
Caliente common segment 4	0	7	0
Bonnie Claire alternative segment	0	13	0
Bonnie Claire alternative segment	0	12	0
Common segment 5	0	25	0
Oasis Valley alternative segment 1	0	6	0
Oasis Valley alternative segment 3	0	9	0
Common segment 6	0	14	18
Total rail alignment distance by BLM district (shortest to longest alignment)	123 to 125	187 to 195	18

a. To convert miles to kilometers, multiply by 1.6093.
b. Individual segment lengths are rounded to two significant figures.

3.2.2.4.1.1 Ely Proposed Resource Management Plan. The Ely District Planning Area consists of public lands in White Pine County, Lincoln County, and a portion of Nye County in east-central Nevada. This district was previously subdivided into three resource areas (Egan, Schell, and Caliente) but would be managed as a single administrative unit under this resource management plan. The Ely Field Office manages approximately 46 square kilometers (11 million acres) of public lands out of the approximately 56 square kilometers (14 million acres) within the boundaries of the district (DIRS 184767-BLM 2007, p. S-i). Of this planning area, the BLM manages 5,400 square kilometers (1.34 million acres) in Nye County, 18,300 square kilometers (4.51 million acres) in White Pine County, and 23,000 square kilometers (5.62 million acres) in Lincoln County (DIRS 184767-BLM 2007, pp. 3.12-1). Management objectives (under the Ely Proposed Resource Management Plan) related to land tenure adjustments, corridors, and access are listed below (DIRS 184767-BLM 2007, all Section 2.4.12).

- Land and realty
  - Retain lands or interest in lands within designated critical habitat unless the disposal results in the acquisition of land with higher quality habitat. Retain lands within Areas of Critical

Environmental Concern. Retain land in areas with high recreation value, unless state or county entities show an overriding need through an acceptable recreation management plan.

- Dispose of not more than 364 square kilometers (90,000 acres) of public land in Lincoln County in accordance with the Lincoln County Conservation, Recreation, and Development Act of 2004. (Some of this land would be in the vicinity of the Caliente and Eccles alternative segments, Caliente common segment 1, and quarry CA-8B. See Section 4.2.2.2.3.1)
- Recommend withdrawal of lands with sensitive or high resource values (for example, Areas of Critical Environmental Concern) from surface and mineral entry.
- Designate 17 new Areas of Critical Environmental Concern totaling an additional 462 square kilometers (114,120 acres). The Schlesser Pincushion and northernmost section of the Lower Meadow Valley Wash areas would be designated as avoidance areas, where granting of rights-of-way should be avoided, but may be granted if there is a minimal conflict with identified resource values and impacts can be mitigated. Management prescriptions in both areas include no new roads. The Eccles alternative segment would establish 0.3 square kilometer (74 acres) of new right-of-way within the Lower Meadow Valley Wash Area of Critical Environmental Concern (Section 4.2.7, Biological Resources, reflects a greater area of impact because the calculations in that section include soil and vegetation disturbance within the existing Union Pacific Railroad right-of-way). Common segment 1 would establish 0.13 square kilometer (32 acres) of new right-of-way within the southern portion of the Schlesser Pincushion Area of Critical Environmental Concern.

- Corridors and right-of-way
  - Maintain corridors designated by the Lincoln County Conservation, Recreation, and Development Act as 0.8 kilometer (0.5 mile) wide.
  - Establish Wilderness Study Areas as avoidance areas; establish designated wilderness as exclusion areas; establish Areas of Critical Environmental Concern as avoidance or exclusion areas.
  - Consider requests by other federal agencies for new withdrawals, withdrawal relinquishments, and modifications on a case-by-case basis.
  - Where feasible, consolidate new land-use authorizations within or adjacent to existing authorizations.
- Off-highway vehicles and recreation
  - Off-highway vehicle use limited to designated roads and trails (41,709 square kilometers [10,306,500 acres]).
  - Provide a wide variety of recreation opportunities; provide visitor information and encourage minimum impact or “Leave No Trace” and “Tread Lightly” recreational skills and ethics for recreational activities.
  - Manage five special recreation management areas (one existing and four new) for a broad recreation opportunity spectrum. This includes the 450-square-kilometer (111,200-acre) new Chief Mountain Special Recreation Management Area that would be crossed by a portion of common Segment 1 and quarry CA-8B.

3.2.2.4.1.2 Tonopah Resource Management Plan. Located in south-central Nevada in Nye and Esmeralda Counties, the Tonopah Planning Area encompasses approximately 25,000 square kilometers (6.1 million acres) of public land and approximately 670 square kilometers (165,000 acres) of private land. Significant resources and program emphases include locatable minerals, livestock grazing, wild horses and burros, realty, cultural resources, and wildlife (DIRS 173224-BLM 1997, p. 1). Relevant land-use management objectives related to land and realty, corridors, and access are summarized below.

- Land and realty
  - Discretionary disposal of approximately 1,210 square kilometers (300,000 acres) of public land (DIRS 173224-BLM 1997, p. 2). Approximately 931 square kilometers (230,000 acres) have been identified for potential disposal in the vicinity of Goldfield, about 23 square kilometers (5,800 acres) have been identified for potential disposal near Scottys Junction, and approximately 160 square kilometers (39,000 acres) have been identified for potential disposal near Beatty (acreage based on BLM GIS data, DIRS 185440-BSC 2008, all).
- Corridors
  - Approximately 1,100 kilometers (670 miles) designated for transportation and utility corridors in the planning area (DIRS 173224-BLM 1997, p. 2).
  - Rights-of-way allowed (if compatible with values) on approximately 600 square kilometers (150,000 acres) (DIRS 173224-BLM 1997, p. 2). (There are no right-of-way exclusion areas within the Caliente rail alignment region of influence.)
  - Designated right-of-way corridors within the planning area will be 5 kilometers (3 miles) wide except where there are topographic constraints. Grants for rights-of-way are still required for facilities placed within designated corridors. Designation of a corridor does not mean that future rights-of-way are restricted to corridors, nor does it mean that the BLM has committed to approving all right-of-way applications within corridors (DIRS 173224-BLM 1997, p. A-38).
- Access and recreation
  - Vehicles unrestricted on 77 percent of the planning area.
  - Vehicles limited to existing roads and trails in primitive and semi-primitive non-motorized and semi-primitive motorized areas.
  - Designates seven Special Recreation Management Areas (DIRS 173224-BLM 1997, p. 2).

3.2.2.4.1.3 Las Vegas Resource Management Plan. The Las Vegas Resource Management Plan provides a comprehensive framework for managing approximately 13,000 square kilometers (3.3 million acres) of public lands in Clark County and the southern portion of Nye County administered by the BLM Las Vegas Field Office. Approximately 2,830 square kilometers (700,000 acres) of this planning area is in Nye County. Significant resources and program emphases in the plan include threatened and ***endangered species***; land disposal actions; wilderness management; wildlife habitat; special status species; ***riparian*** areas; forestry and vegetative products; livestock grazing; wild horses and burros; land acquisition priorities; rights-of-way; cultural resources; hazardous materials management; recreation; utility corridors; and minerals (DIRS 176043-BLM 1998, p. 2). Relevant land-use management objectives related to land and realty, corridors, and access are summarized below (DIRS 176043-BLM 1998, Appendix A, p. 16).

- Land and realty
  - Dispose of approximately 710 square kilometers (175,000 acres) of public lands through sale, exchange or recreation and public-purpose patent to provide for the orderly expansion and development of southern Nevada.
  - All public lands within the planning area, unless otherwise classified, segregated or withdrawn, and with the exception of Areas of Critical Environmental Concern and ***Wilderness Study Areas***, are available for land-use leases and permits at the discretion of the BLM.

- Terminate or modify any unused, outdated, or unnecessary classifications/segregations and withdrawals on public lands to reduce the area of segregation in the plan area.
- Acquire private lands to enhance the recovery of special status species, protect valuable resources, and facilitate the management of adjacent BLM lands.

- Corridors

  All Areas of Critical Environmental Concern and all lands within 0.4 kilometer (0.25 mile) of significant caves, exclusive of any designated corridors, are designated as right-of-way avoidance areas. (There are no Areas of Critical Environmental Concern within the Caliente rail alignment region of influence in the Las Vegas BLM District; the closest area is 140 kilometers [84 miles] south of common segment 6.)

- Access and recreation
  - Ensure that a wide range of recreation opportunities are available for recreation users in concert with protecting the natural resources on public lands that attract users.
  - Provide opportunities for off-road vehicle use while protecting wildlife habitat, cultural resources, hydrological and soil resources, non-motorized recreation opportunities, natural and aesthetic values, and other uses of the public land.

The Las Vegas Proposed Resource Management Plan/Final Environmental Impact Statement briefly mentions the Yucca Mountain Project in sections titled “Income and Employment” and “Social Setting, Attitudes, and Values.” In the Income and Employment section the document notes that there could be population growth in Amargosa Valley as a result of construction and operation of the Yucca Mountain Project. In the Social Setting, Attitudes, and Values section the document notes that people residing in Las Vegas (urbanites) expressed a higher concern than people residing in rural locations about wildlife and ***ecosystem*** values when recording their ***risk*** assessment for the proposed Yucca Mountain Project in a 1995 social research survey conducted by the University of Nevada Las Vegas (DIRS 176043-BLM 1998, pp. 3-81 and 3-82).

3.2.2.4.2 Project-Related Public Land Withdrawals

The BLM announced Public Land Order 7653 on December 28, 2005 (70 *Federal Register* [*FR*] 76854). The Order withdrew approximately 1,249 square kilometers (308,600 acres) of public lands within the Caliente rail corridor from surface and mineral entry for 10 years to allow DOE to evaluate the lands for the potential construction, operation, and maintenance of the proposed railroad to Yucca Mountain. The withdrawal applies only to BLM-administered public lands. The withdrawal area extends approximately 0.8 kilometer (0.5 mile) from either side of the centerline of the proposed rail alignment. The actions covered by this withdrawal meet the BLM definition of ***casual use*** as set forth in 43 Code of Federal Regulations (CFR) 2801.5. On January 10, 2007, the BLM announced that DOE had filed an application requesting a second land withdrawal (72 *FR* 1235). The Department filed the application to cover post-scoping changes in the Caliente rail alignment and to address the addition of the Mina rail alignment. The application requested the withdrawal of an additional 842 square kilometers (208,037 acres) of public lands from surface and mineral entry through December 27, 2015, so DOE could evaluate the lands for the potential construction, operation, and maintenance of a railroad to Yucca Mountain. Chapter 6 of this Rail Alignment EIS includes detailed information about the land withdrawal process.

The BLM granted DOE a right-of-way reservation (N-47748) for Yucca Mountain ***site characterization*** activities (DIRS 102218-BLM 1988, all), which has been extended to December 31, 2014. This reservation comprises 210 square kilometers (52,000 acres). The land in this reservation is open to public use, with the exception of about 20 square kilometers (5,000 acres) near the site of the proposed ***repository*** that were withdrawn in 1990 from the mining and mineral leasing laws to protect the physical integrity of the repository block. The lands in this reservation are not withdrawn from the mining and mineral leasing laws and contain a number of ***unpatented mining claims*** (DIRS 155970-DOE 2002, p. 3-9). This existing right-of-way reservation would be the basis for the planned land withdrawal for the Yucca Mountain Site, as described in the *Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DIRS 155970-DOE 2002, DOE/EIS-0250F-S1), where the land would transfer from BLM administrative responsibility to DOE control.

The BLM also granted DOE a right-of-way reservation (N-48602) for 75 square kilometers (19,000 acres) of land on the Nevada Test and Training Range for site characterization activities. This land is closed to public access and use. This right-of-way reservation has been extended to March 5, 2014.

3.2.2.4.3 Department of Defense-Managed Land, Nevada Test and Training Range

The U.S. Department of Defense administers the Nevada Test and Training Range, which the U.S. Air Force uses for training. The Caliente rail alignment would not cross onto the Nevada Test and Training Range land. Detailed information about land use and resources on the Nevada Test and Training Range is available in the *Proposed Nevada Test and Training Range Resource and Management Plan and Final Environmental Impact Statement* (DIRS 178103-BLM 2003, all).

The airspace above the Nevada Test and Training Range and some adjacent locations consist of the Desert and Reveille Military Operations Areas and five "restricted areas": R-4806E, R-4806W, R-4807A, R-4807B, and R-4809 (DIRS 103472-USAF 1999, p. 3.1-2).

Airspace to the east of the Nevada Test and Training Range is designated as the Desert Military Operations Area and airspace to the north is designated as the Reveille Military Operations Area. These Areas are used for air-to-air intercept training, which consists of high speed operations, abrupt maneuvers, and supersonic flight. These areas are not considered restricted airspace and civil aircraft, under certain restrictions, are permitted to fly through a military operations area when it is in use while exercising certain precautions. Civil aircraft are allowed in these locations because the types of military flight maneuvers conducted in these areas are considered nonhazardous and therefore, compatible, with other airspace uses (DIRS 103472-USAF 1999, pp. 3.1-4 and 3.1-6). Portions of the Caliente rail alignment that would be on land under the Desert Military Operations Area include the Caliente and Eccles alternative segments; Caliente common segment 1; Garden Valley alternative segments 1, 2, 3, and 8; Caliente common segment 2, South Reveille alternative segments 2 and 3; and a portion of Caliente common segment 3. More than half the length of common segment 3 would be on land under the Reveille Military Operations Area.

Restricted airspace consists of areas where nonparticipating aircraft are subject to restriction during scheduled periods when hazardous activities are being performed. Restricted areas designated as joint use by the Federal Aviation Administration allow air traffic control to route nonparticipating aircraft through this airspace when it is not in use or when appropriate separation can be provided. Those areas not designated as joint use cannot be accessed by either nonparticipating civil or military aircraft at any time (DIRS 103472-USAF 1999, p. 3.1-3).

Restricted area R-4807A is designated joint use and land beneath it is comprised of an electronic battlefield with numerous tactical targets and manned electronic combat threat simulators. Portions of the Caliente rail alignment that would be on land below R-4807A include portions of common segment 5, Oasis Valley alternative segments 1 and 2, and a portion of common segment 6 (DIRS 103472-USAF 1999, pp. 3.1-3, 3.1-4, and 3.1-6).

Restricted area R-4808S is controlled by DOE for Nevada Test Site activities and is designated joint use. The Federal Aviation Administration Los Angeles Air Route Traffic Control Center also uses R-4808S for civil aircraft overflights (DIRS 103472-USAF 1999, pp. 3.1-3, 3.1-4, and 3.1-6). A portion of common segment 6 would be on land below R-4808S as it approached the Yucca Mountain Site.

3.2.2.4.4 DOE-Managed Land, Nevada Test Site

Portions of common segment 6 and some railroad operations support facilities would be on Nevada Test Site land (see Figure 3-25), which DOE administers. Detailed information about current and future uses of the Nevada Test Site is available in *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996, all). As discussed previously, land that makes up the proposed Yucca Mountain Site would be withdrawn and transferred to DOE control. Currently, a Memorandum of Agreement between the DOE National Nuclear Security Administration and the Office of Civilian Radioactive Waste Management allows the use of about 230 square kilometers (58,000 acres) on the Nevada Test Site for Yucca Mountain Project activities.

3.2.2.4.5 U.S. Forest Service Land

The Caliente rail alignment would pass within 3.2 kilometers (2 miles) of a portion of the Humboldt-Toiyabe National Forest, which the Ely Ranger District of the U.S. Forest Service manages and which would be outside the rail line construction right-of-way.

3.2.2.5 General Environmental Setting and Land-Use Characteristics

Major public land uses along the Caliente rail alignment include grazing, mineral and energy extraction, and recreation. The rail alignment would cross numerous public roads and trails that provide access to public and private land and would cross BLM-authorized rights-of-way for utilities.

3.2.2.5.1 BLM Grazing Allotments

The Taylor Grazing Act of 1934 (43 U.S.C. 315-316o), as amended, authorizes the Federal Government to issue permits for grazing livestock in grazing districts to settlers, residents, and other livestock owners for an annual payment of reasonable fees. An applicant who owns a base property or controls a water source may apply to the BLM for a lease or permit to use public lands for the grazing of livestock. The BLM grazing administration regulations (43 U.S.C. 4100.0-5) define a base property as land that has the capability to produce crops or forage that can be used to support authorized livestock for a specified period of the year (land base property), or a privately owned right to water that is suitable for consumption by livestock and is available and accessible to livestock when the public lands are used for livestock grazing (water base property). The area that can be properly grazed by livestock watering at certain water sources is considered the “service area” and becomes the allotment for which the permit is issued (43 CFR Part 4100). The grazing allotments are leased or permitted for 10 years and may be renewed under specific circumstances.

> **Animal unit month:** The forage needed to support one cow, one cow/calf pair, one horse, or five sheep for one month. Approximately 800 pounds of forage (DIRS 184767-BLM 2007, p. G-17).

Livestock permitted on grazing allotments include cattle, sheep, goats, horses, and burros. Cattle and sheep are the typical livestock grazed within the Caliente rail alignment region of influence. The grazing lease or permit specifies the types and numbers of livestock based on the property acreage, the period of use, and the amount of use in ***animal unit months***. The intent of assigning animal unit months is to allow grazing on public lands without exceeding the capacity of the allotment to sustain livestock (43 CFR Part 4100).

Depending on the combination of common segments and alternative segments, the Caliente rail alignment would cross up to 20 active grazing allotments, and 3 inactive allotments (Ralston, Montezuma, and one labeled Unused) (see Figures 3-26 through 3-33). Tables 3-6 and 3-7 list information about grazing allotments within the Caliente rail alignment region of influence.

Access to a water source is an essential requirement for livestock grazing in the high ***desert*** of Nevada. In accordance with the Nevada State Water Law, the State Engineer in the Nevada Division of Water Resources may issue permits for water rights to applicants who can demonstrate a beneficial use for the water. Once permitted, water rights are treated as property rights and can be bought and sold (DIRS 178301-State of Nevada [n.d.], all). Because water rights greatly influence the uses and value of land in this generally arid region, any impacts to water rights can directly affect land use. (See Section 3.2.6 for a description of ***groundwater*** resources.)

It is essential to provide adequate water for livestock within reasonable distances of grazing areas. Stockwater is water that is physically diverted from the natural water course or storage of water for use by livestock or wildlife. There are several methods for developing stockwater, including spring developments; wells, ponds, or dugouts; and pipelines with a trough or tank for storage. Table 3-7 lists stockwater features within each Caliente rail alignment segment. The locations of springs and wells near the Caliente rail alignment are provided in Figures 3-75 through 3-82 in Section 3.2.6, Groundwater Resources.

DOE collected information on range improvements (pipelines and fences) based on BLM records in November 2004. Therefore, there could be some range improvements authorized on allotments since that time. Based on the 2004 BLM data, the following rail segments would cross existing allotment fences: Eccles and Caliente alternative segments – two crossings; Caliente common segment 1 – nine crossings; Garden Valley alternative segments 1, 2, and 8 – five crossings; and Garden Valley alternative segment 3 – four crossings (DIRS 185440-BSC 2008, all).

3.2.2.5.2 Mineral and Energy Resources

3.2.2.5.2.1 Mineral Resources. Commercial prospecting for minerals of value began in southern Nevada in the mid-1800s and continues to the present. Minerals currently mined include metallic and nonmetallic minerals. Gold and silver are the most valuable metallic minerals mined in Nevada. Nonmetallic minerals include borate, limestone, clay, building stones, silica, aggregates, gypsum, and salt used in industrial processes and building materials (DIRS 150524-Tingley 1998, all).

There is potential mining activity on private land (patented mining claims) and public land (unpatented mining claims). Figure 3-34 shows mining districts and areas near the Caliente rail alignment. Figures 3-34 through 3-41 show the locations of sections with unpatented mining claims in relation to the construction right-of-way.

The Caliente rail alignment would cross some ***mining areas*** and mining districts, as discussed below. Section 4.2.2.2.6 discusses potential impacts to individual mining claims.

Caliente common segment 1 would cross the northernmost portion of the Seaman Range Mining District. The vast majority of historic mining activity in the district occurred more than 5 kilometers (3 miles) south and southwest of Caliente common segment 1 (DIRS 183644-Shannon & Wilson 2007, p. 101). In the past, this district has been mined for mercury, uranium, gold, zinc, copper, and jasperoid.

The South Reveille alternative segments and Caliente common segment 3 would pass within 2 miles of the Reveille Valley Mining Area. Exploration work in this area since 1988 has focused on finding near-surface, bulk-mineable, precious metal mineralization. Redhawk Resources is conducting this exploration

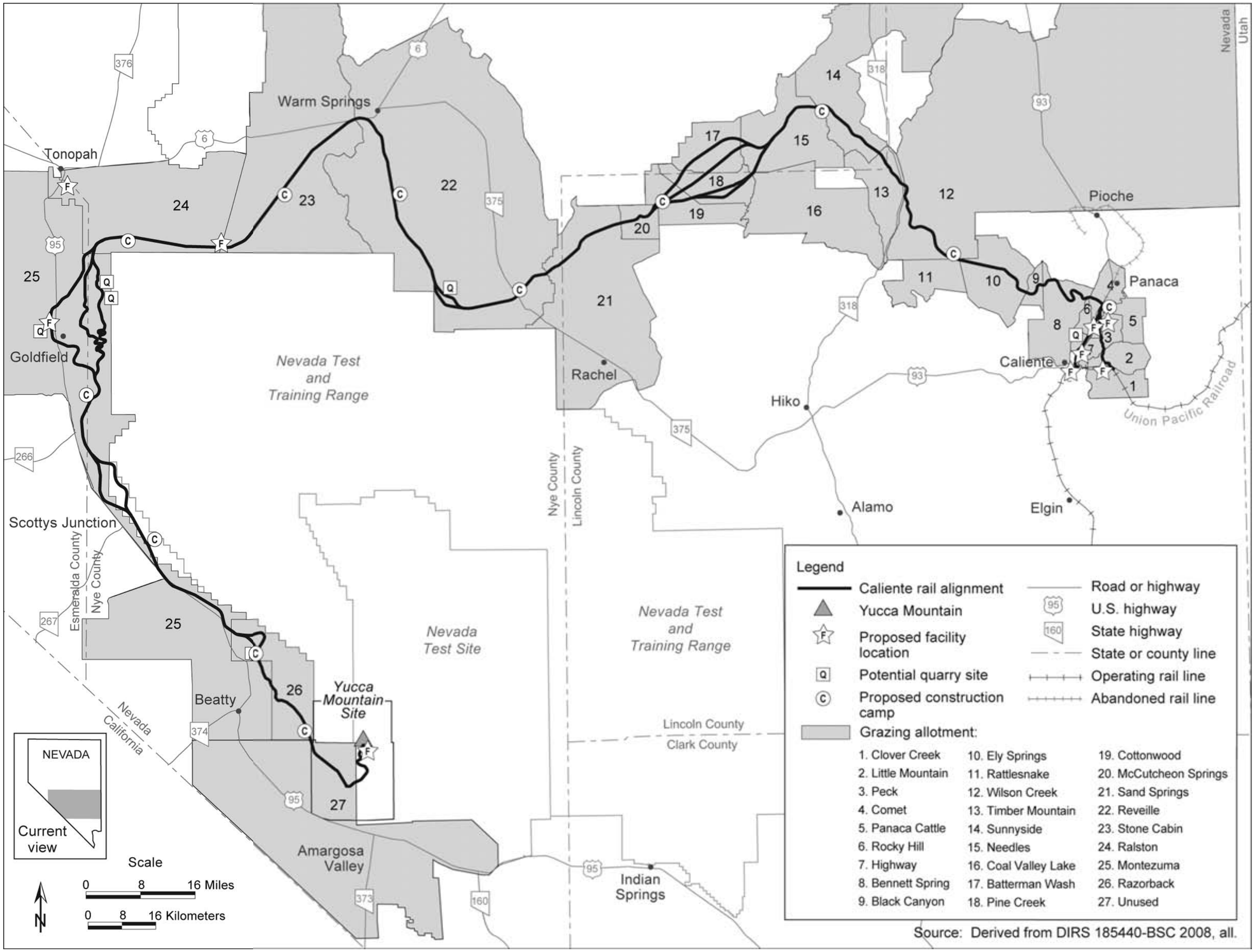


Figure 3-26. Grazing allotments along the Caliente rail alignment.

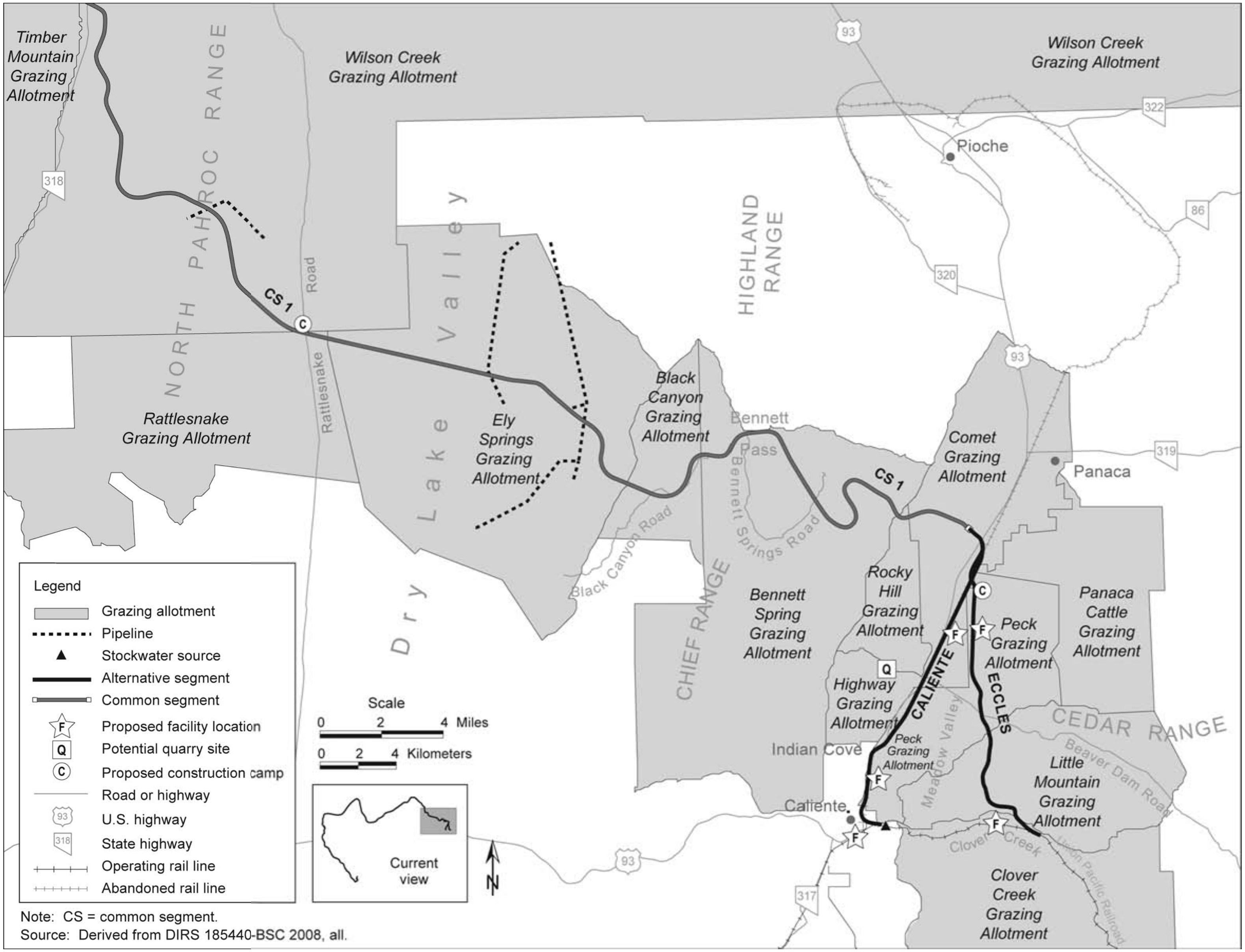


Figure 3-27. Grazing allotments with stockwater features within map area 1.

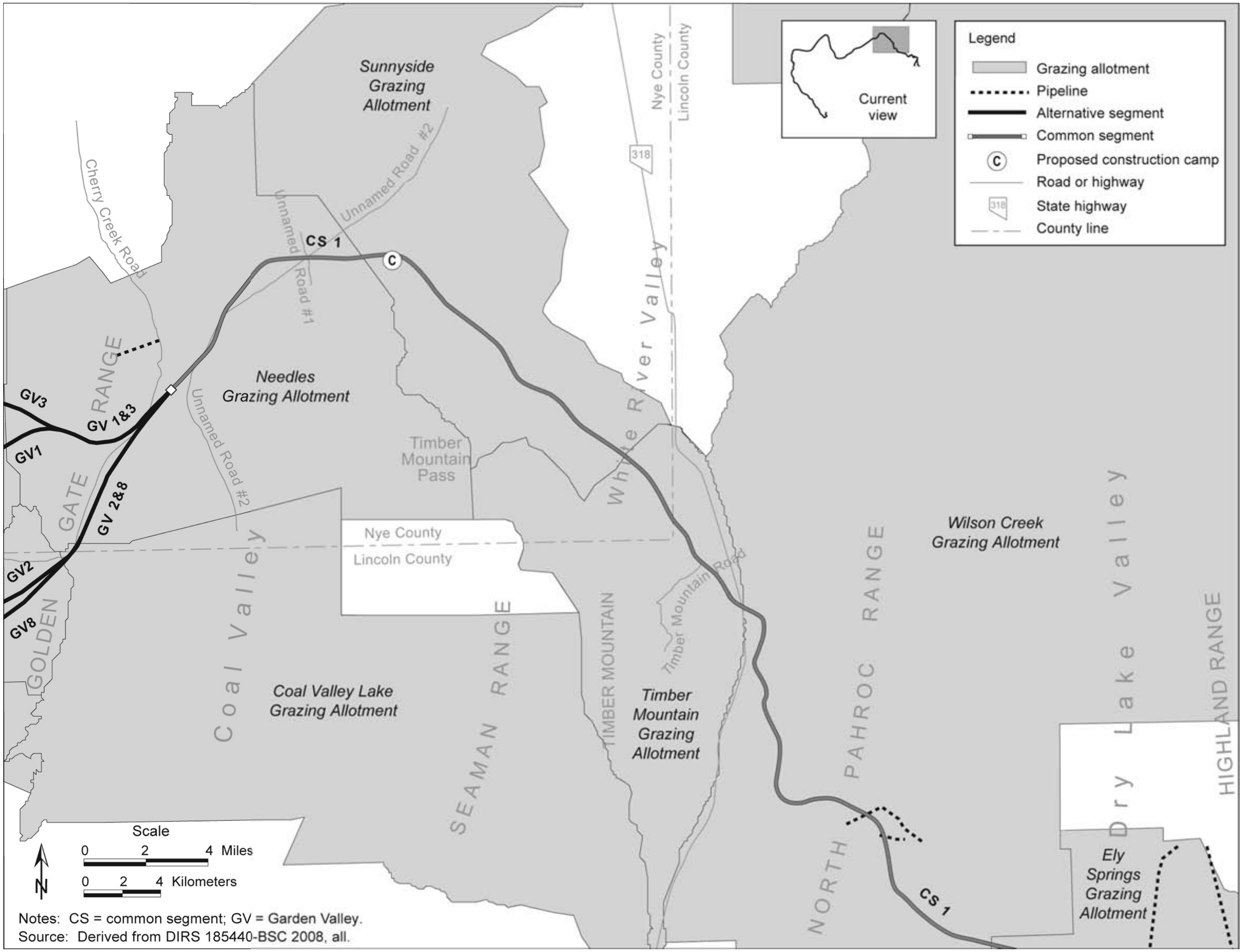


Figure 3-28. Grazing allotments with stockwater features within map area 2.

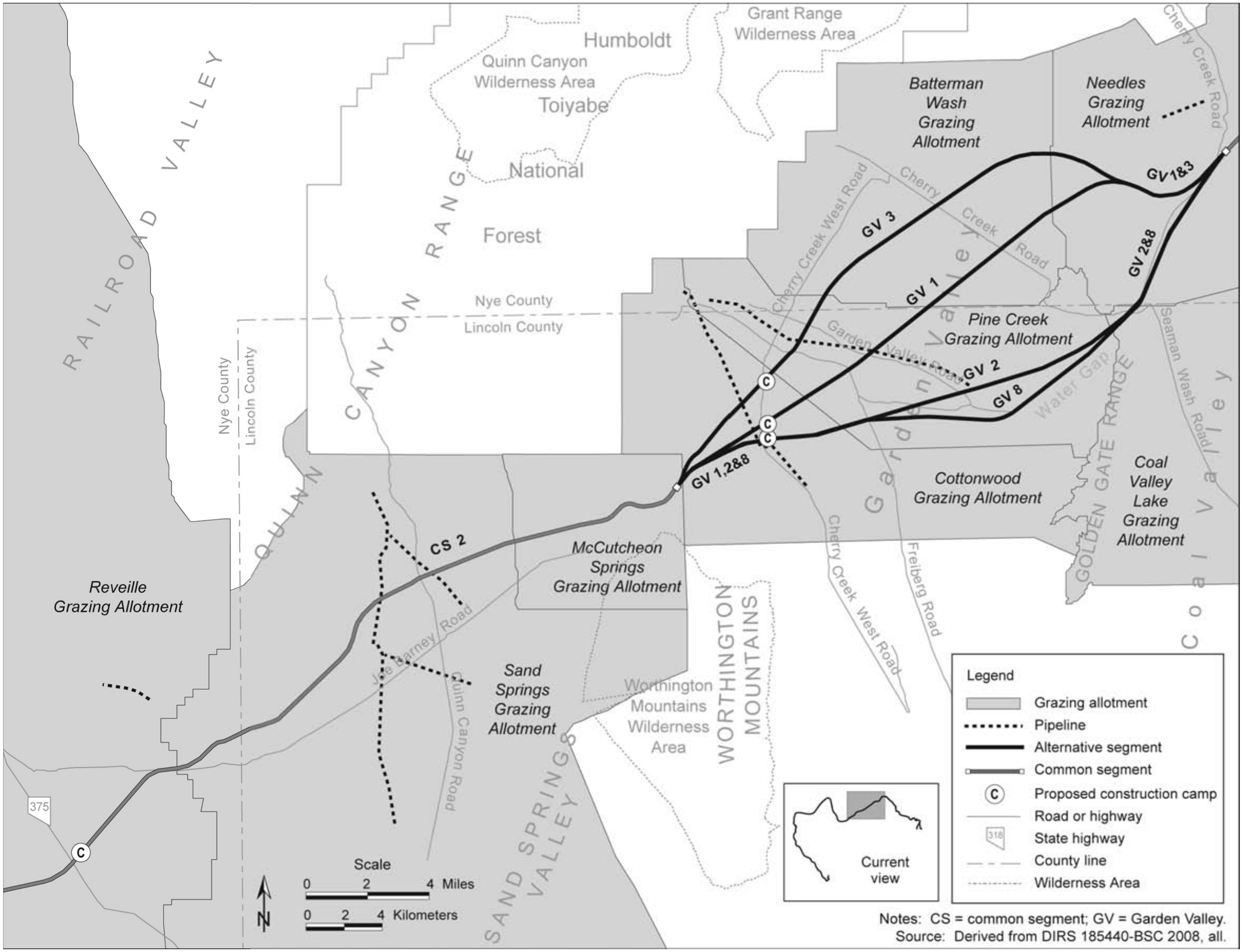


Figure 3-29. Grazing allotments with stockwater features within map area 3.

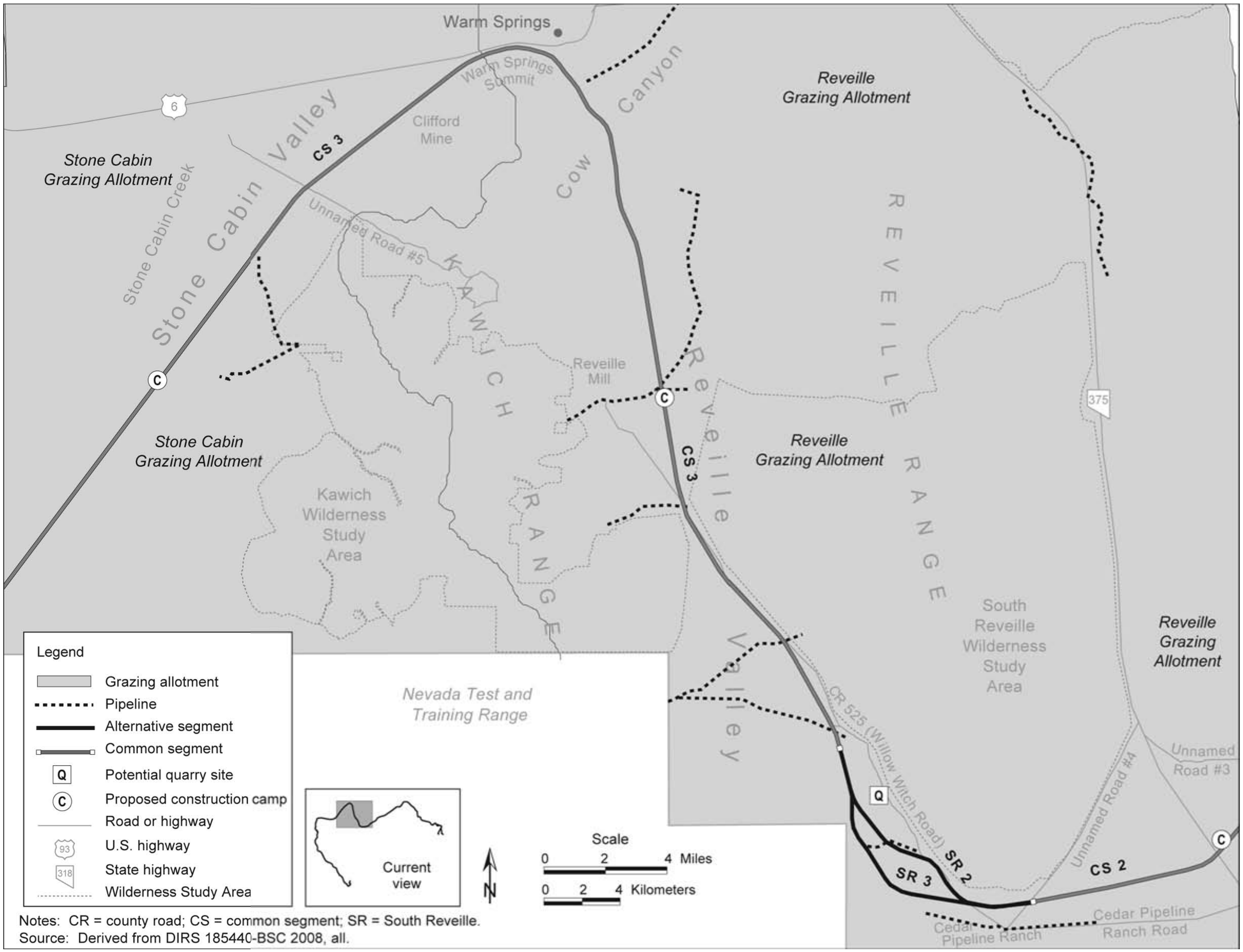


Figure 3-30. Grazing allotments with stockwater features within map area 4.

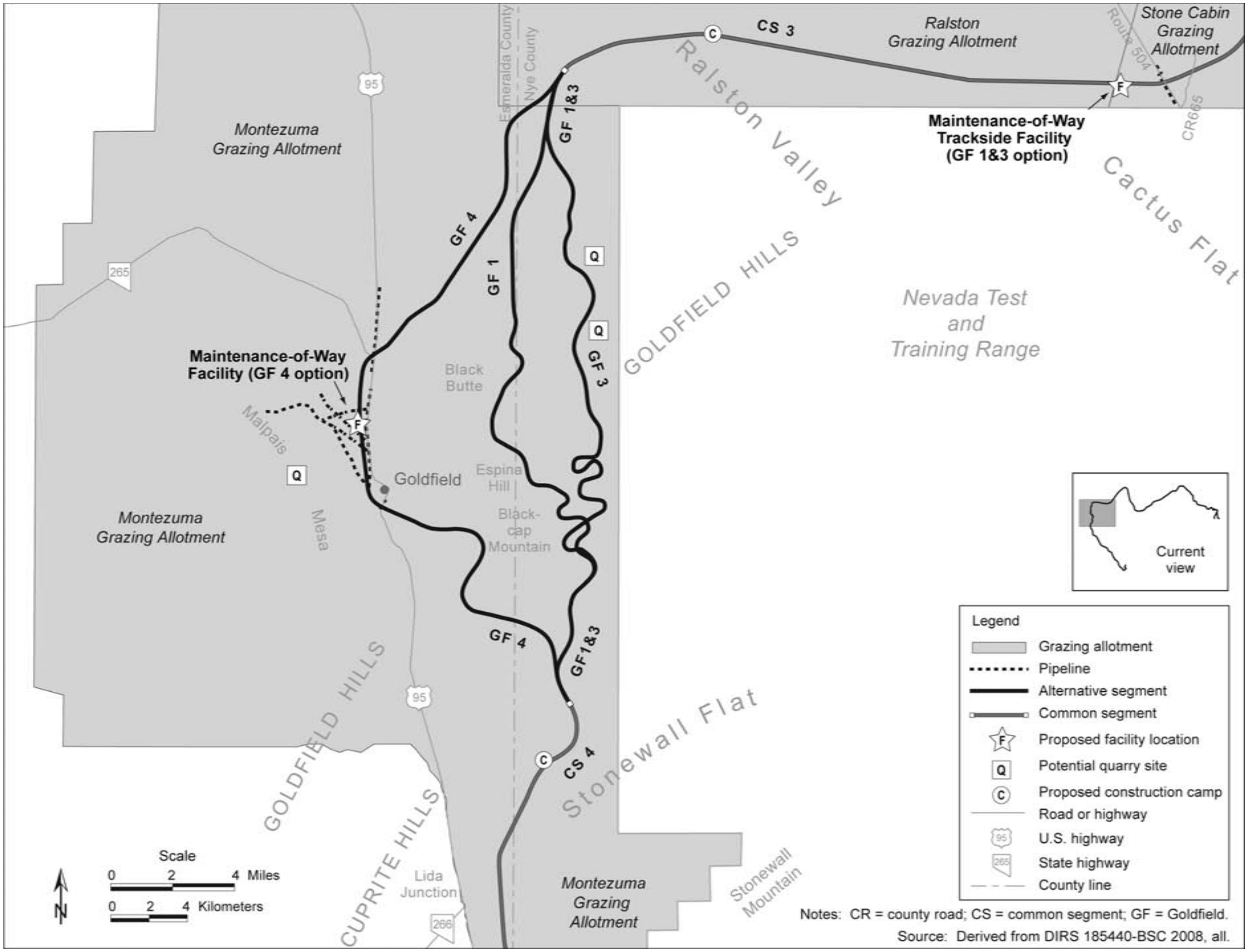


Figure 3-31. Grazing allotments with stockwater features within map area 5.

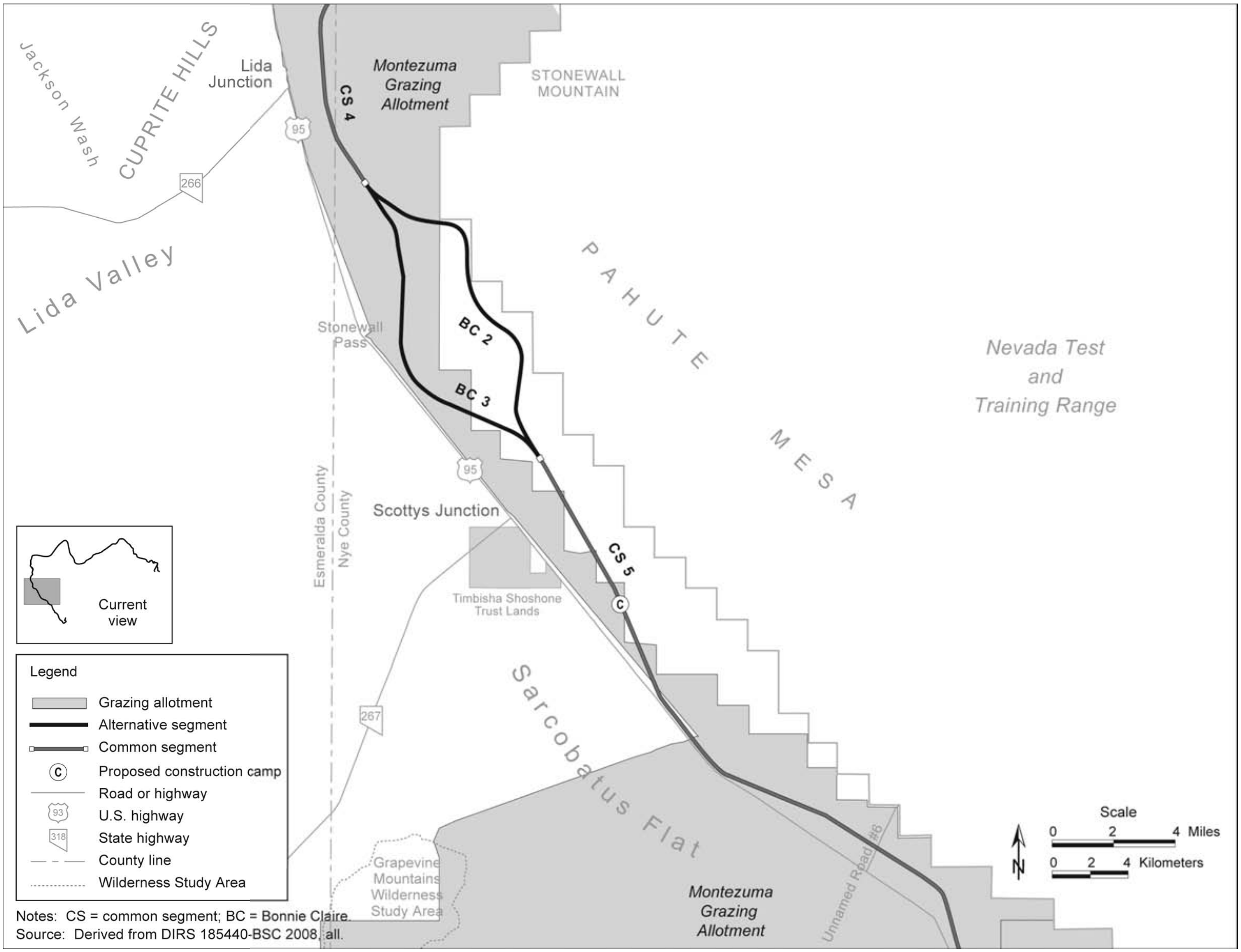


Figure 3-32. Grazing allotments with stockwater features within map area 6.

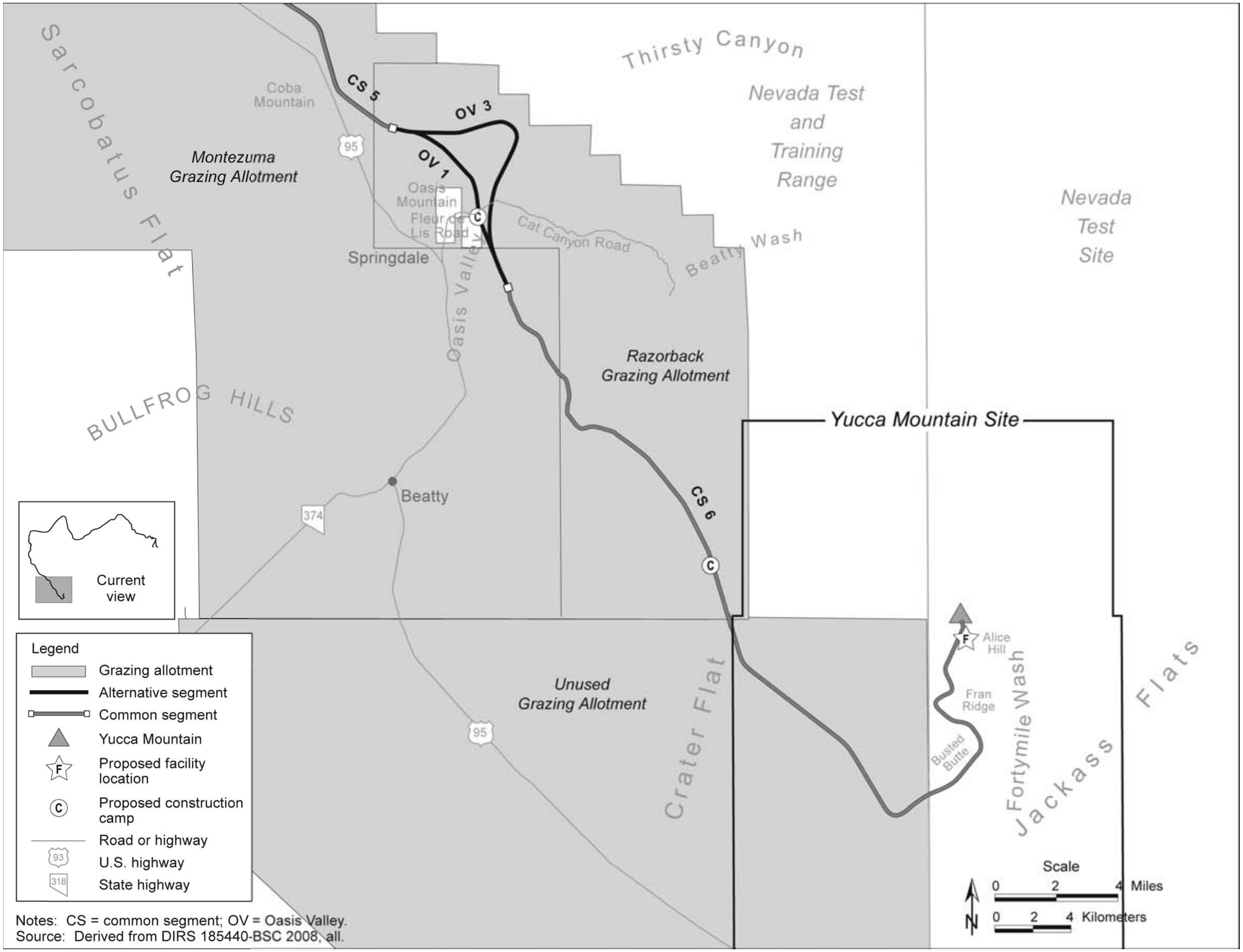


Figure 3-33. Grazing allotments with stockwater features within map area 7.

Table 3-6. Grazing allotment lands within the Caliente rail alignment construction right-of-way (page 1 of 2).

Rail line segment/facility	Grazing allotment	Rail alignment crossing distance (miles)[a]	Area that would be within the construction right-of-way or disturbed (acres)[b]
Eccles alternative segment	Clover Creek	0.9	38
Eccles alternative segment	Little Mountain	4.3	450
Eccles alternative segment[c]	Peck	4.7	670
Eccles alternative segment	Comet	1.2	43
Caliente alternative segment	Comet	0.22	24
Caliente alternative segment	Peck	d	17
Potential quarry CA-8B – Indian Cove option	Highway	d	250
Potential quarry CA-8A – Indian Cove option	Peck	d	44
Potential quarry CA-8B – Upland option	Highway	d	280
Potential quarry CA-8B – Upland option	Rocky Hills	d	8
Caliente common segment 1	Comet	2	240
Caliente common segment 1	Rocky Hills	0.41	49
Caliente common segment 1	Bennett Spring	10	1,250
Caliente common segment 1	Black Canyon	3.2	390
Caliente common segment 1	Ely Springs Cattle	12	1,420
Caliente common segment 1	Rattlesnake	1.1	130
Caliente common segment 1	Wilson Creek	15	1,830
Caliente common segment 1	Timber Mountain	6.4	770
Caliente common segment 1	Sunnyside	11	1,360
Caliente common segment 1	Needles	8.7	1,060
Garden Valley alternative segment 1	Needles	5.9	720
Garden Valley alternative segment 1	Batterman Wash	5.3	640
Garden Valley alternative segment 1	Pine Creek	4.8	580
Garden Valley alternative segment 1	Cottonwood	4.6	540
Garden Valley alternative segment 1	McCutcheon Springs	1.7	110
Garden Valley alternative segment 2	Coal Valley Lake	0.8	93
Garden Valley alternative segment 2	Pine Creek	9.3	1,130
Garden Valley alternative segment 2	Cottonwood	5.5	640
Garden Valley alternative segment 2	Needles	5.5	670
Garden Valley alternative segment 2	McCutcheon Springs	1.8	95
Garden Valley alternative segment 3	Needles	6	730
Garden Valley alternative segment 3	Pine Creek	2.8	340
Garden Valley alternative segment 3	Batterman Wash	9.1	1,100
Garden Valley alternative segment 3	Cottonwood	4.1	490
Garden Valley alternative segment 3	McCutcheon Springs	1.4	170
Garden Valley alternative segment 8	Coal Valley Lake	0.8	100
Garden Valley alternative segment 8	Pine Creek	9.8	1,050
Garden Valley alternative segment 8	Needles	5.5	660

Table 3-6. Grazing allotment lands within the Caliente rail alignment construction right-of-way (page 2 of 2).

Rail line segment/facility	Grazing allotment	Rail alignment crossing distance (miles)[a]	Area that would be within the construction right-of-way or disturbed (acres)[b]
Garden Valley alternative segment 8	McCutcheon Springs	1.1	95
Garden Valley alternative segment 8	Cottonwood	5.5	640
Caliente common segment 2	Sand Springs	14	1,650
Caliente common segment 2	McCutcheon Springs	5.2	620
Caliente common segment 2	Reveille	12	1,420
South Reveille alternative segment 2	Reveille	12	1,370
South Reveille alternative segment 3	Reveille	12	1,490
Potential quarry NN-9A	Reveille	d	490
Potential quarry NN-9B	Reveille	d	320
Caliente common segment 3	Reveille	46	2,730
Caliente common segment 3	Stone Cabin	28	3,400
Caliente common segment 3	Ralston	17	2,100
Goldfield alternative segment 1	Ralston	2.2	260
Goldfield alternative segment 1	Montezuma	25	3,000
Goldfield alternative segment 3	Ralston	2.2	260
Goldfield alternative segment 3	Montezuma	28	3,440
Goldfield alternative segment 4	Ralston	2.4	290
Goldfield alternative segment 4	Montezuma	27	3,280
Caliente common segment 4	Montezuma	7.2	870
Bonnie Claire alternative segment 2	Montezuma	5.6	420
Bonnie Claire alternative segment 3	Montezuma	9.6	1,160
Common segment 5	Montezuma	17	1,960
Common segment 5	Razorback	1.5	180
Common segment 5	Magruder Mountain	0.2	58
Oasis Valley alternative segment 1	Razorback	4.9	590
Oasis Valley alternative segment 1	Montezuma	1.1	130
Oasis Valley alternative segment 3	Razorback	7.7	940
Oasis Valley alternative segment 3	Montezuma	1.1	130
Potential quarry NS-3A	Montezuma	d	920
Potential quarry NS-3B	Montezuma	d	370
Potential quarry ES-7	Montezuma	d	360
Common segment 6	Razorback	11	1,320
Common segment 6	Montezuma	3.3	390
Common segment 6	Unused	9.6	1,160

a. To convert miles to kilometers, multiply by 1.6093.
b. To convert acres to square kilometers, multiply by 0.0040469.
c. Includes construction camp 1.
d. Rail line would not cross allotment; however, the facility would occupy the area listed in the next column.

Table 3-7. Features of grazing allotments within the Caliente rail alignment region of influence (page 1 of 2).

Grazing allotment	Area (acres)[a]	Active animal unit months (for cattle and year-round, unless otherwise specified)	Stockwater features that would be within the region of influence[b]
Clover Creek[c]	22,880	613	None
Little Mountain[c]	18,580	Relinquished	None
Peck[c]	17,740	397	None
Comet[c]	9,150	214	None
Panaca Cattle[c]	16,280	453	None
Highway[c]	4,250	118	None
Rocky Hills[c]	4,380	Relinquished	None
Bennett Spring[c]	48,260	3,498 (October 16 to April 30)	None
Black Canyon[c]	8,440	1,105 (October 16 to April 30)	None
Ely Springs Cattle[c]	55,170	4,248	Caliente common segment 1 would cross two pipelines (water base property).[f]
Rattlesnake[c]	28,430	1,180 (October 16 to May 30)	None
Wilson Creek[c,d]	1,077,990	48,250 cattle and sheep	Caliente common segment 1 would cross one pipeline (water base property).[f]
Timber Mountain[c]	43,840	2,373 cattle and sheep (November 1 to April 10)	None
Sunnyside[c]	219,520	5,402 (June 1 to October 31)	None
Needles[c]	85,500	2,679 (cattle October 1 to February 28 and sheep October 1 to April 15)	None
Batterman Wash[c]	39,880	2.093 (cattle November 15 to June 15 and sheep December 1 to April 15)	None
Pine Creek[c]	34,690	2,667 (May 1 to December 31)	Garden Valley alternative segments 1 and 3 would cross one pipeline.
Coal Valley Lake[c]	115,180	4,821 (cattle September 1 to May 5 and sheep November 1 to April 10)	None
Cottonwood (#11015)[c]	42,170	1,177 (October 1 to December 31 and April 1 to May 31)	None
McCutcheon Springs[c]	18,280	446	None
Sand Springs (#1066)[c]	249,690	7,005	Caliente common segment 2 would cross two pipelines.
Reveille[e]	657,520	25,730	Caliente common segment 3 would cross five pipelines. South Reveille alternative segment 2 may cross the Reveille Peak pipeline extension.
Stone Cabin[e]	389,500	13,963	Caliente common segment 3 would cross one pipeline.

Table 3-7. Features of grazing allotments within the Caliente rail alignment region of influence (page 2 of 2).

Grazing allotment	Area (acres)[a]	Active animal unit months (for cattle and year-round, unless otherwise specified)	Stockwater features that would be within the region of influence[b]
Ralston[e]	368,680	Not applicable; inactive allotment	None
Montezuma[e]	538,300	Not applicable; inactive allotment	Goldfield alternative segment 4 would cross six pipelines.
Razorback[e]	72,880	959	None
Unused[f]	256,500	Not applicable; inactive allotment	None

a. To convert acres to square kilometers, multiply by 0.0040469. Land area values rounded to two significant digits except values over 1,000, which are rounded to the nearest 10.
b. Source: DIRS 182898-NDWR 2007, all.
c. Source: DIRS 184767-BLM 2007, all.
d. Agreement decision stating permittee will take non-use (voluntary or for conservation and protection of range lands). Therefore, total active use occurring on the allotment would be less than shown.
e. Source: DIRS 173224-BLM 1997, all (area of allotment may include private land).
f. Source: DIRS 173845-Resource Concepts 2005, all.

under a 90-year lease agreement with private owners under the Alien Gold Project (DIRS 183644-Shannon & Wilson 2007, pp. 92 and 93).

A portion of Caliente common segment 3 would cross the Clifford Mining District, which is near Warm Springs. The Clifford Mining District is generally south of U.S. Highway 6 in Stone Cabin Valley, trending southwest from Warm Springs. The geology of this district is favorable for gold and silver (DIRS 183644-Shannon & Wilson 2007, pp. 81 and 83). Ore-grade mineralization and exploration programs in the area have led to gold production.

Goldfield alternative segments 1, 3, and 4 would cross the Goldfield Mining District. Goldfield is the largest center of mining within the region of influence. The Goldfield Mining District consists of the Goldfield Main, McMahon Ridge, and Gemfield areas, and is in the Goldfield Hills to the northeast and southwest of Goldfield, Nevada. An additional area (referred to as the Tom Keane area) has been the subject of 2003 exploration efforts. The Goldfield Project, owned by Metallic Ventures Gold, Inc., consists of 385 patented and 849 unpatented claims (wholly owned or controlled) covering more than 83 square kilometers (20,600 acres) in Esmeralda and Nye Counties (DIRS 183644-Shannon & Wilson 2007, p. 63). Metallic Ventures Gold, Inc., has plans to explore the Gemfield area and has plans to conduct two phases of exploration. Gemfield Phase 2 would require the relocation of U.S. Highway 95 west of its current route (DIRS 185176-Siebel, Long, Kennedy, and Carew 2006, p. 18-6). This exploration site would coincide with the location of a portion of Goldfield alternative segment 4 and the proposed Maintenance-of-Way Facility. The company filed a plan of operations and an Environmental Assessment for exploration with the BLM Tonapah field office. The plan of operations will allow the company to continue with exploration activities in and around the Gemfield deposit, particularly to the west (DIRS 185176-Seibel et al. 2006, p. 18-12).

Goldfield alternative segment 1 would cross the Diamondfield Mining District, which is approximately 8 kilometers (5 miles) northeast of Goldfield and is approximately 1.6 kilometers (1 mile) long. There is limited published information on this district, which is known to include ore bodies containing gold and silver. The total recorded value of production of the district is approximately $50,000, but actual production could be as much as $1 million to $2 million (DIRS 183644-Shannon & Wilson 2007, p. 68).

A portion of Caliente common segment 4 would cross the westernmost portion of the Stonewall Mining District, although most of the past mining activity in this district is approximately 5 kilometers (3 miles)

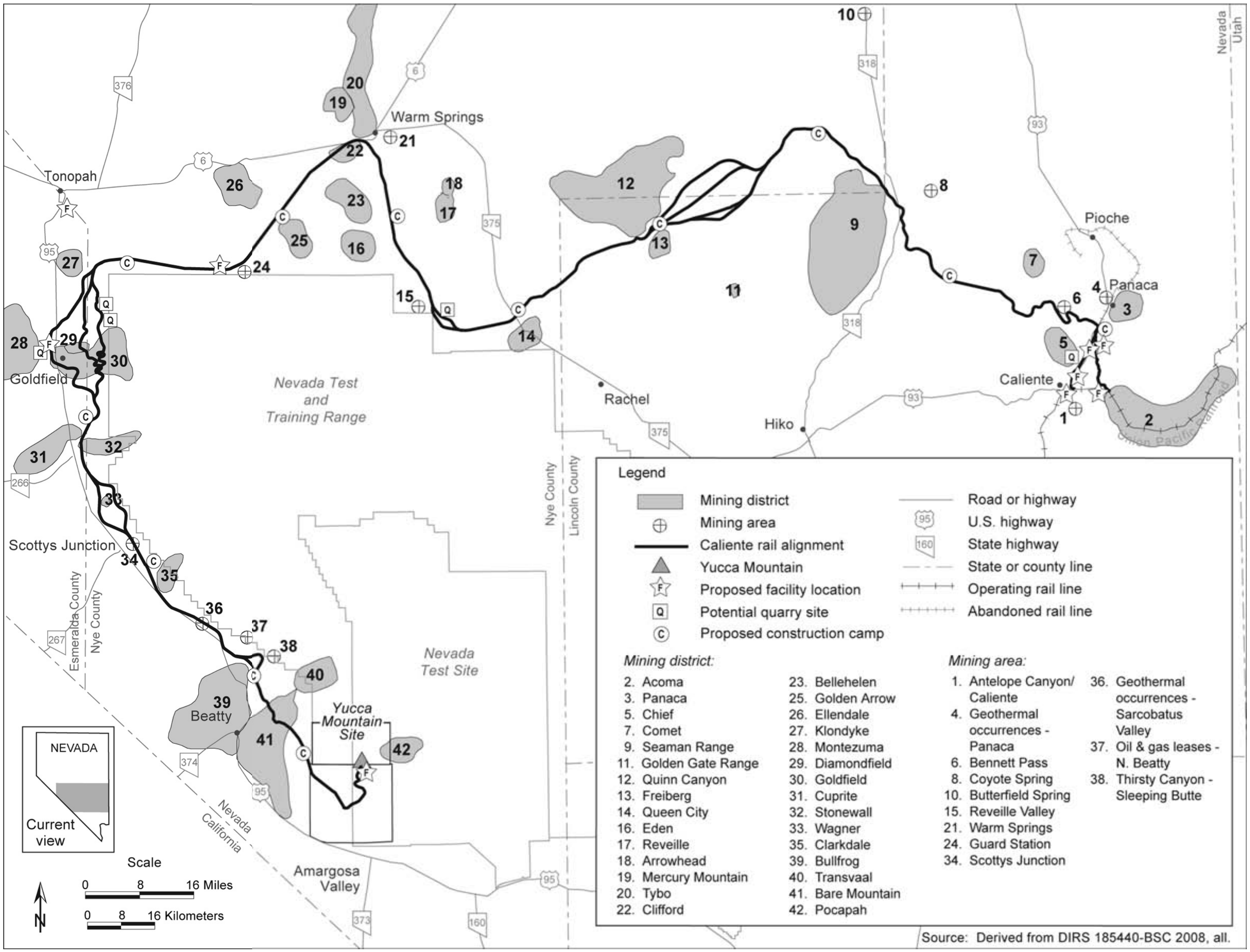


Figure 3-34. Mineral and energy resources along the Caliente rail alignment.

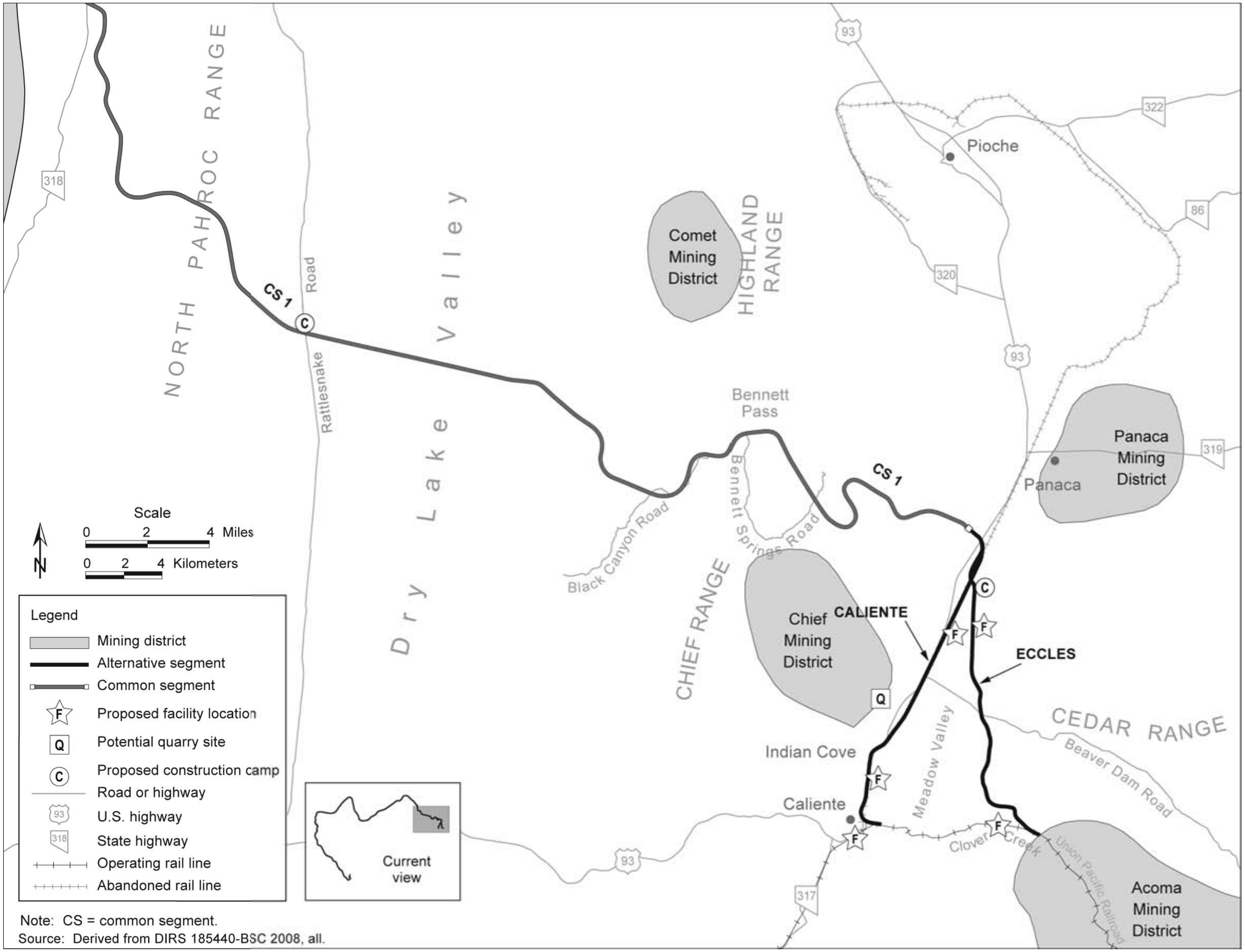


Figure 3-35. Mineral and energy resources within map area 1.

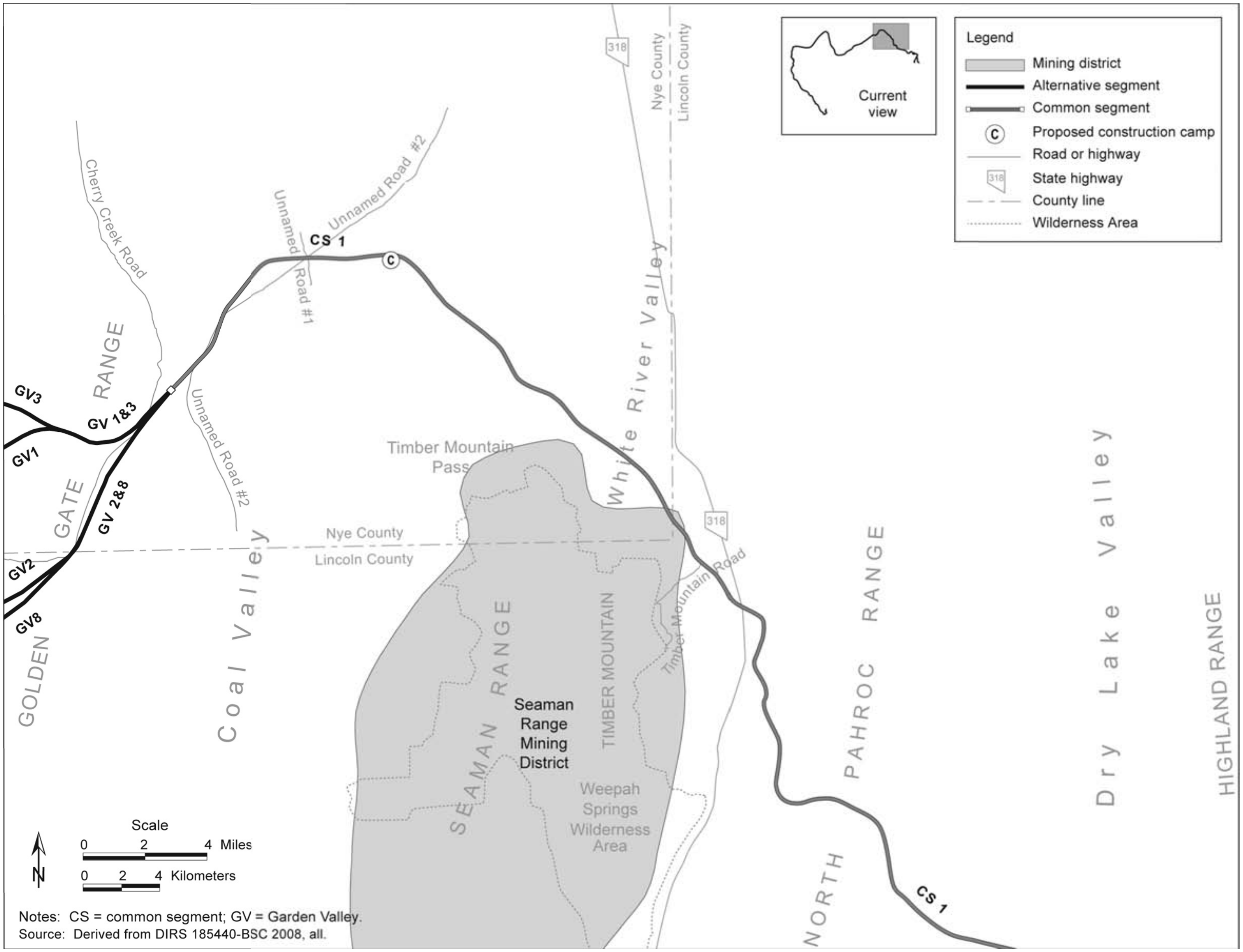


Figure 3-36. Mineral and energy resources within map area 2.

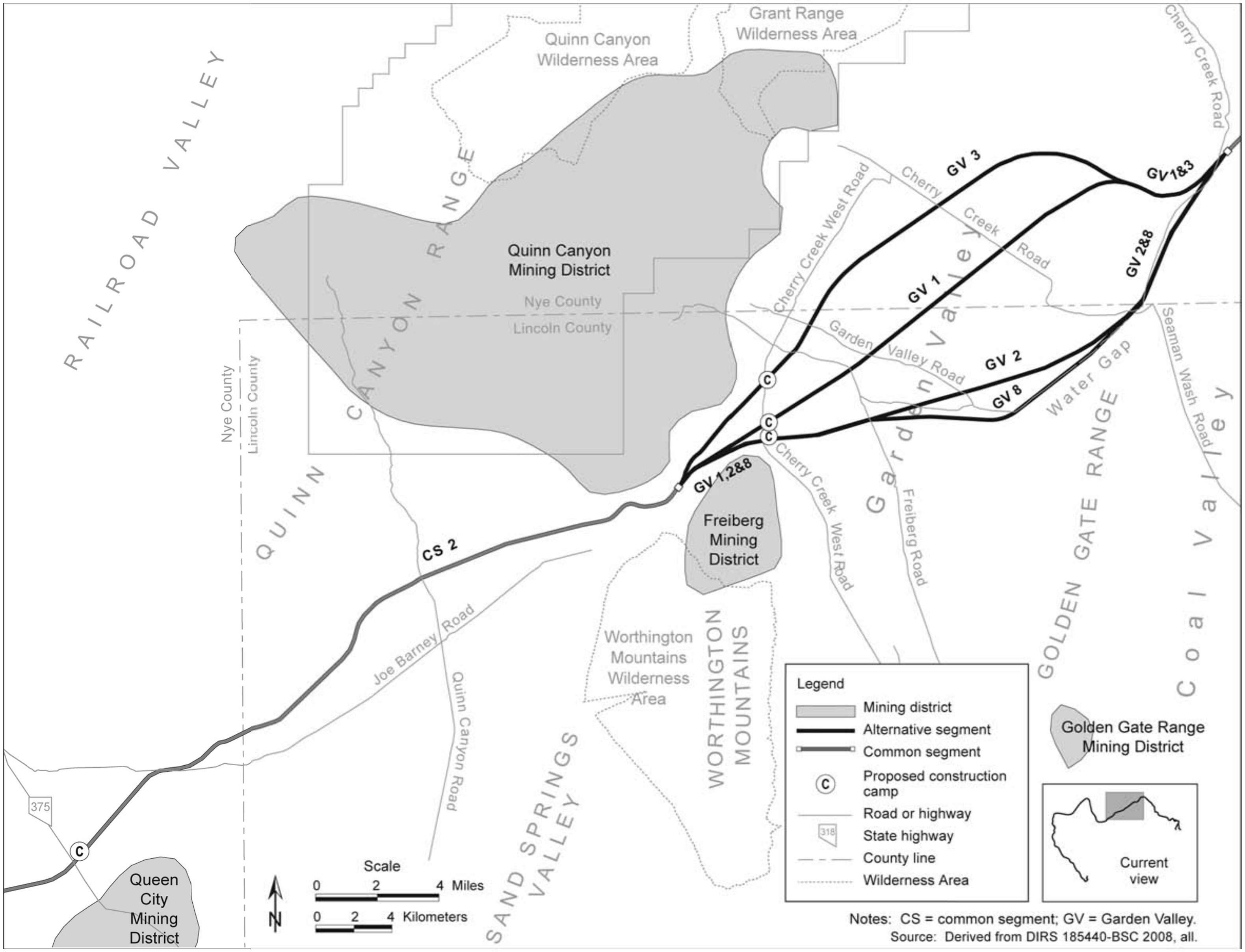


Figure 3-37. Mineral and energy resources within map area 3.

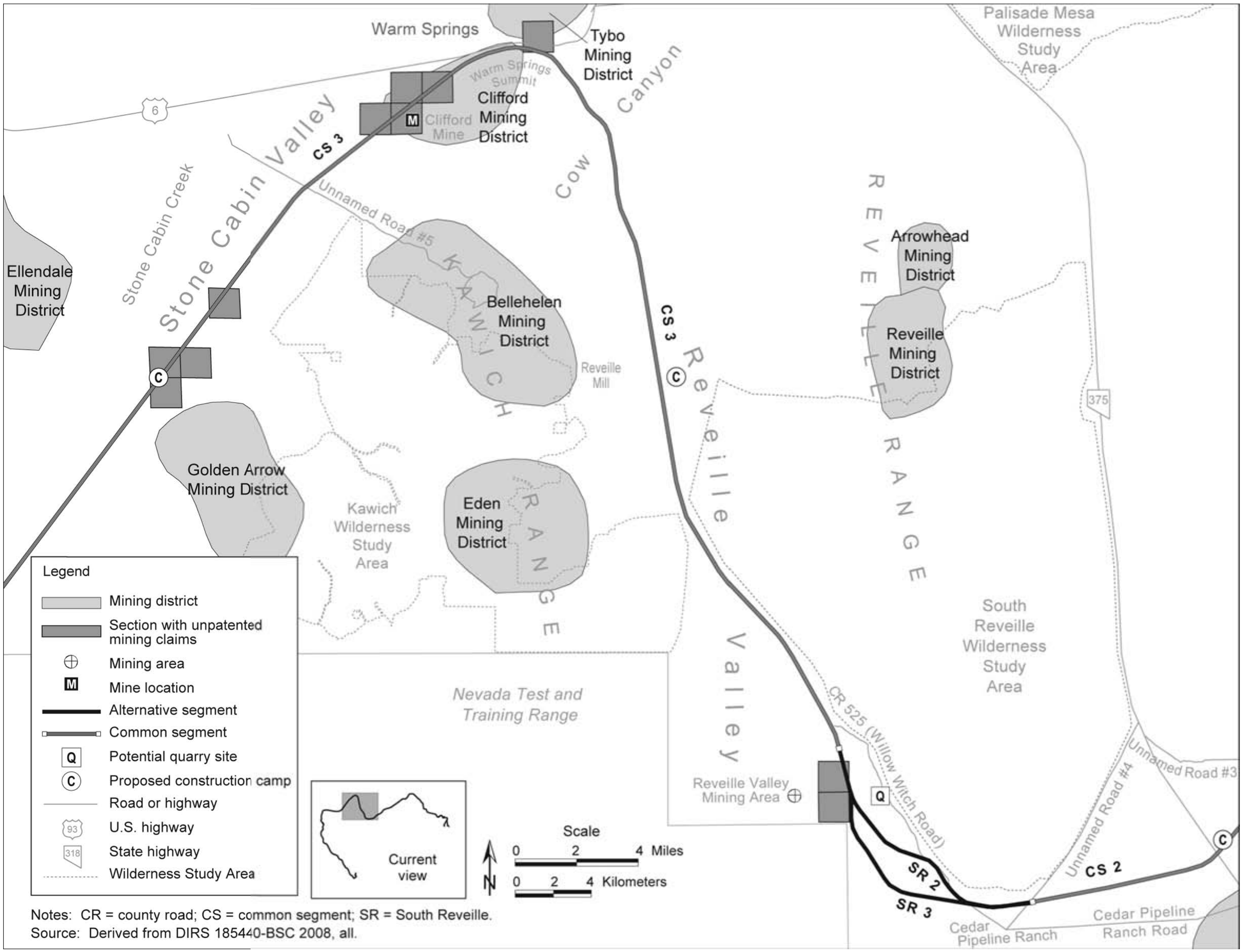


Figure 3-38. Mineral and energy resources within map area 4.

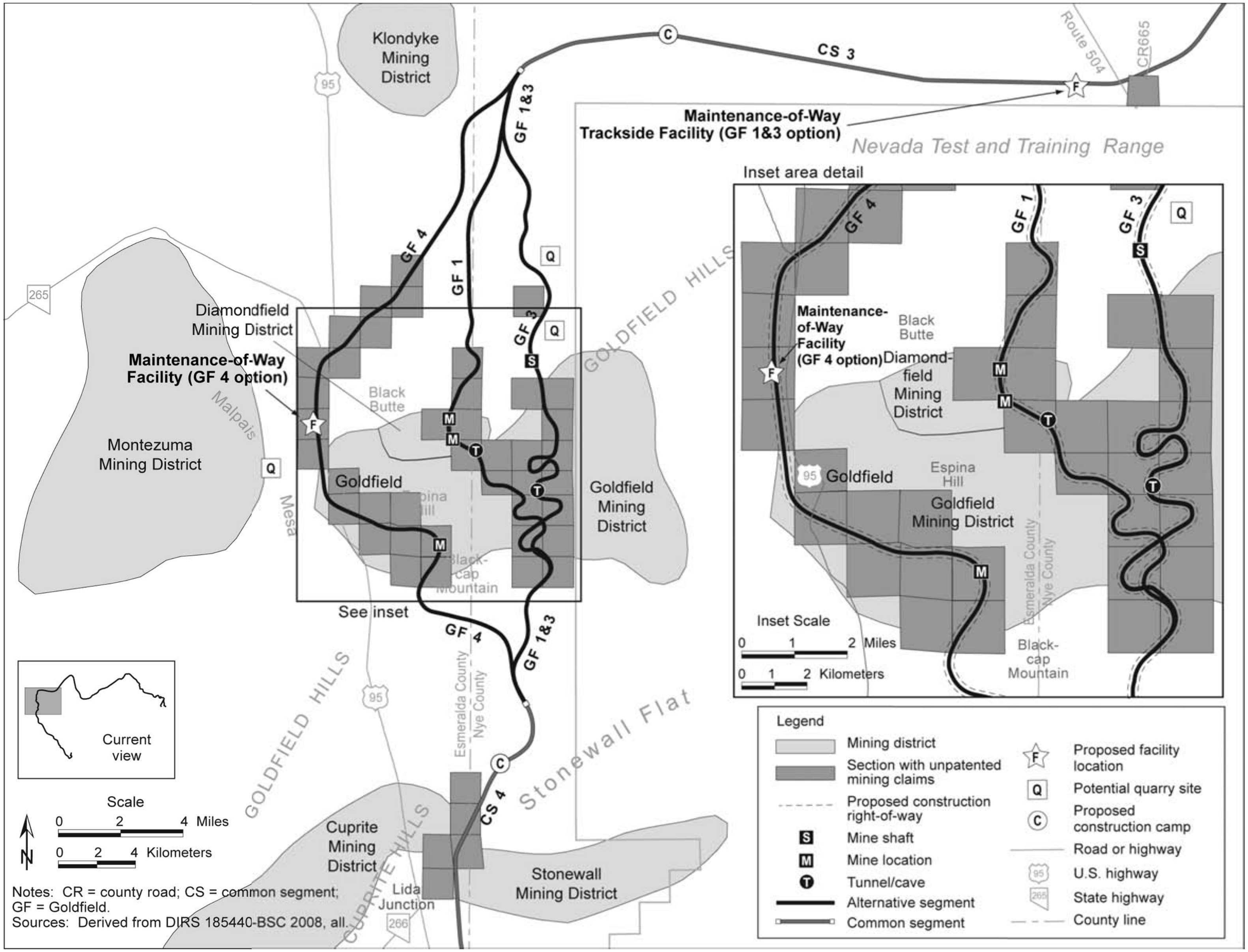


Figure 3-39. Mineral and energy resources within map area 5.

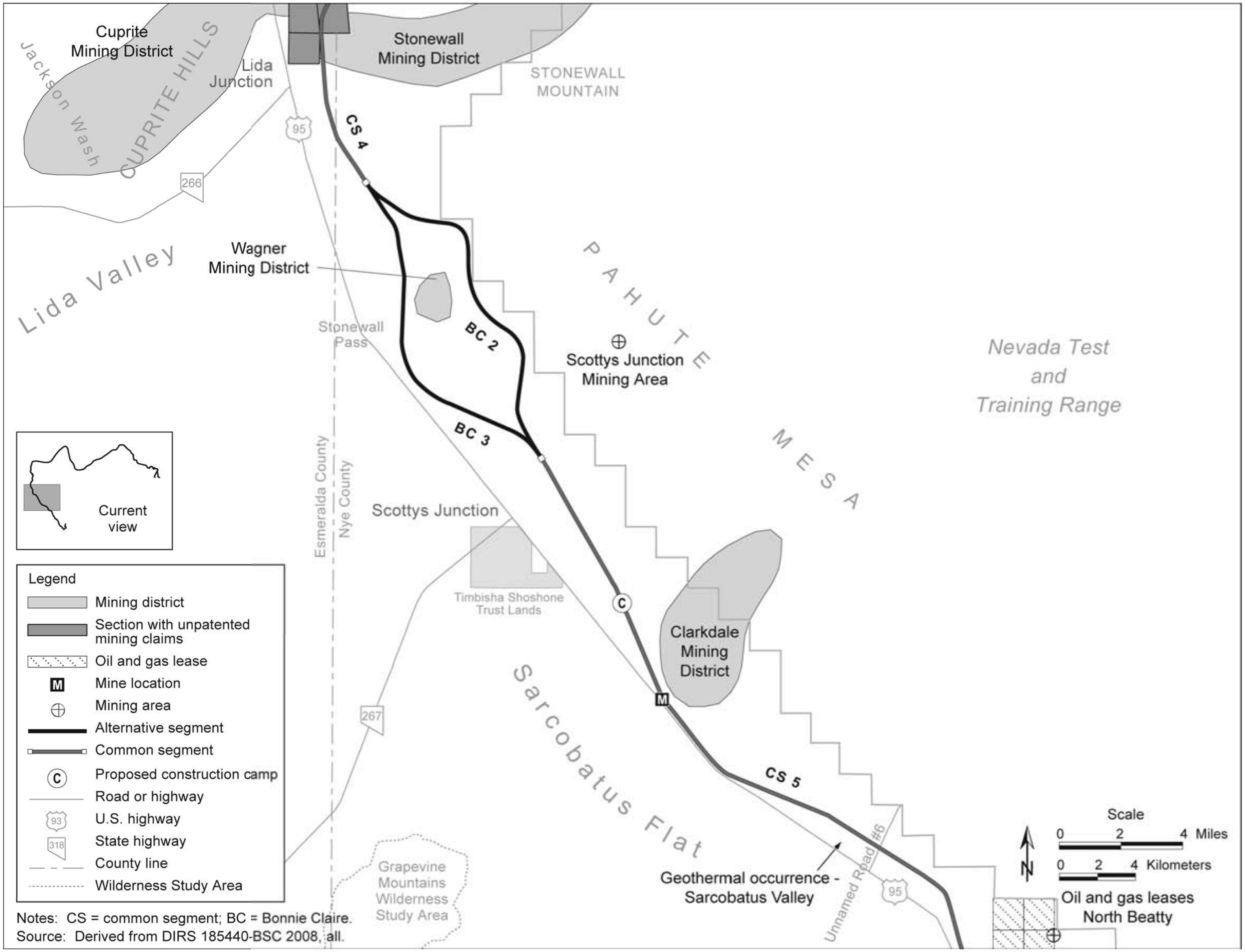


Figure 3-40. Mineral and energy resources within map area 6.

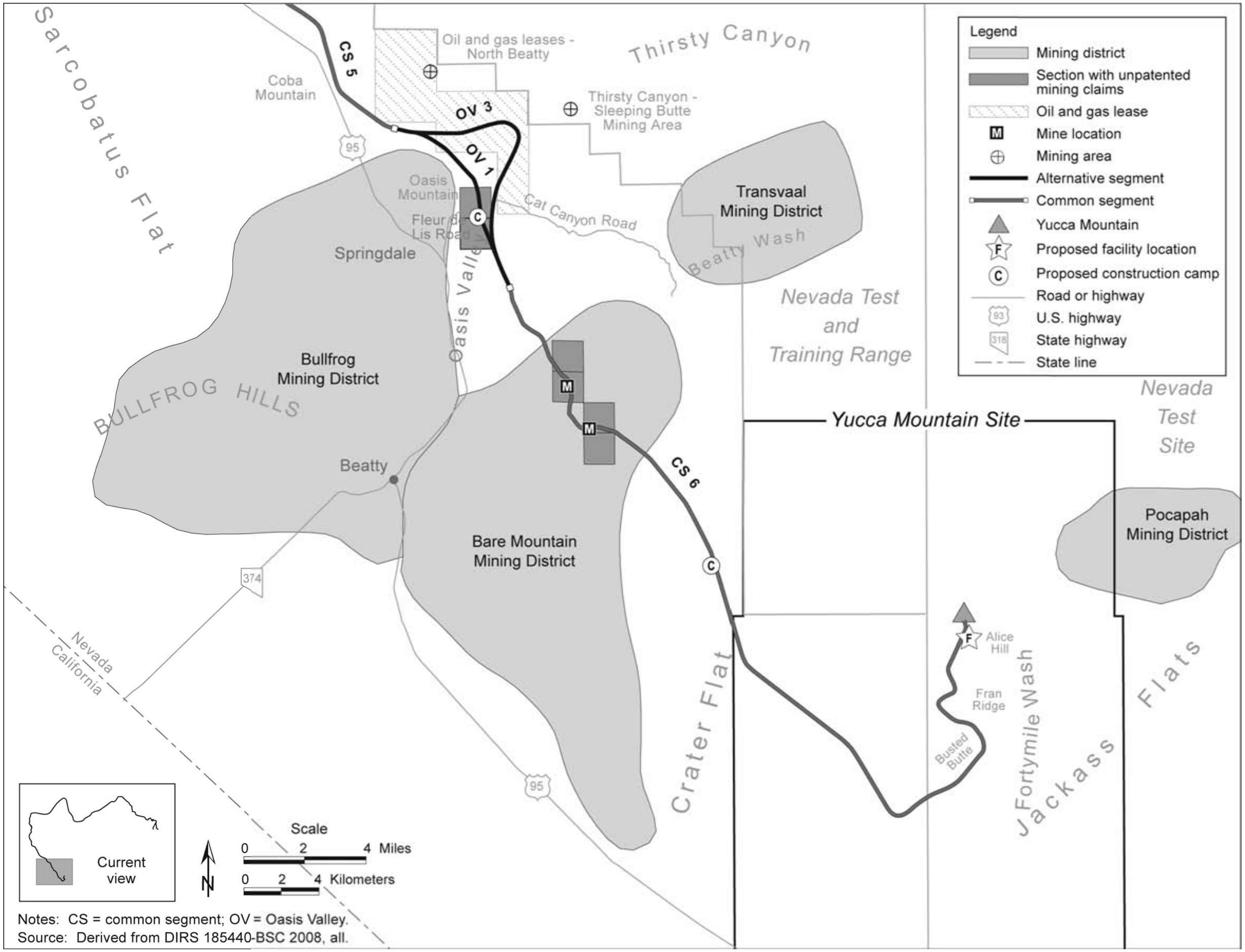


Figure 3-41. Mineral and energy resources within map area 7.

east of the common segment. This district was reportedly prospected for gold and silver as early as 1905 (DIRS 183644-Shannon & Wilson 2007, p. 54). Veins of gold and silver currently under exploration in this district are prominent at areas mined in the past and continue easterly away from the rail alignment.

The Bonnie Claire alternative segments would be west of the Scottys Junction Mining Area and the Wagner Mining District would lie between these segments. Neither segment's construction right-of-way would cross these mining locations. The Wagner Mining District has a number of patented mining claims although none would fall within the construction right-of-way for either Bonnie Claire alternative segment. The main rock types within the Wagner Mining District are shale, quartzite, and intercalated limestone. There was evidence of active exploration efforts in this district by several companies in 2005 (DIRS 183644-Shannon & Wilson 2007, p. 54).

The closest mining districts to common segment 5 would be Clarkdale Mining District to its east and Bullfrog Mining District to its south where it would meet the Oasis Valley alternative segments. The Oasis Valley alternative segments are between the Bullfrog Mining District and the Thirsty Canyon-Sleeping Butte Mining Area. The Clarkdale Mining District contains discontinuous, narrow zones containing some gold and silver mineralization (DIRS 183644-Shannon & Wilson 2007, p. 50). The Bullfrog Mining District contains small, localized areas of gold, silver, and lesser copper mineralization (DIRS 183644-Shannon & Wilson 2007, p. 4). The Thirsty Canyon-Sleeping Butte Mining Area has been historically quarried for decorative rock and building stone (DIRS 183644-Shannon & Wilson 2007, p. 47).

Common segment 6 would cross the northeastern portion of the Bare Mountain Mining District, although the vast majority of past mining activity occurred more than 3 kilometers (2 miles) south of this common segment. The district contains gold-bearing veins, and some veins contain silver. The district also contains a variety of minerals and semi-precious stones, including opal, chalcopyrite, malachite, azurite, galena, pyrite, limonite, hematite, fluorite, fluorspar, and gypsum (DIRS 183644-Shannon & Wilson 2007, pp. 37 and 40).

The only patented mining claims that would fall within or intersect the Caliente rail alignment construction right-of-way would be along the Goldfield alternative segments (see Table 3-4). Table 3-8 lists the number of sections containing unpatented mining claims the rail line construction right-of-way could cross. The existence of abandoned or active mining tunnels and shafts near the rail alignment would also be a concern for safety reasons. There are several tunnels, shafts, and underground mines within the construction right-of-way along the Goldfield alternative segments. There is one tunnel along Goldfield alternative

Table 3-8. Number of unpatented mining claims that may intersect the Caliente rail alignment construction right-of-way.[a]

Rail line segment	Numbers of sections with unpatented mining claims	Unpatented mining claims across all sections[b]
South Reveille 2	2	63
South Reveille 3	2	63
Caliente common segment 3	10	133
Goldfield 1	14	375
Goldfield 3	14	205
Goldfield 4	19	374
Caliente common segment 4	5	22
Oasis Valley 1	2	7
Oasis Valley 3	2	7
Common segment 6	4	19

a. Source: DIRS 185440-BSC 2008, all.
b. Data are provided by Township, Range, and Section and might not fall within the rail line construction right-of-way. DOE would need to verify the actual numbers and locations of unpatented mining claims before applying for a right-of-way grant. These data may not reflect unpatented mining claims closed since this dataset was obtained.

segment 1, four underground mines/shafts along Goldfield alternative segment 3, and one tunnel along Goldfield alternative segment 4. DOE obtained the data on locations of tunnels and caves, mining shafts, and underground mines from the Nevada Bureau of Mines and Geology (DIRS 185440-BSC 2008, all). However, none of the tunnels, shafts, and underground mines in this dataset that fall within the construction right-of-way is identified as having been field verified by the Nevada Bureau of Mines and Geology. Furthermore, this dataset might not include very old tunnels, shafts, and underground mines that were not recorded.

The Caliente rail alignment would tend on average to cut through higher elevation areas to maintain a level grade. Based on the calculated balance of cuts and fill volume along the entire rail alignment, any fill material (sand and gravel) needed to maintain a level grade could be obtained from inside the construction right-of-way without the need to create new borrow sites.

3.2.2.5.2.2 Energy Resources. The Basin and Range Province is considered a favorable area for geothermal resources because it has higher-than-average heat flow and is an area of crustal expansion, where faults can provide permeable reservoirs and conduits for deep circulation of water, and the crust is so thin it has a higher-than-average heat flux. Several hundred wells have been drilled in Nevada to discover high-temperature geothermal steam resources (DIRS 183644-Shannon & Wilson 2007, p. 31).

Geothermal resources are present as hot springs and thermal waters near Caliente Hot Springs, Bennett Spring, Pedro Spring, Warm Springs Summit, Sarcobatus Flat, Scottys Junction, Panaca (Owl Warm Springs), Cedar Spring, Stonewall Flat, and Beatty Warm Springs (DIRS 183644-Shannon & Wilson 2007, p. 15). There are geothermal occurrences (springs and wells) in Sarcobatus Valley along U.S. Highway 95 south of Scottys Junction (DIRS 183644-Shannon & Wilson 2007, p. 48). However, there would be no geothermal resources within the construction right-of-way of any of the Caliente rail alignment alternative segments or common segments.

Fourteen sections of land constitute a single oil and gas lease (one permittee) 19 kilometers (12 miles) north of Beatty along the southwest flank of Pahute Mesa in southern Nye County (DIRS 179587-Wilson 2007, all). For reference, a section is a unit of land equal to 2.6 square kilometers (1 square mile), as defined under the public land survey system. Oasis Valley alternative segment 3 would cross seven of the 14 sections and Oasis Valley alternative segment 1 would cross two sections of this oil and gas lease block.

3.2.2.5.3 Recreation

This section describes the recreational areas within or near the Caliente rail alignment region of influence. Figures 3-42 through 3-49 show recreational areas near the Caliente rail alignment.

3.2.2.5.3.1 Lincoln County. There are two state parks in the vicinity of the Caliente rail alignment in Lincoln County. The Kershaw-Ryan State Park is approximately 2.4 kilometers (1.5 miles) south of the City of Caliente, along State Route 317 (Rainbow Canyon Road). This park is approximately 3.2 kilometers (2 miles) southwest of the Caliente alternative segment and not within the region of influence. The Cathedral Gorge State Park is 2.6 kilometers (1.6 miles) west of U.S. Highway 93, approximately 5.3 kilometers (3.3 miles) northeast of Caliente common segment 1, and not within the region of influence.

Recreation on BLM-administered lands in Lincoln County has traditionally been dispersed. Primary recreation activities in Lincoln County include hunting, camping, exploration and site-seeing, off-highway vehicle competition events, and rock-art viewing.

Under the Ely Proposed Resource Management Plan (DIRS 184767-BLM 2007, p. 2.4-98), the BLM would designate two ***Back Country Byways*** (Silver State Trail Byway and Rainbow Canyon Byway) near

A **Back Country Byway** is a vehicle route that traverses scenic corridors utilizing secondary or back country road systems (DIRS 181598-BLM [n.d.], all).

the Caliente rail alignment. The Silver State Off-Highway Vehicle Trail is approximately 420 kilometers (260 miles) long and consists of a series of existing backcountry roads that are open for use by off-highway vehicle enthusiasts. Caliente common segment 1 would cross the most trails of any segment along the Caliente rail alignment, and would also cross the Silver State Off-Highway Vehicle Trail in two places (see Figure 3-43). The northern portion of the proposed Rainbow Canyon Back Country Byway would include portions of U.S. Highway 93 in Caliente. The Caliente and Eccles alternative segments would cross the Byway. The Rainbow Canyon Back Country Byway is made up of paved and unpaved ***class 3 or 4 roads***.

The Ely Proposed Resource Management Plan would also designate Chief Mountain as an off-highway vehicle use emphasis area (see Figure 3-43). The Chief Mountain area is frequently used for off-highway vehicles. The south access point is at Oak Springs Summit on the north side of U.S. Highway 93 approximately 8 kilometers (5 miles) west of Caliente. Portions of common segment 1 would cross this proposed off-highway vehicle use emphasis area.

A **class 3 road** is a light-duty, paved or improved road.

A **class 4 road** is an unimproved, unsurfaced road (includes track roads in back country).

Trail routes are trails and roads passable only with a 4-wheel drive vehicle (also called Jeep trails).

Source: DIRS 181386-BLM 2001, all.

A number of BLM-permitted off-highway vehicle races and special recreation events take place annually in areas around the Caliente rail alignment common segments and alternative segments in Lincoln County (DIRS 178416-Nevada Rail Partners 2007, all). These events are limited to courses for which NEPA analysis has been completed. The largest number of BLM-approved race routes are in and around Caliente and Panaca, and the Eccles and Caliente alternative segments would each cross previously used routes approximately 10 times. Caliente common segment 1 would cross previously used routes approximately 20 times, primarily east of Dry Lake Valley and in the Pahroc Range. Recent off-highway vehicle events in the area have included the Las Vegas to Reno Race and the Silver State 300.

There are two Wilderness Areas along the Caliente rail alignment in Lincoln County – the Weepah Springs Wilderness Area and the Worthington Mountains Wilderness Area. Caliente common segment 1 would be 1.6 kilometers (1 mile) from the Weepah Springs Wilderness Area at its closest point (see Figure 3-44). Caliente common segment 2 would be 0.9 kilometer (0.6 mile) from the Worthington Mountains Wilderness Area at its closest point (see Figure 3-45).

The Weepah Springs and Worthington Mountains Wilderness Areas are predominantly natural areas, with only some evidence of localized human activity. Recreational uses of both areas include day hiking; backpacking; caving; photography; horseback riding; rockhounding; big game and upland bird hunting; wildflower viewing; bird watching, sightseeing; and ***heritage tourism*** (DIRS 176796-Winslow 2006, p. 3).

Particularly scenic locales in these Wilderness Areas include natural arches, caves, and vistas from the ridgeline of the Worthington Mountains and the summit of Timber Mountain in the Weepah Springs Wilderness Area. Caliente common segment 2 would be 3.2 kilometers (2 miles) from the Humboldt-Toiyabe National Forest at its closest point. The Ely Ranger District of the U.S. Forest Service manages this part of the forest, which is bordered by Railroad Valley on the west and Garden Valley on the east. Hunting, photography, wildlife viewing, camping, and hiking are the dominant recreation uses of the area. Most of the recreational use is along Little Cherry Creek and Hooper Canyon. Approximately 33 kilometers (21 miles) of poor- or very-poor-condition trails are either not used or are only lightly used

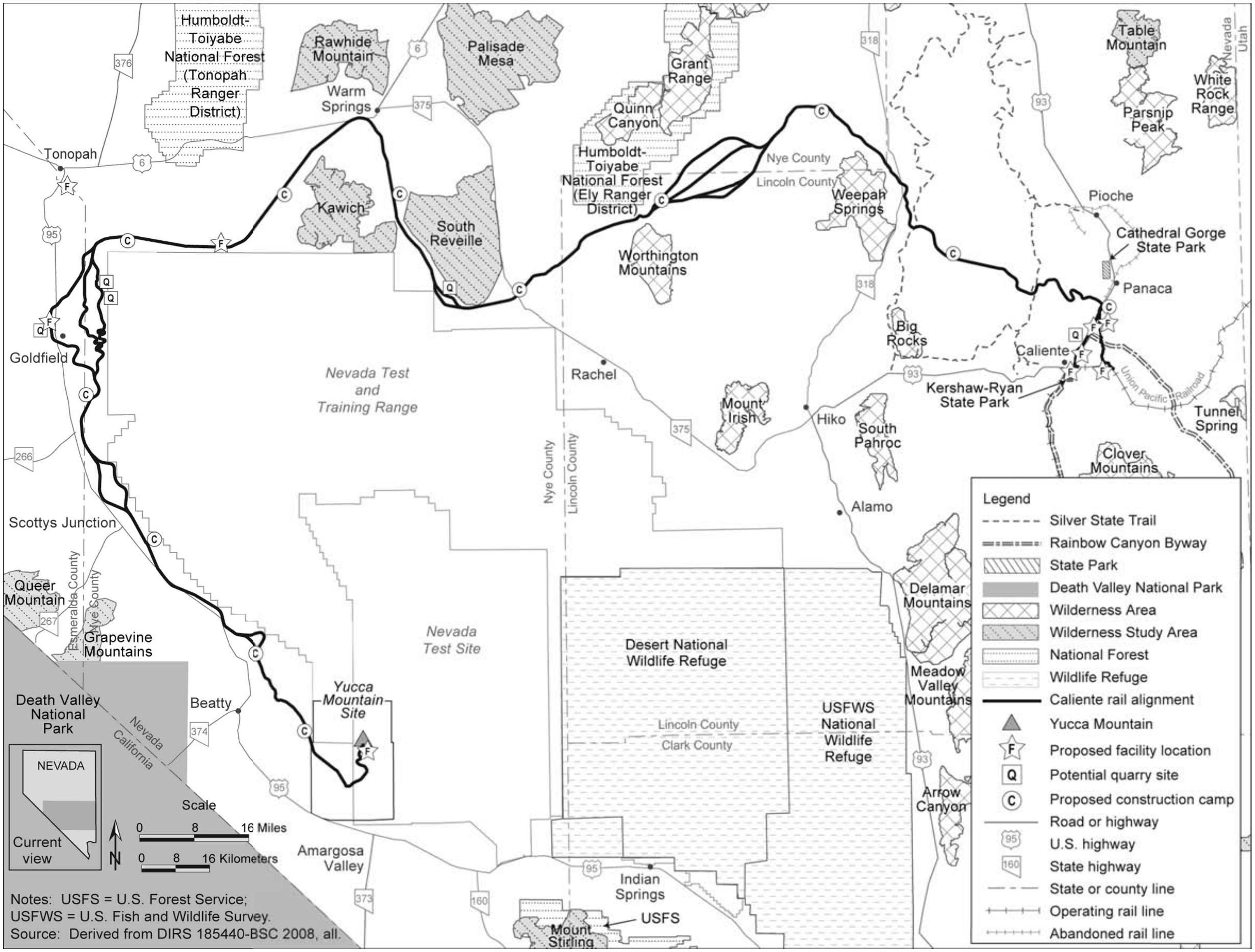


Figure 3-42. Recreation areas and roads along the Caliente rail alignment.

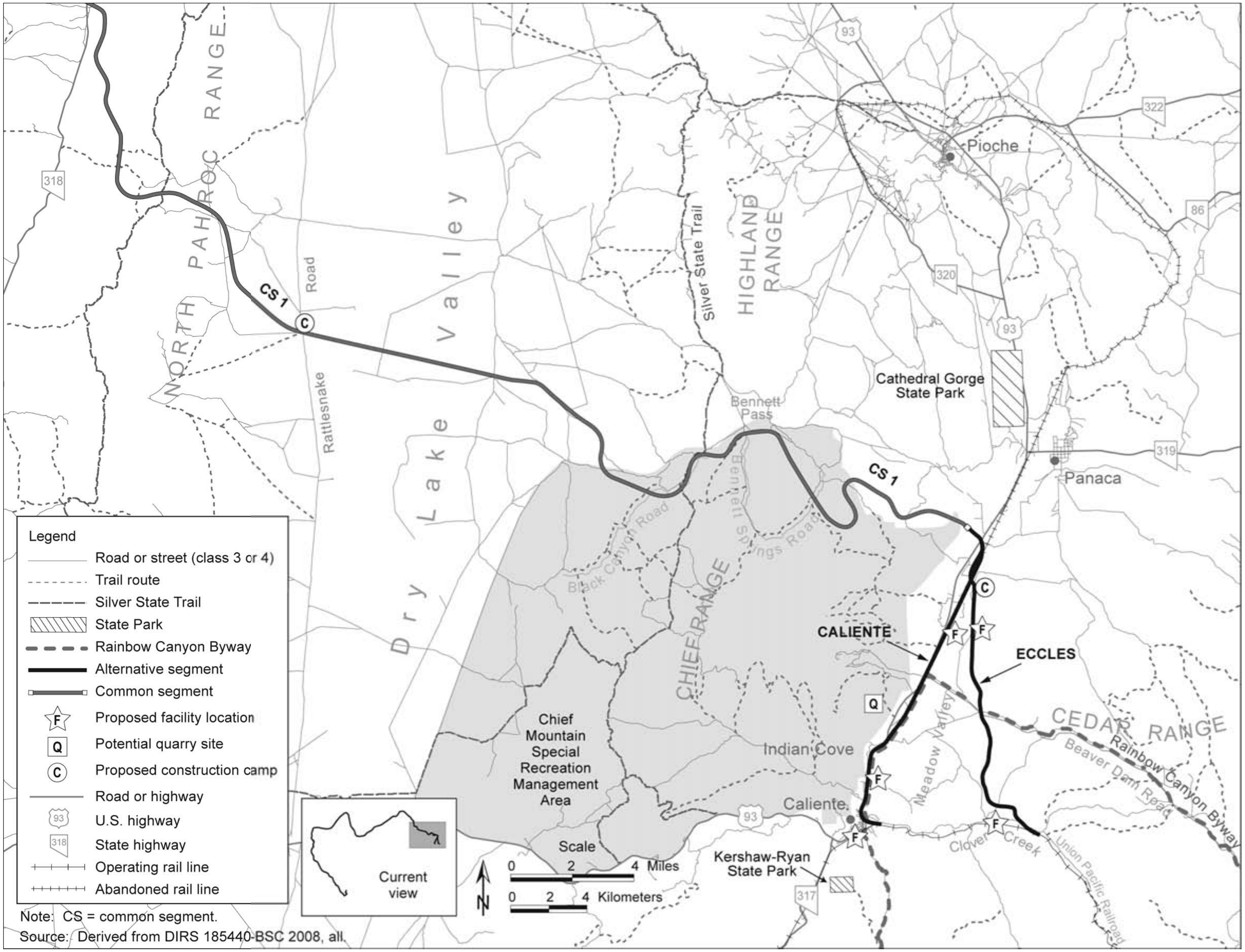


Figure 3-43. Recreation areas and roads within map area 1.

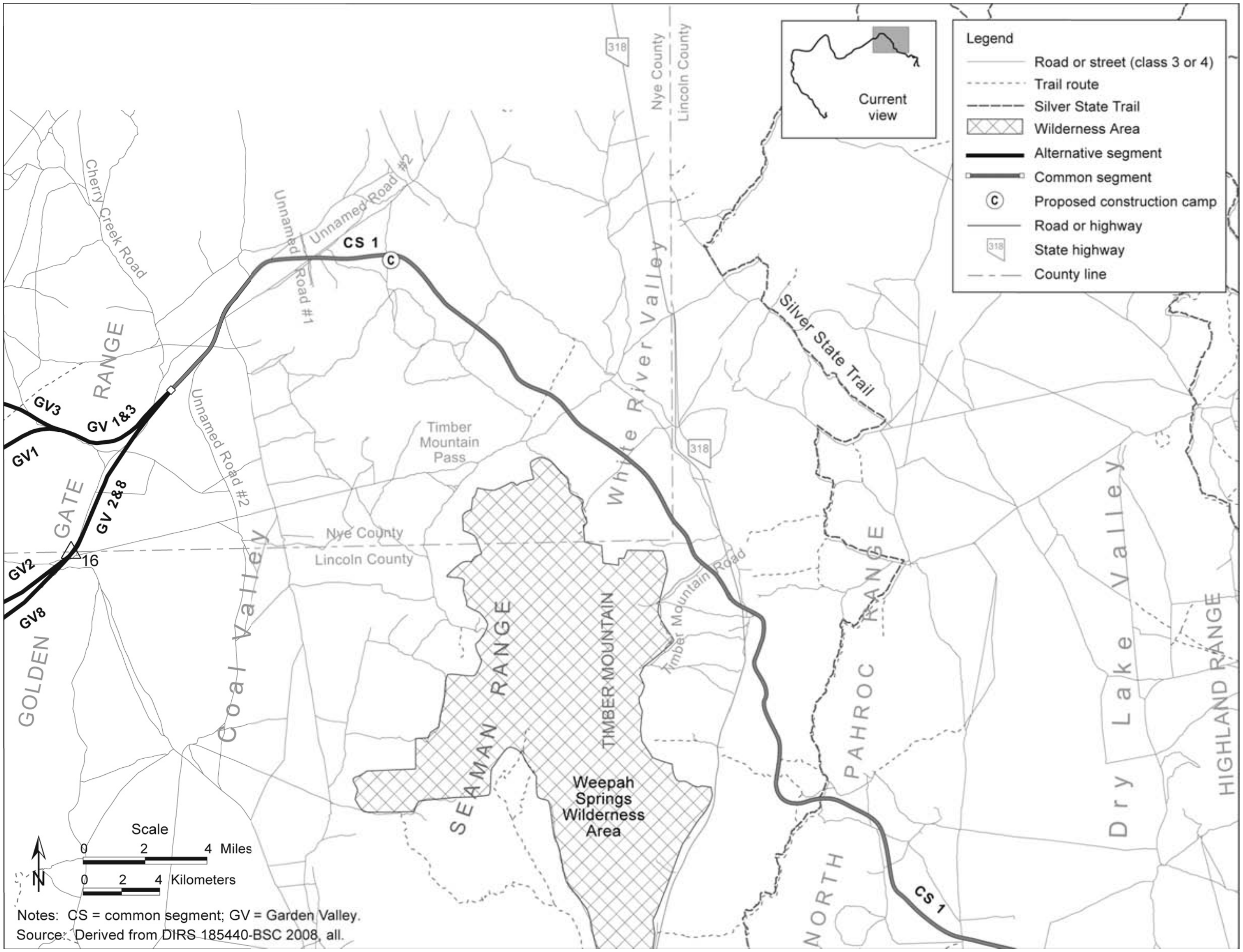


Figure 3-44. Recreation areas and roads within map area 2.

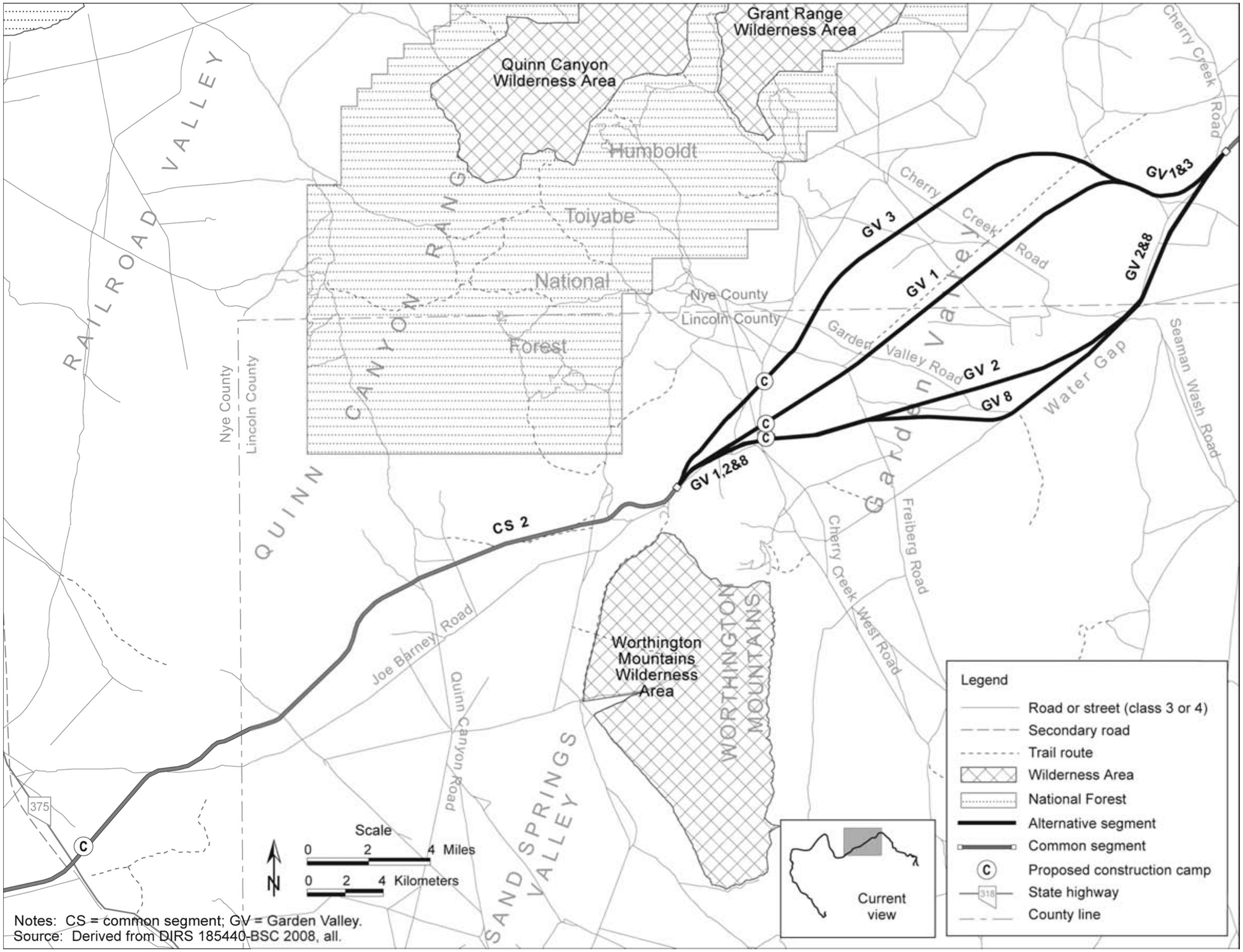


Figure 3-45. Recreation areas and roads within map area 3.

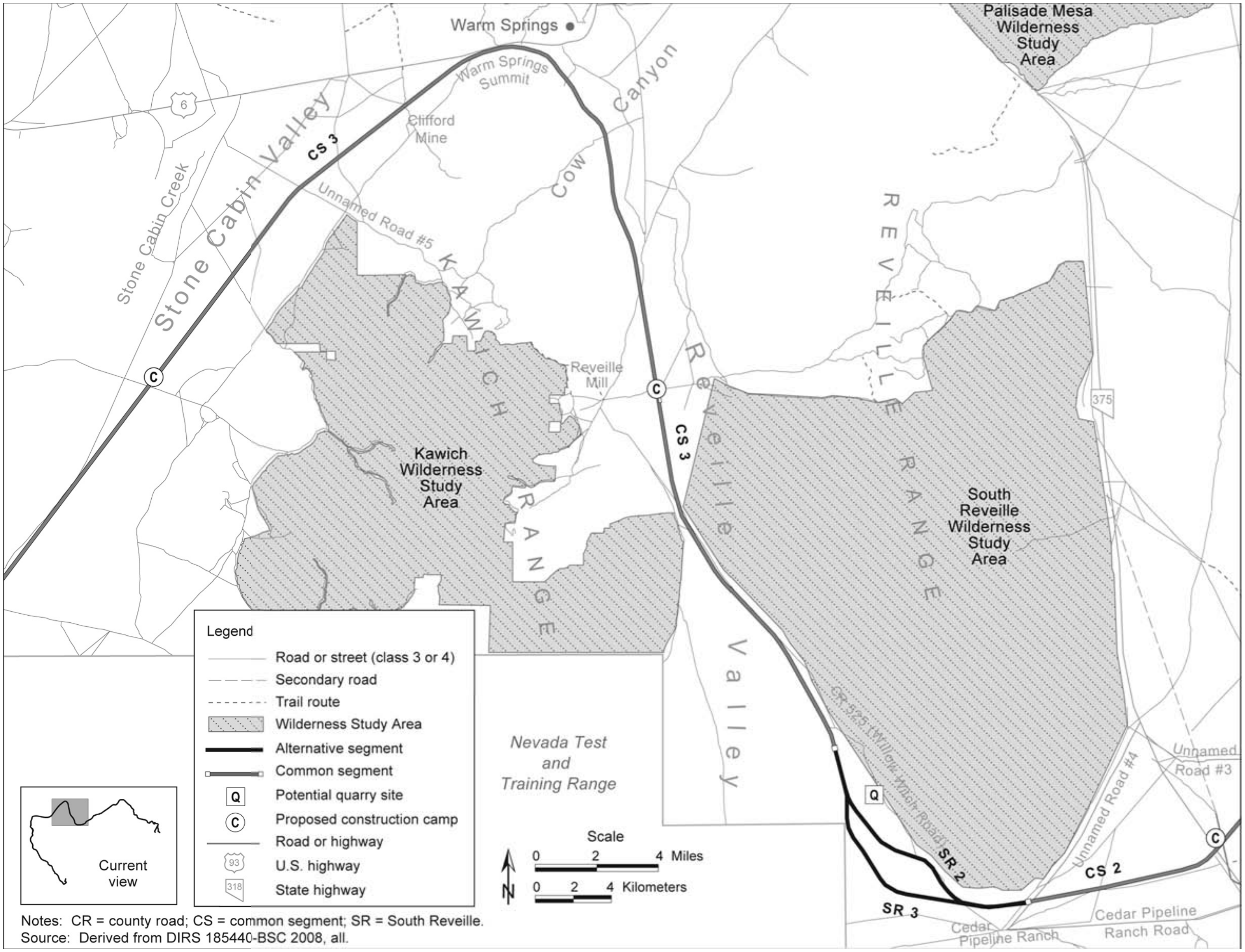


Figure 3-46. Recreation areas and roads within map area 4.

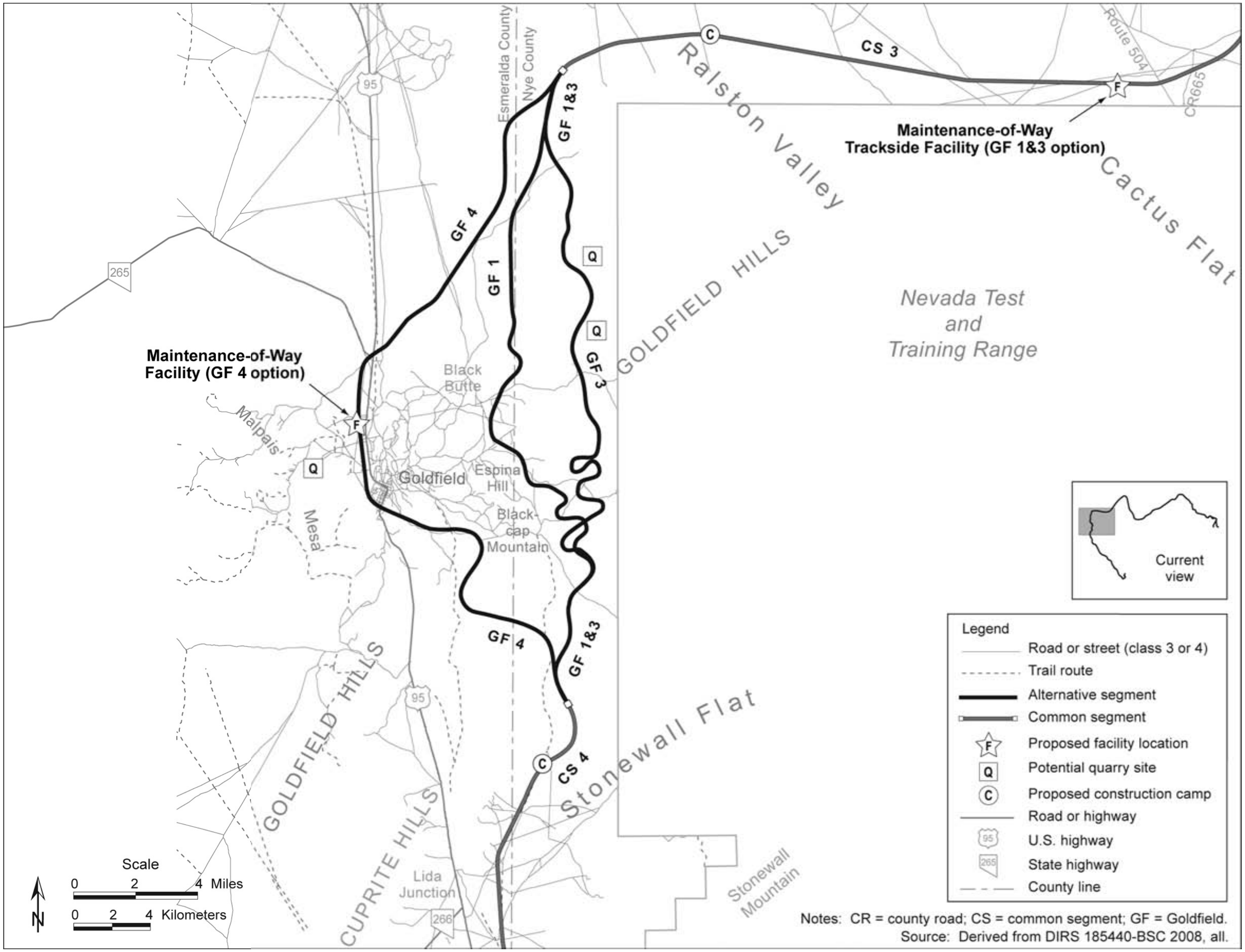


Figure 3-47. Recreation areas and roads within map area 5.

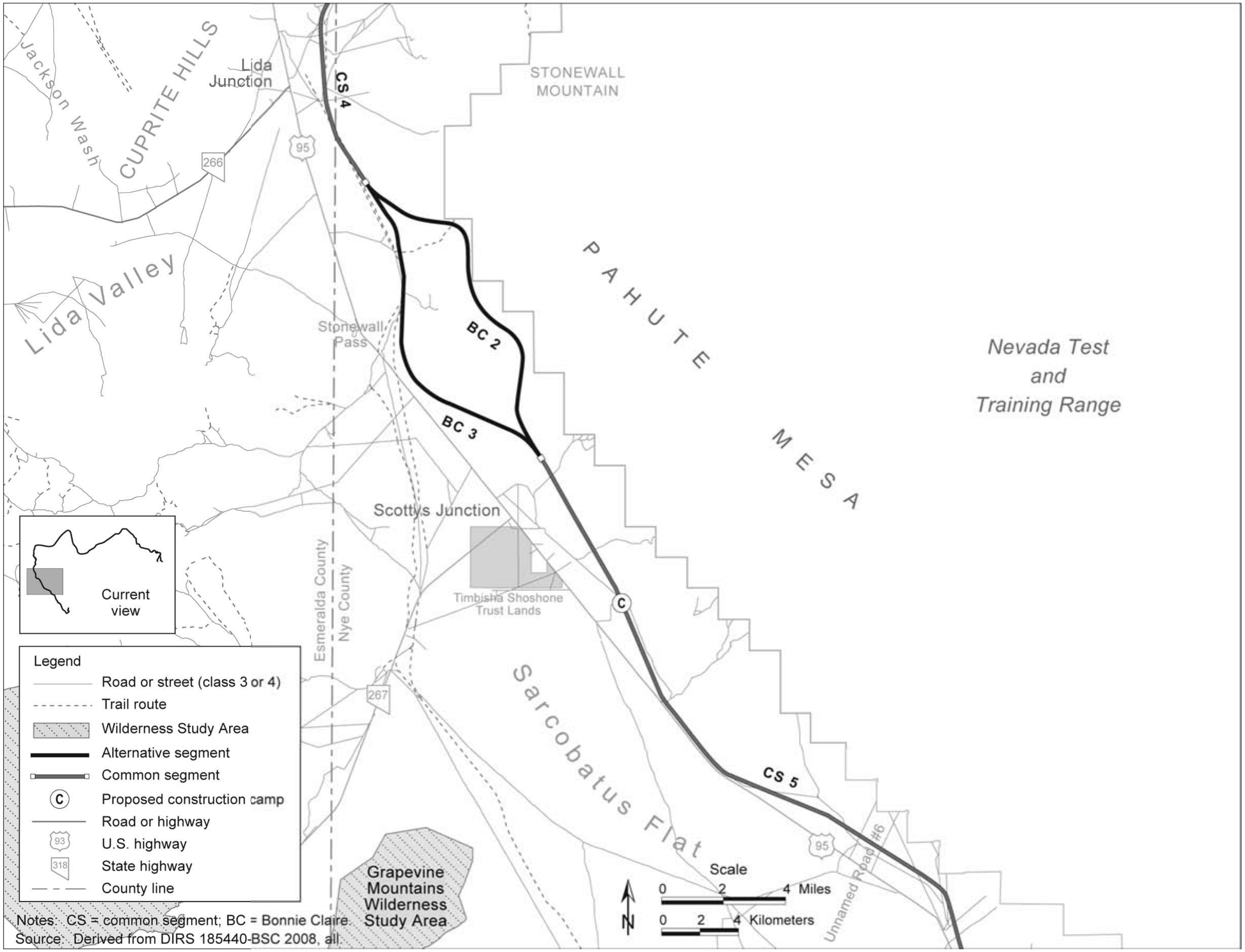


Figure 3-48. Recreation areas and roads within map area 6.

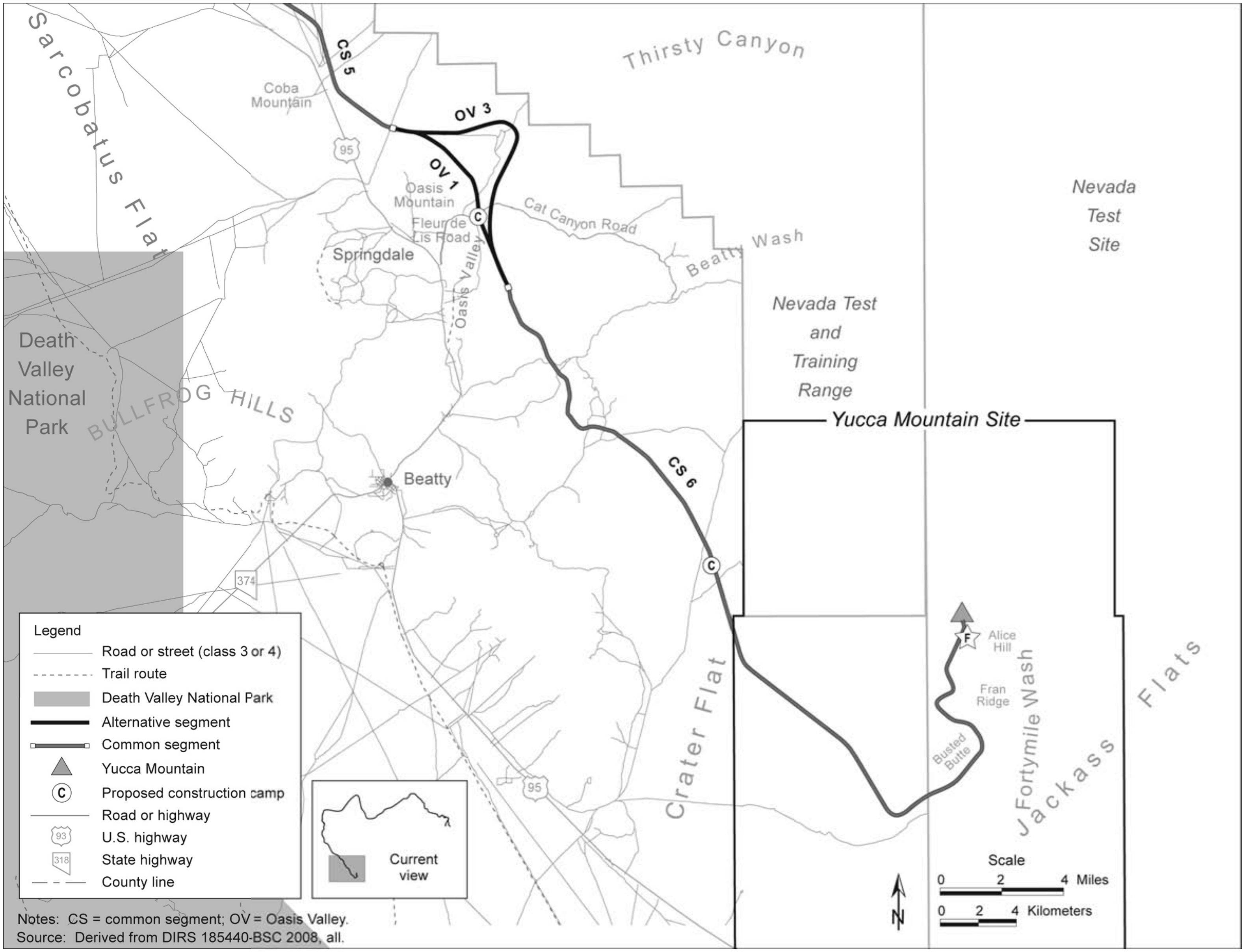


Figure 3-49. Recreation areas and roads within map area 7.

(DIRS 176796-Winslow 2006, all). Access to this part of the Humboldt-Toiyabe National Forest is by unimproved roads from State Highway 318 or State Highway 375, which the Caliente rail alignment would not cross.

3.2.2.5.3.2 Nye County. Recreation on BLM-administered lands in Nye County is generally dispersed, and there would be no developed recreation sites within 1.6 kilometers (1 mile) of the Caliente rail alignment (see Figure 3-46). Dispersed recreation opportunities in Nye County include hunting, camping, exploration and sightseeing, and off-highway vehicle recreation and competition events.

There are two Wilderness Study Areas along the Caliente rail alignment in Nye County – the Kawich Wilderness Study Area and the South Reveille Wilderness Study Area. Caliente common segment 2 would be within 0.3 kilometer (0.2 mile) of the Kawich Wilderness Study Area at its closest point. The South Reveille Wilderness Study Area would be 30 meters (100 feet) from the centerline of Caliente common segment 2. The Kawich Wilderness Study Area consists of rugged, mountainous country with a high central plateau and several mountain peaks. The South Reveille Wilderness Study Area is a thick, multi-ridged swath of steep-sided mountain rising to crests and flat-topped summits between 2,400 and 2,700 meters (8,000 and 9,000 feet). Sheer cliffs form the mountain sides in many places and large canyons with steep walls run out to the edge of the valleys (DIRS 176796-Winslow 2006, p. 5).

Very few BLM-permitted off-highway vehicle races and special recreation events occur within the region of influence for the Caliente rail alignment common segments and alternative segments in Nye County (DIRS 178416-Nevada Rail Partners 2007, all). Both common segments 3 and 6 would cross race routes several times. All approved race routes the rail line would cross are on existing roads and trails.

3.2.2.5.3.3 Esmeralda County. Recreation in Esmeralda County is generally dispersed and includes competitive off-highway vehicle events, sometimes near the proposed rail alignment. The county is home to numerous largely abandoned towns and historical sites, many of which are in old mining districts, and areas for hunting and fishing (DIRS 176770-Duval et al. 1976, p. 28). No Areas of Critical Environmental Concern (see Section 3.2.2.4.1) fall within the rail alignment region of influence in Esmeralda County. The closest Wilderness Area or Wilderness Study Area to the rail alignment would be Queer Mountain Wilderness Study Area, which would be approximately 20 kilometers (12 miles) away from common segment 5, far outside the construction right-of-way.

A number of BLM-permitted off-highway vehicle races and special recreation events take place annually in areas around the Caliente rail alignment common segments and alternative segments in Esmeralda County (DIRS 178416-BSC 2006, all). Recent permitted recreation events in the area have included the Las Vegas to Reno Race and the Nevada 1000 Race off-highway vehicle events. The largest number of BLM-approved race routes occur in and around Tonopah and Goldfield, and Goldfield alternative segment 4 would cross multiple routes. Most approved race routes are on existing roads and trails.

3.2.2.5.4 Land Access

The Caliente rail alignment would cross a number of class 3 or 4 roads and unpaved trail routes (see Table 3-9). The intersections of the Caliente rail alignment with these roads and trails could impact access to public lands (for recreational and land-management activities) and to private property.

3.2.2.5.5 Utilities

3.2.2.5.5.1 Utility Rights-of-Way. Figures 3-50 through 3-57 show the major utilities and utility corridor networks in the region of influence. The figures do not identify smaller, local electric distribution lines, typically in the 14- to 25-kilovolt range, with linear right-of-way reservations along

Table 3-9. Trails and class 3 or 4 roads the Caliente rail alignment alternative segments and common segments would cross.

Segment	Lincoln County roads	Lincoln County trails	Nye County roads	Nye County trails	Esmeralda County roads	Esmeralda County trails
Eccles alternative segment[a]	8	0	0	0	0	0
Caliente alternative segment[a]	7	0	0	0	0	0
Caliente common segment 1[b]	19	7	12	1	0	0
Garden Valley alternative segment 1	6	0	2	1	0	0
Garden Valley alternative segment 2	9	0	3	0	0	0
Garden Valley alternative segment 3	6	0	4	1	0	0
Garden Valley alternative segment 8	10	1	3	0	0	0
Caliente common segment 2	7	1	5	0	0	0
South Reveille alternative segment 2	0	0	1	0	0	0
South Reveille alternative segment 3	0	0	1	0	0	0
Caliente common segment 3	0	0	30	0	0	0
Goldfield alternative segment 1	0	0	6	0	9	0
Goldfield alternative segment 3	0	0	5	0	0	0
Goldfield alternative segment 4	0	0	0	1	41	2
Caliente common segment 4	0	0	2	1	11	0
Bonnie Claire alternative segment 2	0	0	0	1	0	0
Bonnie Claire alternative segment 3	0	0	2	2	0	0
Common segment 5	0	0	14	0	0	0
Oasis Valley alternative segment 1	0	0	3	0	0	0
Oasis Valley alternative segment 3	0	0	3	0	0	0
Common segment 6	0	0	7	0	0	0

a. Both the Caliente and Eccles alternative segments would cross the Rainbow Canyon Back Country Byway.
b. Caliente common segment 1 would cross the Silver State Trail in two places.

major roads, or local water, sewer, power, or telephone lines serving individual residences or businesses, or their corresponding rights-of-way.

3.2.2.5.5.2 Utility Corridors. As stated in Section 3.2.2.4.1, BLM resource management plans designate utility and transportation corridors to consolidate the location of new and existing rights-of-way whenever feasible. Table 3-10 lists the extent to which DOE would construct each Caliente rail alignment segment within BLM-designated corridors.

Table 3-11 identifies locations of where the rail line construction right-of-way and the possible locations for the ***Staging Yard*** could cross utility corridors. Figures 3-51 through 3-57 do not show all of the individual crossings because some of the locations are very close together. Utility lines listed in Table 3-11 are depicted on the figures by the location number designated in the table. For clarification, see Volume III-A of this Rail Alignment EIS, Map Atlas. Table 3-12 identifies utility corridors at potential quarry sites.

The locations of potential utility crossings shown on figures and listed in tables are approximate and would be reviewed and verified after completion of the final rail design.

Table 3-10. Rail line segments within designated utility or transportation corridors.[a]

Segment	Resource management plan	Distance (miles)[b] within BLM-designated corridors	Total distance (miles) of segment	Percent within BLM-designated corridor
Caliente alternative segment	Proposed Ely	0	11	0
Eccles alternative segment	Proposed Ely	0	12	0
Caliente common segment 1	Proposed Ely	0.5	71	0.7
Garden Valley alternative segment 1	Proposed Ely	0	22	0
Garden Valley alternative segment 2	Proposed Ely	0	22	0
Garden Valley alternative segment 3	Proposed Ely	0	23	0
Garden Valley alternative segment 8	Proposed Ely	0	23	0
Caliente common segment 2	Tonopah	3.8	12	32
Caliente common segment 2	Proposed Ely	0	19	0
South Reveille alternative segment 2	Tonopah	0	12	0
South Reveille alternative segment 3	Tonopah	0	12	0
Caliente common segment 3	Tonopah	50	70	71
Goldfield alternative segment 1	Tonopah	2.5	29	8.6
Goldfield alternative segment 3	Tonopah	2.5	31	8
Goldfield alternative segment 4	Tonopah	3.8	33	11.5
Caliente common segment 4	Tonopah	0	7	0
Bonnie Claire alternative segment 2	Tonopah	0	13	0
Bonnie Claire alternative segment 3	Tonopah	1.3	12	10.8
Common segment 5	Tonopah	13	25	52
Oasis Valley alternative segment 1	Tonopah	5.9	6	95.4
Oasis Valley alternative segment 3	Tonopah	7	9	79.6
Common segment 6	Tonopah	4.9	14	35
Common segment 6	Las Vegas	2.5	18	13.9

a. Source: DIRS 185440-BSC 2008, all.
b. To convert miles to kilometers, multiply by 1.6093.

Table 3-11. Potential Caliente rail alignment utility crossings[a] (page 1 of 3).

Rail line segment/facility	Identified utilities and utility corridors[b,c,d]	Construction right-of-way crossings	Location number[e]
Caliente alternative segment	Transmission/power line	1	1
Caliente alternative segment	Transmission/power line	2	2
Caliente alternative segment	Transmission/power line	2	3
Caliente alternative segment	Transmission/power line	1	4
Caliente alternative segment	Transmission/power line	1	5
Caliente alternative segment	Transmission/power line	1	6
Caliente alternative segment	Transmission/power line	3	7
Caliente alternative segment	Transmission/power line	1	8
Caliente alternative segment	Transmission/power line	1	9
Caliente alternative segment	Transmission/power line	1	10
Caliente alternative segment	Transmission/power line	1	11

Table 3-11. Potential Caliente rail alignment utility crossings[a] (page 2 of 3).

Rail line segment/facility	Identified utilities and utility corridors[b,c,d]	Construction right-of-way crossings	Location number[e]
Caliente alternative segment	Transmission/power line	1	12
Caliente alternative segment	Transmission/power line	1	13
Caliente-Upland Staging Yard	Transmission/power line	1	7
Caliente-Upland Staging Yard	Transmission/power line	1	12
Caliente-Indian Cove Staging Yard	Transmission/power line	1	5
Caliente-Indian Cove Staging Yard	Transmission/power line	1	6
Caliente-Upland Staging Yard	Transmission/power line	1	7
Caliente-Upland Staging Yard	Transmission/power line	1	12
Caliente-Indian Cove Staging Yard	Transmission/power line	1	5
Caliente-Indian Cove Staging Yard	Transmission/power line	1	6
Eccles alternative segment	Transmission/power line	1	14
Caliente common segment 1	Transmission/power line	1	15
Caliente common segment 1	Transmission/power line	1	16
Caliente common segment 1	Transmission/power line	2	17
Caliente common segment 1	Telephone line	1	18
Garden Valley alternative segment 1	Unidentified line	1	19
Garden Valley alternative segment 2	Unidentified line	1	19
Garden Valley alternative segment 2	Unidentified line	1	20
Garden Valley alternative segment 3	Unidentified line	1	20
Garden Valley alternative segment 8	Unidentified line	1	19
Caliente common segment 2	None	None	None
South Reveille alternative segments	None	None	None
Caliente common segment 3	Transmission/power line	2	21
Caliente common segment 3	Transmission/power line	1	22
Caliente common segment 3	Transmission/power line	1	23
Caliente common segment 3	Transmission/power line	1	24
Goldfield alternative segment 1	None	None	None
Goldfield alternative segment 3	None	None	None
Goldfield alternative segment 4	Transmission/power line	1	25
Goldfield alternative segment 4	Telephone line	1	26
Goldfield alternative segment 4	Transmission/power line	1	27
Goldfield alternative segment 4	Transmission/power line	1	28

Table 3-11. Potential Caliente rail alignment utility crossings[a] (page 3 of 3).

Rail line segment/facility	Identified utilities and utility corridors[b,c,d]	Construction right-of-way crossings	Location number[e]
Goldfield alternative segment 4	Transmission/power line	1	29
Goldfield alternative segment 4	Transmission/power line	1	30
Goldfield alternative segment 4	Transmission/power line	1	31
Goldfield alternative segment 4	Telephone line	1	32
Caliente common segment 4	None	None	None
Bonnie Claire alternative segments	None	None	None
Common segment 5	Transmission/power line	1	33
Common segment 5	Transmission/power line	1	34
Oasis Valley alternative segments	None	None	None
Common segment 6	None	None	None

a. Source: DIRS 185440-BSC 2008, all.
b. Electric distribution lines along major roads might not have been identified. Utilities serving individual residences or businesses are not identified.
c. To convert feet to meters, multiply by 0.3048.
d. Lines listed as "unidentified" are so listed in the Geographic Information System database.
e. Location numbers are shown on Figures 3-51 to 3-57.

Table 3-12. Potential quarry site utility crossings.[a]

Potential quarry site	Identified utilities and utility corridors	Number of crossings
CA-8B	Transmission/power line	1
CA-8B	Transmission/power line	1
CA-8B	Transmission/power line	1
ES-7	Water line	1
ES-7	Water line	1
ES-7	Transmission/power line	1

a. Source: DIRS 185440-BSC 2008, all.

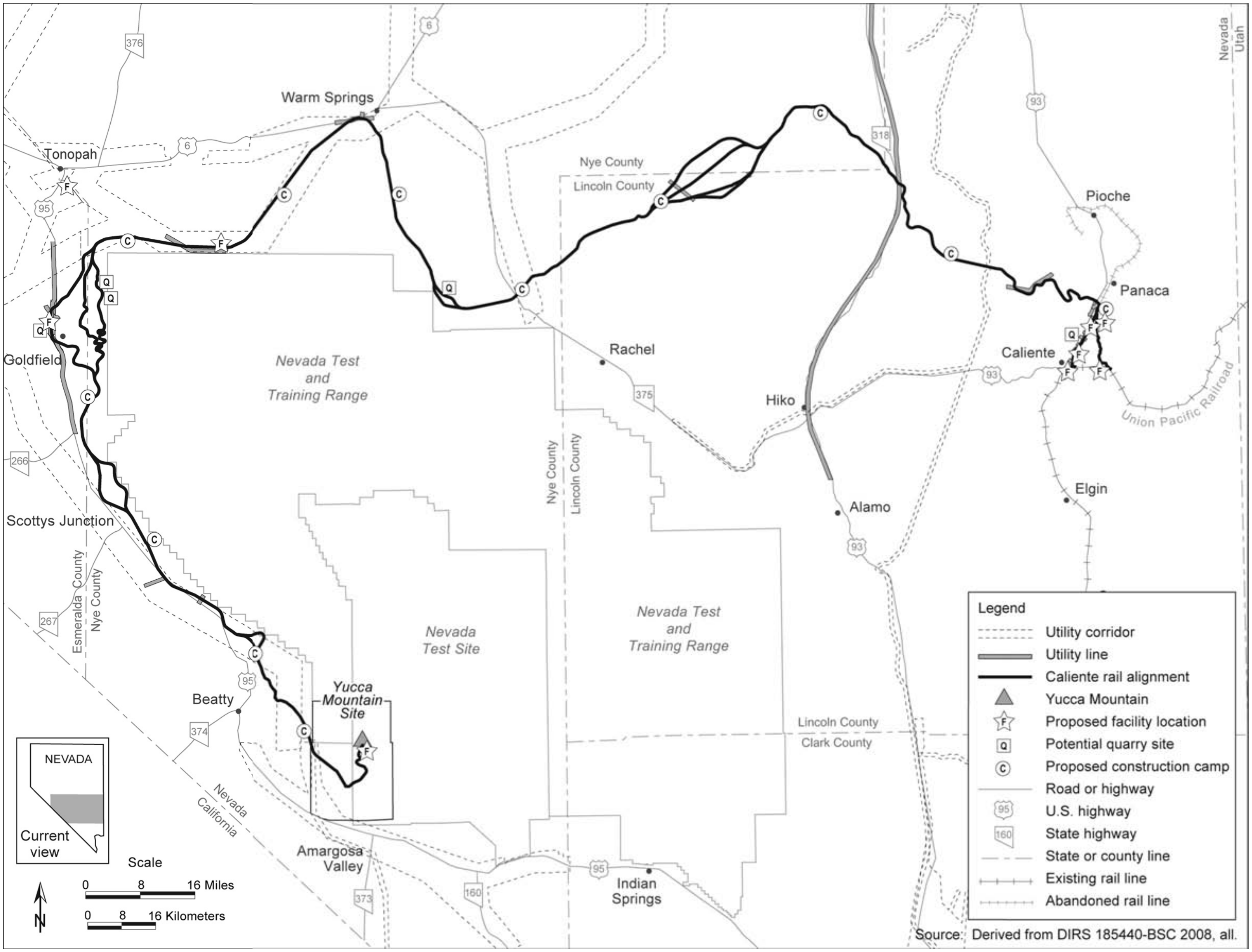


Figure 3-50. Utility corridors along the Caliente rail alignment.

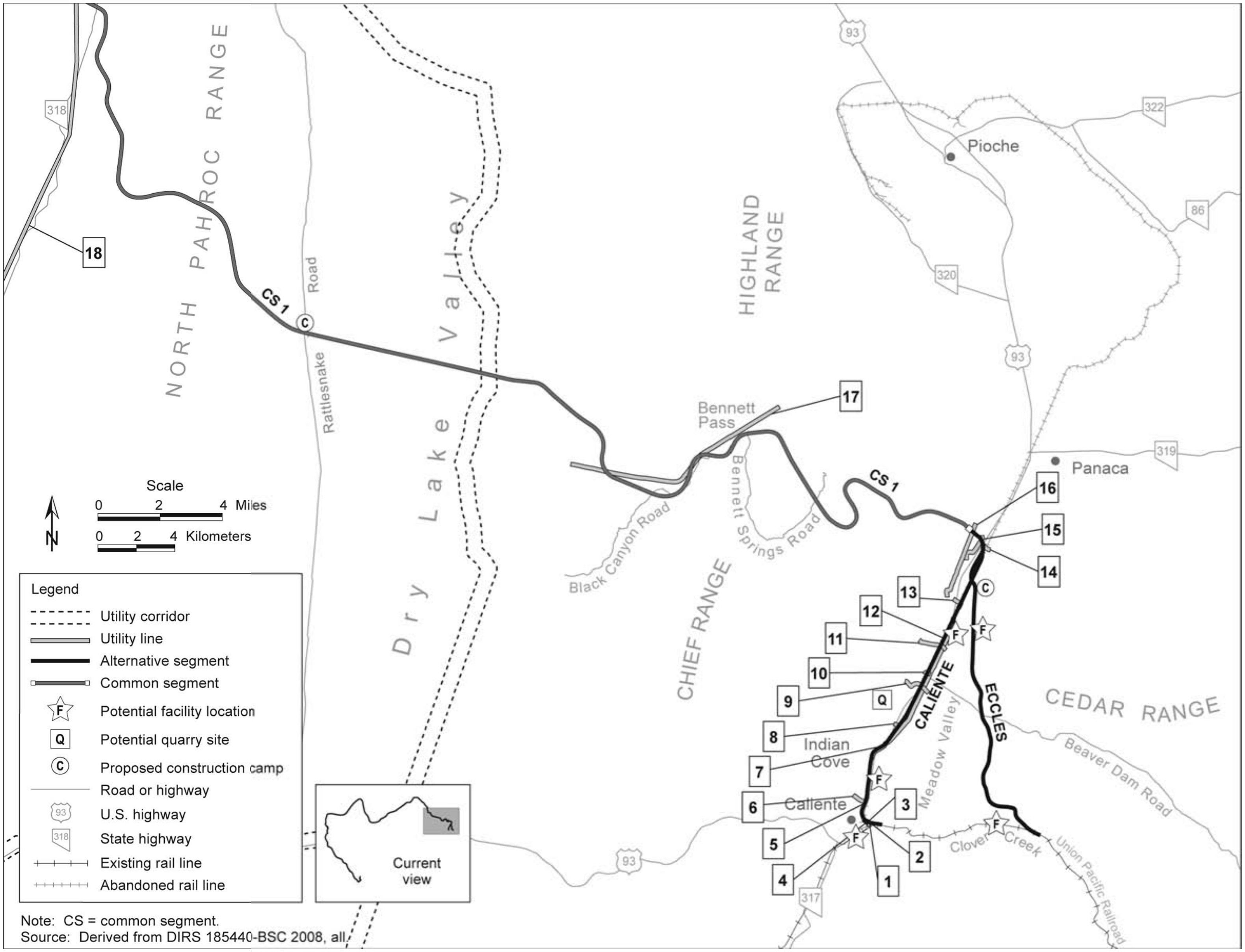


Figure 3-51. Utility corridors within map area 1.

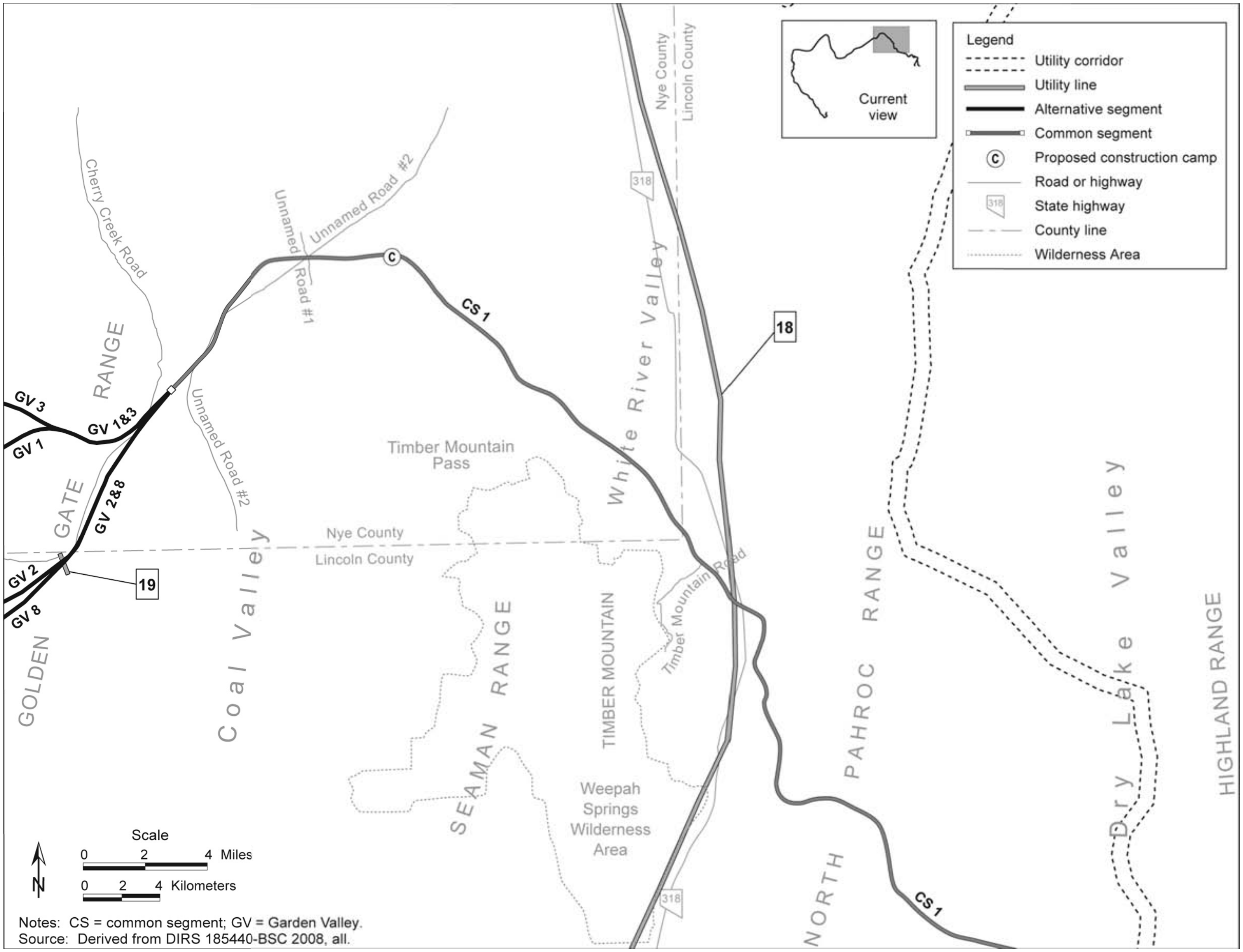


Figure 3-52. Utility corridors within map area 2.

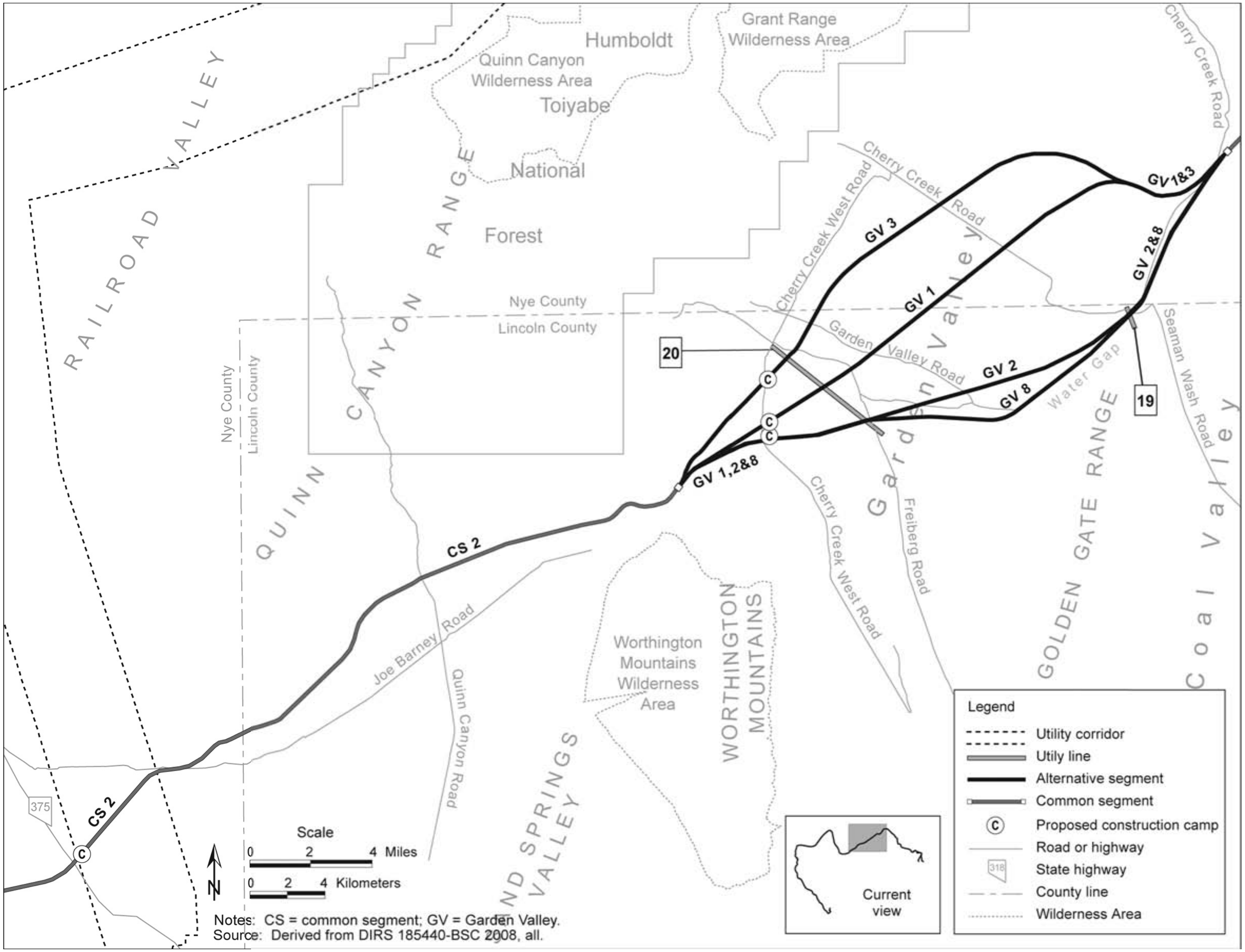


Figure 3-53. Utility corridors within map area 3.

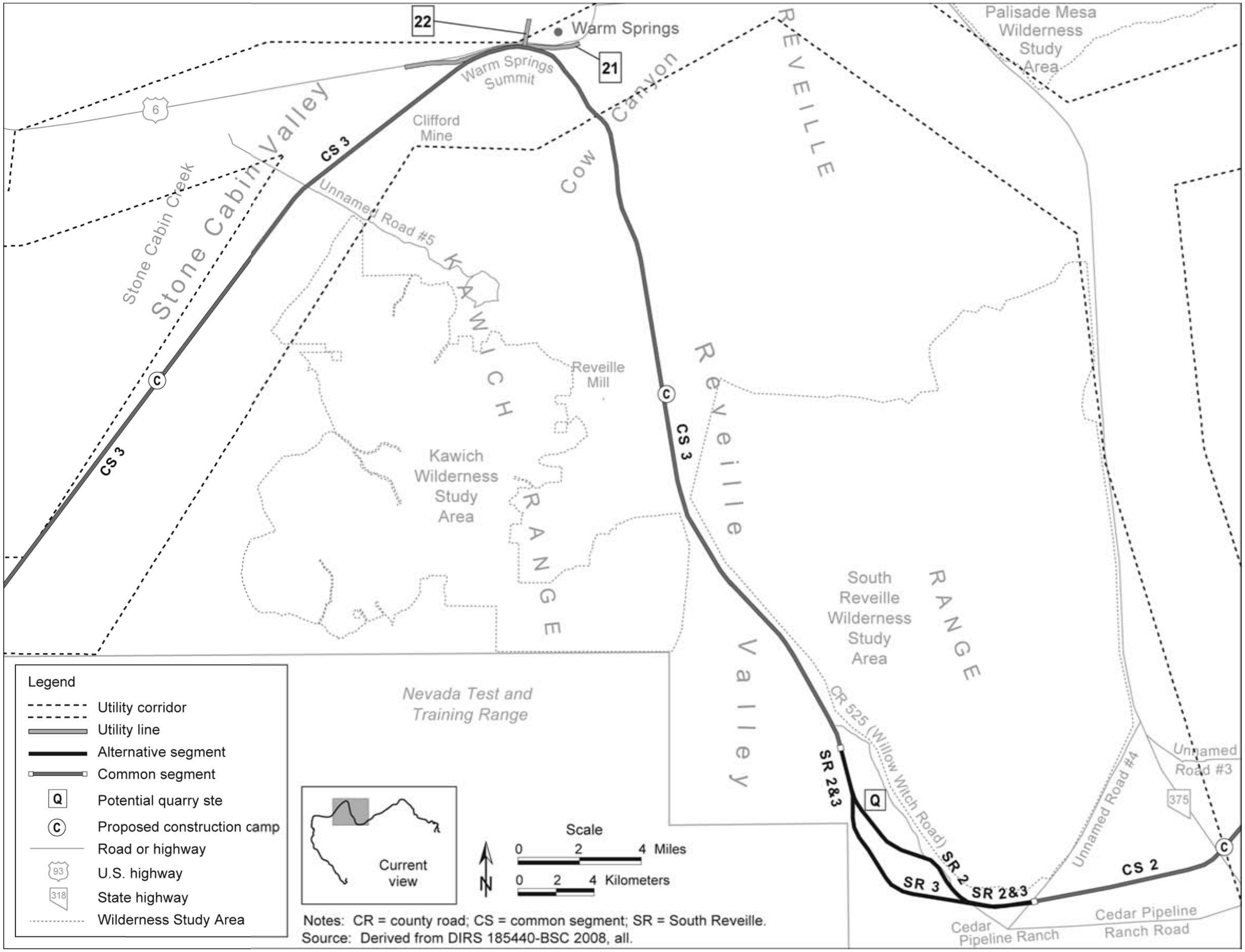


Figure 3-54. Utility corridors within map area 4.

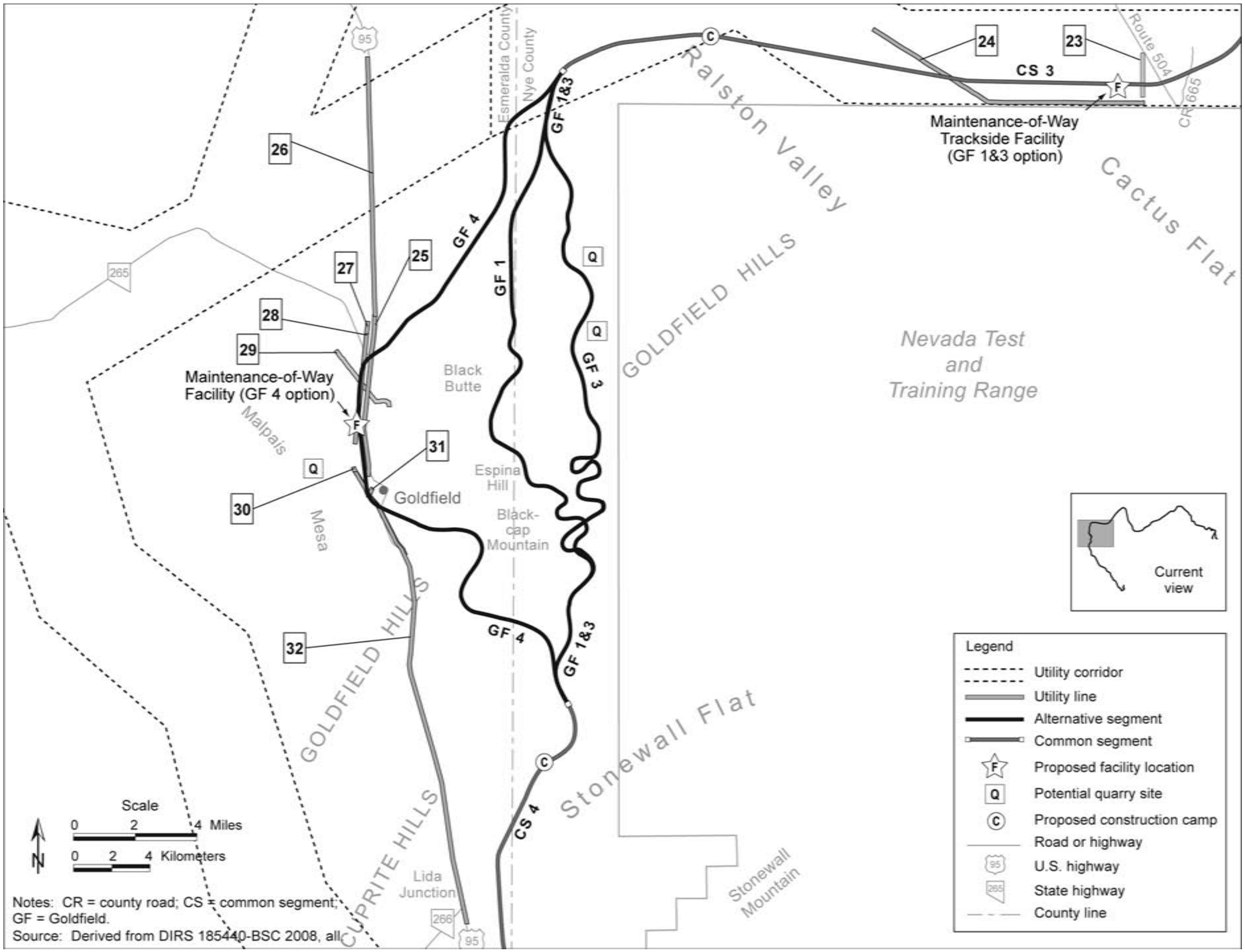


Figure 3-55. Utility corridors within map area 5.

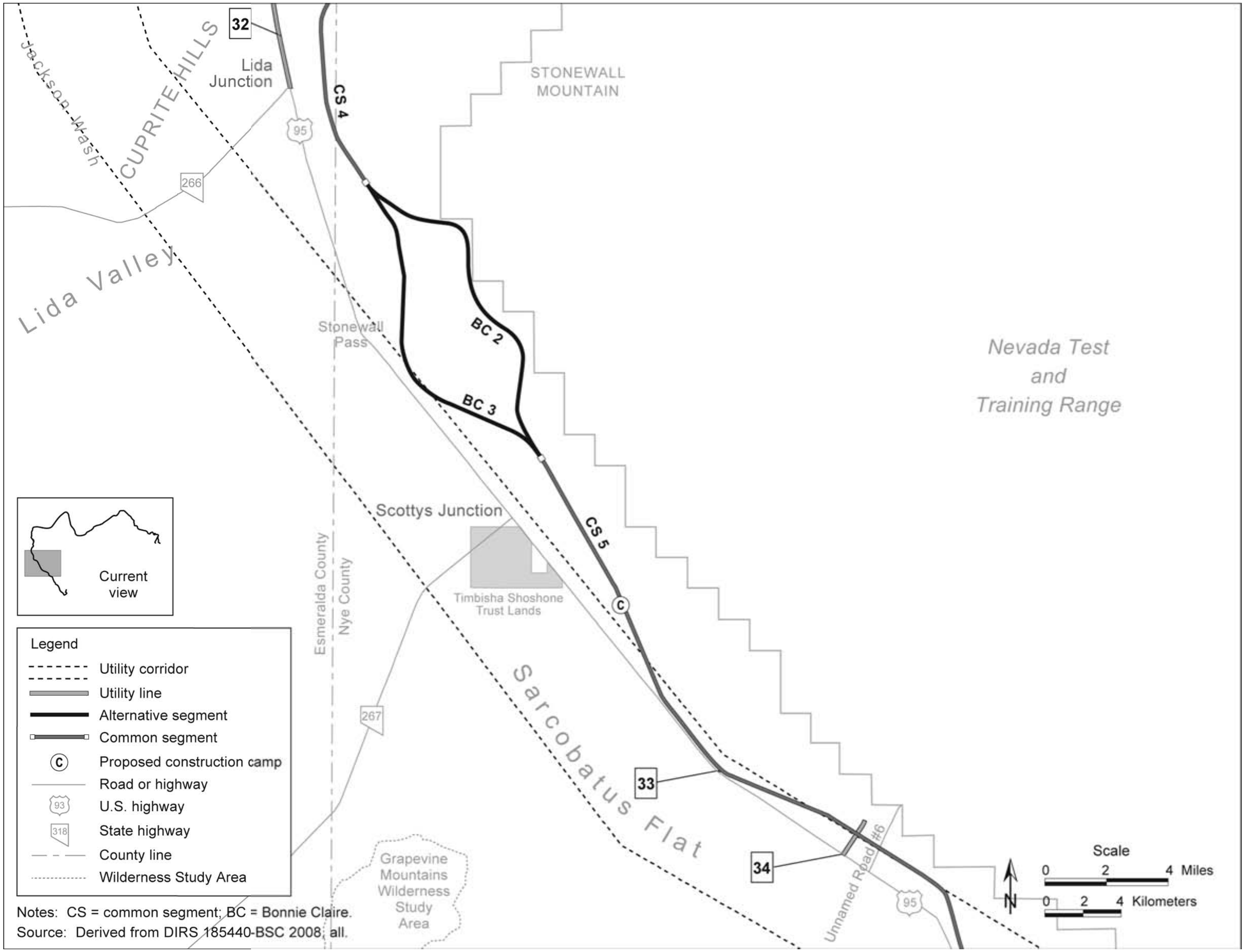


Figure 3-56. Utility corridors within map area 6.

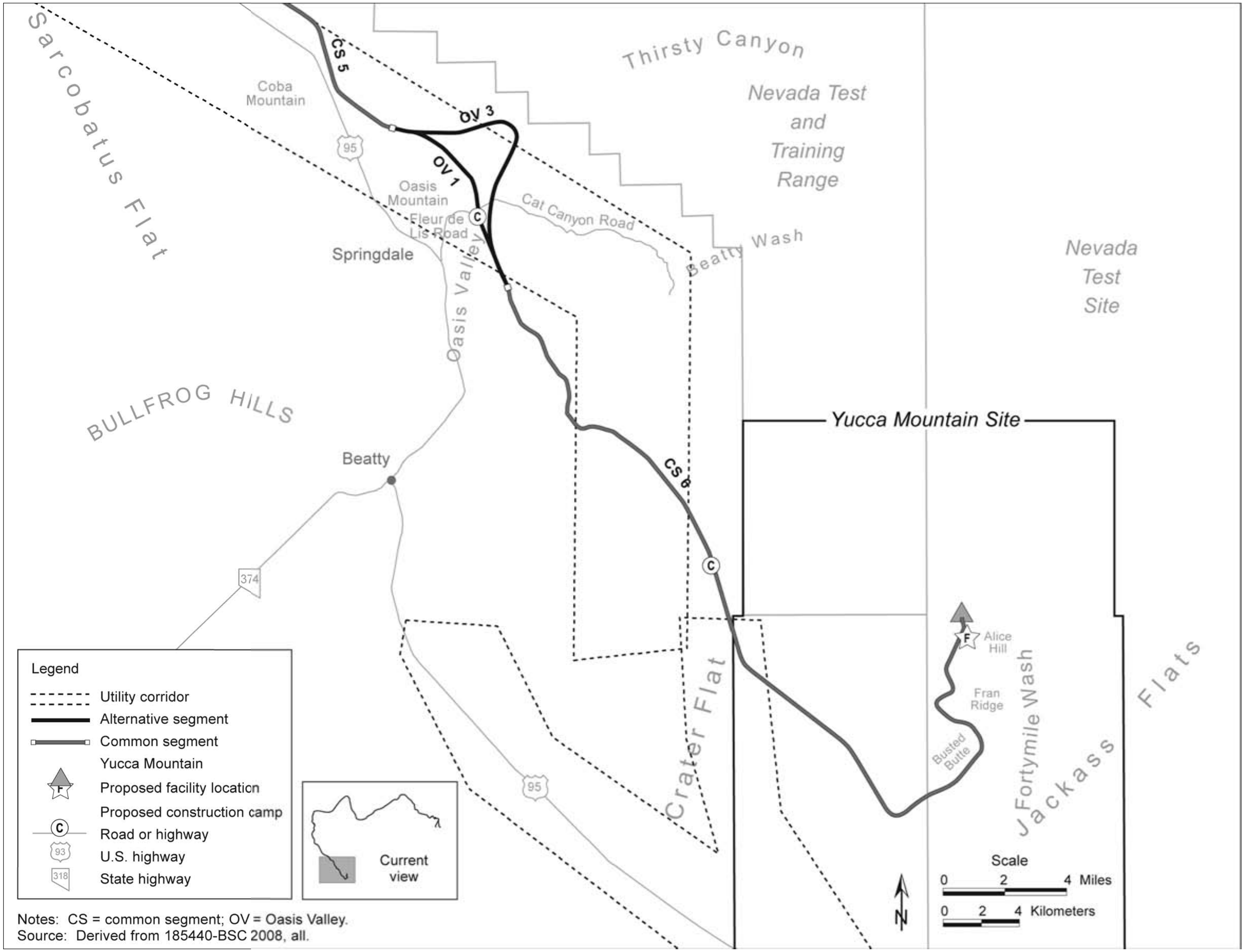


Figure 3-57. Utility corridors within map area 7.

3.2.3 AESTHETIC RESOURCES

This section describes the aesthetic (visual) setting in the region of influence along the Caliente rail alignment. Section 3.2.3.1 describes the region of influence for aesthetic resources; Section 3.2.3.2 describes the methods DOE used to classify visual values; and Section 3.2.3.3 describes the environmental setting and characteristics for aesthetic resources along the Caliente rail alignment.

3.2.3.1 Region of Influence

The region of influence for aesthetic resources is the viewshed around all Caliente rail alignment alternative segments, common segments, and proposed locations of rail line construction and operations support facilities.

BLM guidance subdivides landscapes into three ***distance zones*** based on relative visibility from travel routes or observation points. "Foreground-middleground" zone includes areas less than 5 to 8 kilometers (3 to 5 miles) away. "Background" zone includes areas visible beyond the foreground-middleground zone but usually less than 24 kilometers (15 miles) away. Areas not seen as foreground-middleground or background are in the "seldom-seen" zone (DIRS 101505-BLM 1986, Section IV). To ensure that seldom-seen views were included in this analysis, DOE used a conservative region of influence extending 40 kilometers (25 miles) on either side of the centerline of the Caliente rail alignment.

3.2.3.2 Methodology for Classifying Visual Values

Most of the lands along the Caliente rail alignment are BLM-administered public lands. Therefore, DOE used BLM methodologies for evaluating visual values. The BLM considers visual resources when addressing aesthetic issues during BLM planning. These resources include natural or manmade physical features that give a landscape its character and value as an environmental factor. The BLM uses a visual resource management system to classify the aesthetic value of its lands and to set management objectives (DIRS 173052-BLM 1984, all).

Scenic quality is a measure of the visual appeal of a tract of land. Areas are rated based on key factors including landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (DIRS 101505-BLM 1986, Section II).

Sensitivity levels are a measure of public concern for scenic quality. Areas are ranked high, medium, or low based on types of users, amount of use, public interest, adjacent land uses, and whether they are special areas (DIRS 101505-BLM 1986, Section III).

The BLM classification of visual resource value, the visual resource inventory, involves assessing visual resources and assigning them to one of four visual resource management classes based on three factors: ***scenic quality***, visual sensitivity (***sensitivity levels***), and distance from travel or observation points (DIRS 101505-BLM 1986, all). The BLM uses a combination of the ratings of these three factors to assign a visual resource inventory class to a piece of land, ranging from Class I to Class IV, with Class I representing the highest visual values. Each visual resource class is subsequently associated with a management objective, defining the way the land may be developed or used. Each BLM district assigns visual resource management classes to its lands during the resource management planning process. Table 3-13 lists the BLM management objectives for visual resource classes.

The BLM uses visual resource contrast ratings to assess the visual impacts of proposed projects and activities on the existing landscape (DIRS 173053-BLM 1986, all).

Table 3-13. BLM visual resource management classes and objectives.[a]

Visual resource class	Objective	Acceptable changes to land
Class I	Preserve the existing character of the landscape.	Provides for natural ecological changes but does not preclude limited management activity.
		Changes to the land must be small and must not attract attention.
Class II	Retain the existing character of the landscape.	Management activities may be seen but should not attract the attention of the casual observer.
		Changes must repeat the basic elements of form, line, color, and texture of the predominant natural features of the characteristic landscape.
Class III	Partially retain the existing character of the landscape.	Management activities may attract attention but may not dominate the view of the casual observer.
		Changes should repeat the basic elements in the predominant natural features of the characteristic landscape.
Class IV	Provides for management activities that require major modifications of the existing character of the landscape.	Management activities may dominate the view and be the major focus of viewer attention.
		An attempt should be made to minimize the impact of activities through location, minimal disturbance, and repeating the basic elements.

a. Source: DIRS 101505-BLM 1986, Section V.B.

The Bureau looks at basic elements of design to determine levels of contrast created between a proposed project and the existing viewshed. Depending on the visual resource management objective for a particular location, varying levels of contrast are acceptable.

Contrast ratings are determined from locations called key observation points, which are usually along commonly traveled routes such as highways or frequently used county roads or in communities. To identify key observation points along the Caliente rail alignment, DOE considered the following factors: angle of observation, number of viewers, how long the project would be in view, relative project size, season of use, and light conditions. BLM guidance (DIRS 173053-BLM 1986, Section IIC) recommends that key observation points for linear projects, such as the proposed railroad, include the following:

- Most-critical viewpoints (for example, views from communities at road crossings)
- Typical views encountered in representative landscapes, if not covered by critical viewpoints
- Any special project or landscape features such as river crossings and substations

3.2.3.3 Visual Setting and Characteristics

3.2.3.3.1 General Visual Setting and Characteristics

The Class IV lands in the Caliente rail alignment region of influence consist of landscapes that are generally flat in form and horizontal in line, with gray and brown colors from soil and rock, and texture ranging from flat to slightly rough, depending on whether the broad flat valleys and alluvial fans include any topographic features such as hills, buttes, or eroded stream channels. Vegetation is usually small, low, and rounded in form (for example, grasses, shrubs, and small trees), horizontal in line, brown or gray-green in color, and light-to-medium in texture with irregular spacing. Structures are rare, but could include transmission towers, ranch buildings, or similar structures. Class III lands generally include more varied forms, lines, colors, and textures, including vertical lines in topography and vegetation, brighter greens in vegetation, visible blues from water, and dense texture from forested lands or rough texture in eroded rock. Class I and II lands are mostly in mountains that include forested areas and open rock exposures, with mixed forms including slopes and ridges; rounded lines; a wide range of rock and soil colors, and vegetation that changes color with the seasons; and variable texture that is often dense in forested areas.

> **Special areas** are lands where visual values may be a management concern. Special areas often include designated natural areas, Wilderness Study Areas, scenic rivers, and scenic roads. Special areas are not necessarily unique or picturesque, but the management objective for a special area is to preserve its natural characteristics (DIRS 101505-BLM 1986, Section III.5).

Sections 3.2.3.3.2.1 through 3.2.3.3.2.12 describe visual resources along and near the Caliente rail alignment alternative segments and common segments. The discussions highlight resources of high visual value, identify current visual resource management classifications, ***special areas***, and key observation points.

DOE excerpted visual resource management classifications for lands along the Caliente rail alignment primarily from BLM resource management plans from districts the alignment would cross (DIRS 173224-BLM 1997, all; DIRS 103079-BLM 1998, all; DIRS 184767-BLM 2007, all). The BLM Las Vegas and Ely Districts provided Geographic Information System data from their resource management plans as a source for mapping the visual resource management classes in their districts (DIRS 103079-BLM 1998, Map 2-9; DIRS 184767-BLM 2007, Map 2.4.11-1).

The Department based visual resource classification boundaries for the BLM Battle Mountain District on the *Tonopah Resource Management Plan and Record of Decision* (DIRS 173224-BLM 1997, pp. 6, 7, and 27, and Map 8), and GIS files provided by the Nevada State BLM office. DOE developed visual resource management classifications for non-BLM (tribal lands, lands administered by other federal or state agencies, and private lands) lands using BLM methodology (DIRS 173053-BLM 1986, all; DIRS 173052-BLM 1984, all), considering scenic quality ratings reported in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, pp. 3-158 and 3-159) where available. DOE confirmed visual resource management classifications in telephone communications and meetings with BLM personnel responsible for visual resource management for the Ely, Las Vegas, and Battle Mountain Districts (DIRS 174631-Quick 2005, all; DIRS 174632-Quick 2005, all; DIRS 176988-Quick 2006, all).

Figure 3-58 is a map of visual resource management classifications for lands surrounding the Caliente rail alignment based on the sources identified above. As the figure shows, most of the lands surrounding the alternative segments and common segments are Class IV lands, which are common to the area. However, there are a few locations where the alternative segments and common segments would cross Class II or III lands or be very close to Class I, II, or III lands.

DOE selected 37 key observation points along the Caliente rail alignment to evaluate the visual impacts of constructing and operating the proposed railroad. Figure 3-58 also shows the locations of key observation points. Appendix D, Aesthetics, contains photos taken at each key observation point. Table 3-14 lists visual resource management classes in the viewshed of each key observation point.

Following BLM guidance, DOE selected most key observation points along travel routes or at use or potential use areas, and included critical viewpoints and typical views. DOE also selected multiple points within Garden Valley, along county roads used primarily by a small number of residents, for two reasons: (1) During the scoping period for this Rail Alignment EIS, commenters expressed concern about visual impacts in Garden Valley because of *City*, a large outdoor complex of sculptural and architectural forms on private land, currently under construction; (2) Garden Valley is a large area of Class II land. Section 3.2.3.3.2 highlights areas of high visual value and other special areas, and identifies key observation points from which DOE analyzed impacts to these areas.

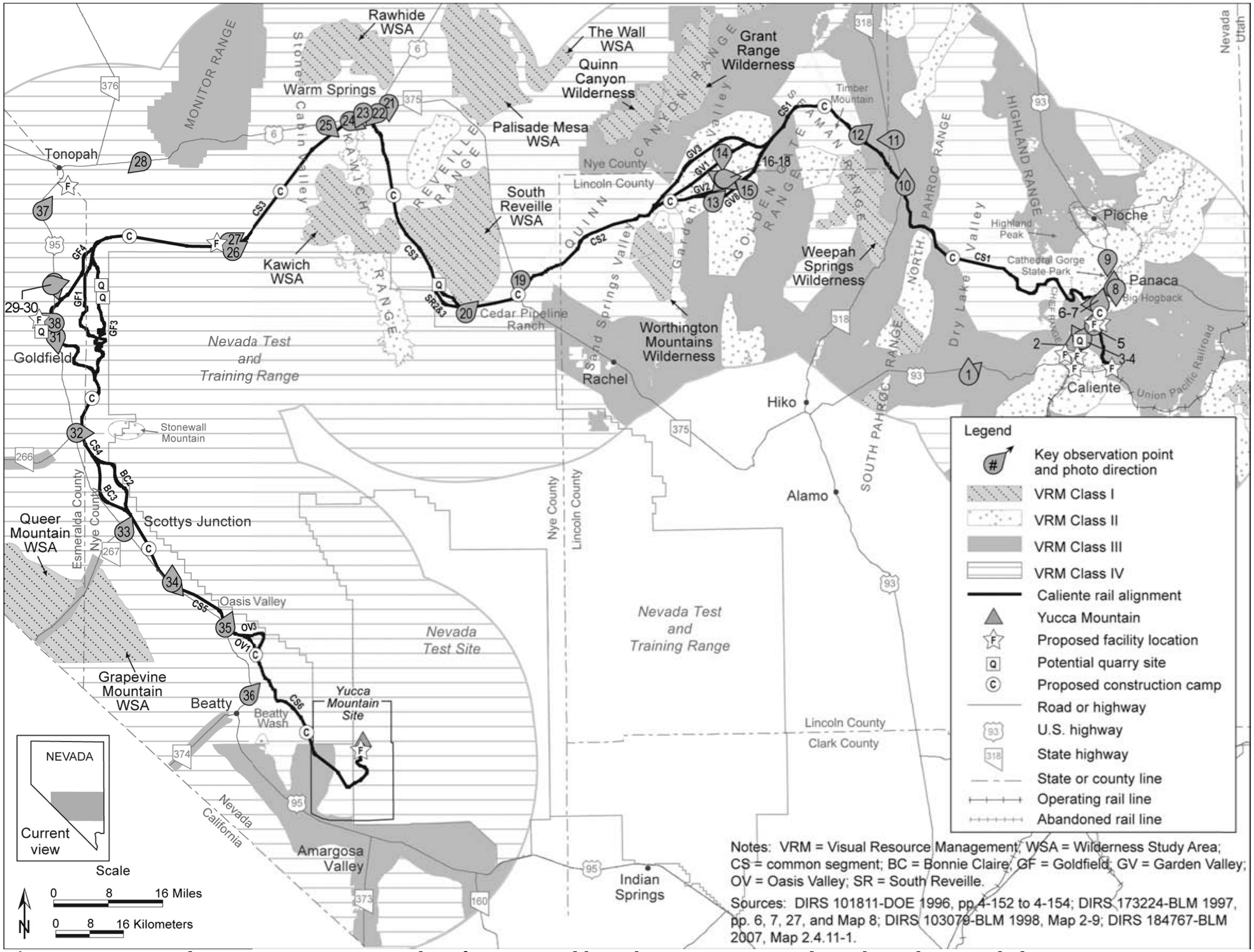


Figure 3-58. Visual resource management classifications and key observation points along the Caliente rail alignment.

Table 3-14. Key observation points and visual resource management classes in the Caliente rail alignment viewshed[a] (page 1 of 2).

Key observation point	Location	Visual resource management classes[b]
1	U.S. Highway 93 at Dry Lake Valley	Surrounding lands (III and IV), Highland and Chief Ranges (II and III)
2	Caliente-Indian Cove option for the Staging Yard	Surrounding lands (III)
3	Conveyer that would cross U.S. Highway 93 to feed Staging Yard, Caliente-Indian Cove option	Surrounding lands (II)
4	Conveyor that would cross U.S. Highway 93 to feed Staging Yard, Caliente-Upland option	Surrounding lands (III)
5	Caliente-Upland option for the Staging Yard	Surrounding lands (III, II)
6	Where rail line would cross U.S. Highway 93	Surrounding lands (III)
7	U.S. Highway 93 north of where rail line would cross	Surrounding lands (III), Big Hogback (II)
8	U.S. Highway 93 at State Route 319	Surrounding lands (III, II)
9	Miller Point - Cathedral Gorge	Surrounding lands (III, II), Cathedral Gorge State Park (II)
10	Where rail line would cross State Route 318	Surrounding lands (III), Weepah Springs Wilderness (I)
11	Off county road west of State Route 318 north of where rail line would cross	Surrounding lands (III), Timber Mountain (II), Weepah Springs Wilderness (I)
12	Where rail line would cross Timber Mountain Pass Road	Surrounding lands (III), Timber Mountain (II), Weepah Springs Wilderness (I)
13 and 15	County roads on south side of Garden Valley	Garden Valley (II), Golden Gate Range (III), Quinn Canyon Range (III), Quinn Canyon Wilderness (I), Grant Range Wilderness (I), Worthington Mountains (II), Worthington Mountains Wilderness (I)
14	County road in middle of Garden Valley	Garden Valley (II), Golden Gate Range (III), Quinn Canyon Range (III), Quinn Canyon Wilderness (I), Grant Range Wilderness (I), Worthington Mountains (II), Worthington Mountains Wilderness (I)
16 to 18	Top of *City* structure elements	Garden Valley (II), Golden Gate Range (III), Quinn Canyon Range (III), Quinn Canyon Wilderness (I), Grant Range Wilderness (I), Worthington Mountains (II), Worthington Mountains Wilderness (I)
19	State Route 375 near where rail line would cross	Surrounding lands (IV)
20	Cedar Pipeline Ranch	Surrounding lands (IV), Kawich Range (II), Quinn Canyon Range (III), South Reveille Wilderness Study Area (I)
21	State Route 375 near U.S. Highway 6	Surrounding lands (IV), Kawich Range (II), Kawich and Rawhide Wilderness Study Areas (I)
22	U.S. Highway 6 near State Route 375	Surrounding lands (IV), Kawich Range (II), Kawich and Rawhide Wilderness Study Areas (I)
23	U.S. Highway 6 on east side of Warm Springs Summit	Surrounding lands (IV), Kawich Range (II), Rawhide Wilderness Study Area (I)
24	Warm Springs Summit	Surrounding lands (IV), Kawich Range (II), Rawhide Wilderness Study Area (I)

Table 3-14. Key observation points and visual resource management classes in the Caliente rail alignment viewshed[a] (page 2 of 2).

Key observation point	Location	Visual resource management classes[b]
25	U.S. Highway 6 at a mine access road	Surrounding lands (IV), Kawich Range (II), Kawich Wilderness Study Area (I), Rawhide Wilderness Study Area (I)
26	Nevada Test and Training Range Road near where rail line would cross	Surrounding lands (IV), Kawich Wilderness Study Area (I)
27	Nevada Test and Training Range Road	Surrounding lands (IV), Kawich Wilderness Study Area (I)
28	U.S. Highway 6 at Nevada Test and Training Range Road	Surrounding lands (IV), Monitor Range (III)
29	U.S. Highway 95 north of Goldfield	Surrounding lands (IV)
30	U.S. Highway 95 at north end of Goldfield	Surrounding lands (IV)
31	Where rail line would cross U.S. Highway 95 south of Goldfield	Surrounding lands (IV)
32	U.S. Highway 95 at State Route 266	Surrounding lands (IV), State Route 266 (III), Stonewall Mountain (II)
33	U.S. Highway 95 at State Route 267	Surrounding lands (IV), State Route 267 (III)
34	U.S. Highway 95 (typical cut)	Surrounding lands (IV)
35	U.S. Highway 95 north of Oasis Valley (typical landscape)	Surrounding lands (IV)
36	U.S. Highway 95 and Beatty Wash access road	Surrounding lands (IV)
37	U.S. Highway 95 at proposed Maintenance-of-Way Headquarters Facility for Goldfield alternative segments 1 and 3	Surrounding lands (IV)
38	U.S. Highway 95 at proposed Maintenance-of-way combined Headquarters and Trackside Facility for Goldfield alternative segment 4	Surrounding lands (IV)

a. Appendix D contains photographs taken from each key observation point.
b. Sources: DIRS 155970-DOE 2002, pp. 3-158 and 3-159; DIRS 173224-BLM 1997, pp. 6, 7, and 27, and Map 8; DIRS 103079-BLM 1998, Map 2-9; DIRS 101811-DOE 1996, pp. 4-152 to 4-154; DIRS 184767-BLM 2007, Map 2.4.11-1.

3.2.3.3.2 Specific Visual Settings and Characteristics along Alternative Segments and Common Segments

3.2.3.3.2.1 Alternative Segments at the Interface with the Union Pacific Railroad Mainline. The Caliente rail alignment would begin in or near the City of Caliente with either the Caliente or the Eccles alternative segment. The Caliente alternative segment would begin in non-BLM-administered lands in the City of Caliente that would be considered Class III with application of the BLM methodology, with Class II BLM-administered lands on all sides; while the Eccles alternative segment would begin in a Class III area farther east. Big Hogback, a Class II visual resource, would be visible from some points along either alternative segment but would be more than 4 kilometers (2.5 miles) in the background of views across the alternative segments from U.S. Highway 93. The Caliente and Eccles alternative segments would approach within 6.1 kilometers (3.8 miles) of the southern boundary of Cathedral Gorge State Park, a Class II special area.

The Caliente alternative segment would cross or be very near Class III lands for approximately 8 kilometers (5 miles) after crossing approximately 1.1 kilometers (0.7 mile) of Class II BLM-administered lands north of the City of Caliente. The Eccles alternative segment would cross approximately 16 kilometers (10 miles) of Class III lands over its entire length and would approach within approximately 400 meters (1,300 feet) of Class II lands east of the City of Caliente for approximately 1 to 2 kilometers (0.6 to 1.2 miles). The northernmost 1.6 kilometers (1 mile) of both alternative segments would cross agricultural fields on non-BLM-administered lands that would be considered Class III with application of the BLM methodology, with Class II BLM-administered lands lying immediately adjacent to the agricultural fields.

Key observation points (indicated in parentheses) for the Caliente and Eccles alternative segments provide a view of where the rail line would cross under U.S. Highway 93 (6); views from the intersection of U.S. Highway 93 and State Route 319 toward Big Hogback and Cathedral Gorge (8); a view from Cathedral Gorge toward the alignment (9); and views of the Caliente-Upland and Caliente-Indian Cove options for the Staging Yard (5 and 2, respectively). In addition, a key observation point (3) provides a view of the place where a conveyor would cross U.S. Highway 93 to the Staging Yard Caliente-Indian Cove option if DOE developed potential quarry CA-8B (see Figure 2-24) as a source of ballast. Another key observation point (4) provides a view of the place where a conveyor would cross U.S. Highway 93 to the south of the Staging Yard Caliente-Upland option.

3.2.3.3.2.2 Caliente Common Segment 1 (Dry Lake Valley Area). Caliente common segment 1 would cross through the pass between the Highland Range and the Chief Range, through Dry Lake Valley, through the North Pahroc and Seaman Ranges, and on to the Golden Gate Range. Part of the Highland Range is Class II. Much of the Seaman Range falls into the Weepah Springs Wilderness, a Class I area; two areas are Class II, including Timber Mountain; while the north and south ends of the Seaman Range are Class III or IV.

As shown in Figure 3-58, Caliente common segment 1 would cross Class II and Class III lands in the area of the Highland and Chief Ranges, and Class IV land in Dry Lake Valley. The segment would also cross the Chief Mountain Special Recreation Management Area, an area recognized by the BLM for high levels of motorized recreational use (DIRS 184767-BLM 2007, pg 3.14-2) Caliente common segment 1 would be approximately 2 kilometers (1.2 miles) north of the Class II lands of the Pahroc Range and would cross Class III lands between the Pahroc Range and Timber Mountain. The segment would approach within a few hundred meters of the northeastern point of Weepah Springs Wilderness, but would not cross any Class I land. Finally, Caliente common segment 1 would cross Class IV and then Class III lands from Timber Mountain to Garden Valley.

A key observation point on State Route 318 provides a view of the location where the Caliente rail alignment would cross the highway (10). A key observation point on a county road just off State Route 318 provides a view over the rail alignment on the slopes of Timber Mountain (11), while another key observation point provides a view of the rail alignment crossing the county road on those slopes (12). Two key observation points provide views across Dry Lake Valley and toward the Chief and Highland Ranges (1 and 7, respectively).

3.2.3.3.2.3 Garden Valley Alternative Segments. The Garden Valley alternative segments would cross the Golden Gate Range and Garden Valley, and pass between the Worthington Mountains and the Quinn Canyon Range. The Golden Gate Range is a Class III area. The portion of the Quinn Canyon Range that bounds Garden Valley on the northwest is managed by the U.S. Forest Service. The Quinn Canyon Range is generally considered Class III in this evaluation, with the exceptions of the Quinn Canyon and Grant Range Wilderness Areas (approximately 6 kilometers [4 miles] from Garden Valley alternative segment 3 at their closest), which are analyzed as Class I. The Worthington Mountains include the Class I Worthington Mountains Wilderness, and lower slopes that are Class III or Class IV.

As shown in Figure 3-58, the valley floor and the hills and lower slopes of ranges around Garden Valley are Class II.

City is a complex of abstract sculptural and architectural forms made from earth, rock, and concrete extending over 2.4 kilometers (1.5 miles) on private land in Garden Valley. The largest feature as of early 2007 was approximately 21 to 24 meters (70 to 80 feet) high and 0.4 kilometer (0.25 mile) long. *City* is designed in five phases and could be completed by 2010. City is supported by private funding.

Several key observation points (13 to 18) both inside and outside the sculpture provide views across one or more of the Garden Valley alternative segments. The DOE selection of key observation points within the sculpture area and along lightly traveled county roads is more conservative than standard BLM methodology, which calls for viewpoints at locations where a significant number of viewers are expected. There are no public roads within the sculpture area, and views from key observation points on county roads outside the sculpture area do not include the sculpture. DOE selected the additional key observation points to better inform decisionmakers about managing for the visual values in the Class II lands, and to provide data to address concerns about visual impacts in Garden Valley raised in public comments offered during the scoping period for this Rail Alignment EIS.

3.2.3.3.2.4 Caliente Common Segment 2 (Quinn Canyon Range Area). Caliente common segment 2 would run to the north of the Worthington Mountains, pass within approximately 1.3 kilometers (0.8 mile) of both a Class II area and the Class I Worthington Mountains Wilderness, and then travel through the Class IV land in the south end of the Quinn Canyon Range. The segment would continue through Class IV land but would come within 730 meters (2,400 feet) of the Class I South Reveille Wilderness Study Area at the southern end of the Reveille Range. A key observation point provides views from State Route 375 across common segment 2 near the highway crossing and a proposed construction camp (19).

3.2.3.3.2.5 South Reveille Alternative Segments. The South Reveille alternative segments would begin near Cedar Pipeline Ranch, between the Reveille and Kawich Ranges, and extend northwest through Class IV lands. The Reveille Range includes the Class I South Reveille Wilderness Study Area. The more northerly South Reveille alternative segment 2 would approach within about 340 meters (1,100 feet) of this Wilderness Study Area at the base of the range, while South Reveille alternative segment 3 would pass farther south from this area. The Kawich Range is Class II in the area of these alternative segments, although the range would be more than 10 kilometers (6.2 miles) away at its closest point. Key observation point 20 is near Cedar Pipeline Ranch.

3.2.3.3.2.6 Caliente Common Segment 3 (Stone Cabin Valley Area). Caliente common segment 3 would extend north up Reveille Valley and pass through the Kawich Range at Warm Springs Summit. It would then proceed through Stone Cabin Valley and around the Nevada Test and Training Range to the Goldfield area. Caliente common segment 3 would approach as close as approximately 90 meters (300 feet) from the Class I South Reveille Wilderness Study Area, and would parallel its boundary for approximately 11 kilometers (7 miles) in the Class IV land between the Reveille and Kawich Ranges. As previously mentioned, the Kawich Range is a Class II area. Caliente common segment 3 would be at least 5 kilometers (3 miles) away from the Class II portions of the Kawich Range as it crossed the Class IV portion of the valley, except near Warm Springs Summit, where it would approach within approximately 2.1 kilometers (1.3 miles) of the Class II area. The Kawich Range also contains the Class I Kawich Wilderness Study Area to the west of common segment 3. The segment would be within 430 meters (1,400 feet) of the Wilderness Study Area but would remain in Class IV land. This portion of the common segment would also come within approximately 14 kilometers (8.7 miles) of the southern edge of the Rawhide Mountains Wilderness Study Area, which is north of Warm Springs. As common segment 3 passed Warm Springs Summit and headed southwest and then west along the boundary of the

Nevada Test and Training Range, it would cross Class IV lands exclusively. Key observation points provide views from State Route 375 and U.S. Highway 6 across Caliente common segment 3 (21 through 23) on the east side of Warm Springs Summit, views at Warm Springs Summit and approaching it from the west (24 and 25), and views across common segment 3 from U.S. Highway 6 (28) and from the road leading into the Nevada Test and Training Range (26 and 27).

3.2.3.3.2.7 Goldfield Alternative Segments. The Goldfield alternative segments would pass through the Class IV hills northwest of Stonewall Mountain, which is a Class II area. Key observation points include a view across all three Goldfield alternative segments toward potential quarry NS-3A (29), a view across Goldfield alternative segment 4 from north Goldfield (30), a view of the place Goldfield alternative segment 4 would cross U.S. Highway 95 at the south end of Goldfield (31), and views of the proposed Maintenance-of-Way Headquarters Facility (37), which DOE would construct if it were to select Goldfield alternative segment 1 or 3, and the Maintenance-of-Way combined Headquarters and Trackside Facility (38), which DOE would construct if it were to select Goldfield alternative segment 4, from U.S. Highway 95.

3.2.3.3.2.8 Caliente Common Segment 4 (Stonewall Flat Area). Caliente common segment 4 would begin south of Goldfield and proceed past Stonewall Mountain and beyond the intersection of U.S. Highway 95 and State Route 266. Caliente common segment 4 would be in Class IV land and would never pass closer than 6.9 kilometers (4.3 miles) of the Class II Stonewall Mountain area. The BLM manages State Route 266 west of U.S. Highway 95 as a Class III area. Lida Junction, the intersection of U.S. Highway 95 and State Route 266, is a key observation point for the view toward Stonewall Mountain (32).

3.2.3.3.2.9 Bonnie Claire Alternative Segments. The Bonnie Claire alternative segments would cross Class IV lands to the southwest of the Nevada Test and Training Range and past Scottys Junction at the intersection of U.S. Highway 95 and State Route 267, which the BLM manages as a Class III area west of U.S. Highway 95. A key observation point at Scottys Junction provides a view northeast toward the alternative segments (33).

3.2.3.3.2.10 Common Segment 5 (Sarcobatus Flat Area). Common segment 5 would cross Class IV land between the Bonnie Claire area and the Oasis Valley area. There are no visual resources of concern along this common segment and, therefore, no key observation points.

3.2.3.3.2.11 Oasis Valley Alternative Segments. The Oasis Valley alternative segments would cross Class IV areas through Oasis Valley. Key observation point (35) is north of Springdale, looking east over the Oasis Valley, showing a typical landscape. Key observation point (34) provides a view of a typical cut.

3.2.3.3.2.12 Common Segment 6 (Yucca Mountain Approach). Common segment 6 would pass from the Oasis Valley area, near Beatty and across Beatty Wash, through the Nevada Test Site to the Yucca Mountain Site. State Route 374, entering Beatty, is a Class III area. Common segment 6 would cross approximately 10 kilometers (6.2 miles) of Class III lands before it entered the Nevada Test Site, but the segment would be more than 15 kilometers (9.3 miles) from U.S. Highway 95 in this area. Land on the Nevada Test Site is not under BLM jurisdiction. Land on the Nevada Test Site that is visible from U.S. Highway 95 and that the rail line would cross is considered Class IV in this evaluation. Key observation point (36) is north of Beatty, with views from U.S. Highway 95 over the Class IV lands surrounding the access road to Beatty Wash. The viewshed within the wash is considered a contributing element to cultural resources within the wash that are important to American Indians (DIRS 174205-Kane et al. 2005, p. 17). Beatty Wash and the rail line through it would not be visible from the highway. Therefore, DOE did not select key observation points in this area.

3.2.4 AIR QUALITY AND CLIMATE

This section describes the present air quality and climate characteristics along the Caliente rail alignment and summarizes information from ***ambient air*** monitoring and meteorological data collection in the region. Section 3.2.4.1 describes the region of influence for air quality and climate, Section 3.2.4.2 describes general air quality characteristics in the Caliente rail alignment region of influence, and Section 3.2.4.3 describes the climate characteristics in the Caliente rail alignment region of influence.

3.2.4.1 Region of Influence

The region of influence for air quality and climate along the Caliente rail alignment is the air basins in Lincoln, Nye, and Esmeralda Counties. Historic data on pollutant emissions inventories and compliance status for the State of Nevada are calculated at the county level, and these data provide a basis for determining existing air quality in the region of influence for use in analyzing potential impacts to air quality (see Section 4.2.4).

However, air-emissions fixed-point sources such as quarries and linear sources such as operating railroads can subject certain locations (known as receptors; for example, population centers) to higher localized levels of pollutants than a regional analysis would suggest. Therefore, DOE also selected more focused study locations within the region of influence in which to model air quality impacts on specific receptors. These locations are the two largest population centers near the Caliente rail alignment (the City of Caliente in Lincoln County and Goldfield in Esmeralda County), and potential quarry sites northwest of the City of Caliente (CA-8B) and in South Reveille Valley (NN-9B).

In addition to regulated air pollutants that affect air quality, greenhouse gas emissions have been identified as an air pollutant with a potential impact on climate. However, unlike regulated air pollutants, greenhouse gas emissions are only important as to their contribution globally to cumulative emissions, so their regions of influence are at the global scale.

3.2.4.2 Existing Air Quality

Air quality is determined by measuring concentrations of certain pollutants in the atmosphere. The U.S. Environmental Protection Agency designates an area as being ***in attainment*** for a particular pollutant if ambient concentrations of that pollutant are below the National ***Ambient Air Quality Standards***. The pollutants regulated under the State of Nevada and National Ambient Air Quality Standards are ***ozone***, ***carbon monoxide***, ***nitrogen dioxide***, ***sulfur dioxide***, ***particulate matter*** with an aerodynamic diameter less than or equal to 10 micrometers (***PM_{10}***) and particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (***$PM_{2.5}$***), and lead. Collectively, these pollutants are referred to as ***criteria pollutants***. Table 3-15 lists the National Ambient Air Quality Standards for both the primary public health standard and the secondary public welfare standards in comparison to State of Nevada Ambient Air Quality Standards. Although emissions of the principal anthropogenic greenhouse gas, carbon dioxide, are not currently subject to State of Nevada or federal standards, the impact of carbon dioxide on global climate change is a topic of increasing awareness and concern to members of the public.

Areas in violation of one or more of these standards are classified as ***nonattainment areas***. If there is not enough air quality data to determine the status of a remote or sparsely populated area, then the U.S. Environmental Protection Agency lists the area as unclassifiable. However, for regulatory purposes, unclassifiable areas are considered to be in attainment. All portions of the Caliente rail alignment would be within areas classified as in attainment for all National Ambient Air Quality Standards.

Table 3-15. State of Nevada and National Ambient Air Quality Standards[a] (page 1 of 2).

Pollutant[b]	Averaging time[c]	Nevada standards concentration[b]	National primary standards[b]	National secondary standards[b]	Notes regarding the air quality standard
Ozone	1 hour	0.12 ppm (235 μg/m^3)	None	Same as primary	The expected number of days per calendar year with a maximum hourly average concentration above the standard is less than or equal to 1.
	8 hour	None	0.075 ppm (147 μg/m^3)	Same as primary	To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm.
Ozone, Lake Tahoe Basin	1 hour	0.10 ppm (195 μg/m^3)	None	None	The expected number of days per calendar year with a maximum hourly average concentration above the standard is less than or equal to 1.
Carbon monoxide	8 hours	9 ppm (10,500 μg/m^3) for elevations less than 5,000 feet[d] above mean sea level	9 ppm (10,500 μg/m^3) at any elevation	None	Not to be exceeded more than once per year.
		6 ppm (7,000 μg/m^3) for elevations greater than 5,000 feet above mean sea level			
Carbon monoxide (at any elevation)	1 hour	35 ppm (40,500 μg/m^3)	35 ppm (40,500 μg/m^3)		
Nitrogen dioxide	Annual arithmetic mean	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)	Same as primary	Not to be exceeded.
Sulfur dioxide	Annual arithmetic mean	0.03 ppm (80 μg/m^3)	0.03 ppm (80 μg/m^3)	None	Not to be exceeded.
	24 hours	0.14 ppm (365 μg/m^3)	0.14 ppm (365 μg/m^3)		Not to be exceeded more than once per year.
	3 hours	0.5 ppm (1,300 μg/m^3)	None	0.5 ppm (1,300 μg/m^3)	
Particulate matter as PM_{10}	Annual arithmetic mean	50 μg/m^3	Revoked[e]	Revoked[e]	The 3-year average of the weighted annual mean concentration at each monitor within an area.
	24 hours	150 μg/m^3	150 μg/m^3		Not to be exceeded more than once per year.[f]

Table 3-15. State of Nevada and National Ambient Air Quality Standards[a] (page 2 of 2).

Pollutant[b]	Averaging time[c]	Nevada standards concentration[b]	National primary standards[b]	National secondary standards[b]	Notes regarding the air quality standard
Particulate matter as $PM_{2.5}$	Annual arithmetic mean	None	15 μg/m^3	Same as primary	The 3-year average of the weighted annual mean concentration from single or multiple community-oriented monitors.
	24 hours	35 μg/m^3	35 μg/m^3		The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.[g]
Lead [h]	Quarterly arithmetic mean	1.5 μg/m^3	1.5 μg/m^3	Same as primary	Not to be exceeded.
Hydrogen sulfide[h]	1 hour	0.08 ppm (112 μg/m^3)	None	None	Not to be exceeded.

a. Sources: Nevada Administrative Code Section 445B.22097 and 40 CFR 50.4 through 50.11.
b. PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers; ppm = parts per million; μg/m^3 = micrograms per cubic meter.
c. Time over which pollutant is measured.
d. To convert feet to meters, multiply by 0.3048.
e. The U.S. Environmental Protection Agency revoked the annual PM_{10} standard effective December 18, 2006 (71 *FR* 60853, October 17, 2006).
f. The 24-hour state standard is attained when the expected number of days per calendar year with a 24-hour average concentration above the standard is equal to or less than 1. The expected number of days per calendar year is based on an average of the number of exceedances per year for the last 3 years.
g. The 24-hour state standard is attained when the second highest of a 3-year rolling average of the 24-hour concentration at each monitor is less than the standard.
h. The proposed railroad would not emit lead or hydrogen sulfide; they are included here for completeness.

The most comprehensive source of representative data on ambient concentrations of gas-phase air pollutants for the region of influence is a special study at Yucca Mountain covering a 4-year period from October 1991 to September 1995 (DIRS 102877-CRWMS M&O 1999, all). The limited amount of air quality data reflects choices made by national and state agencies to focus monitoring resources either on population centers or pristine areas such as national parks. Additional data on particulate matter are available based on monitoring at three sites in the vicinity of Yucca Mountain from 1989 to 1997 (DIRS 102877-CRWMS M&O 1999, all; DIRS 102876-CRWMS M&O 1997, all; DIRS 147777-SAIC 1992, all; DIRS 147780-SAIC 1992, all), from three sites from 1998 to 2001 (DIRS 173738-DOE 2002, p. 42), and from two sites from 2002 through 2005 (DIRS 168842-DOE 2003, p. 42; DIRS 173740-DOE 2004, p. 36; DIRS 176801-Wills 2005, p. 38; DIRS 179948-DOE 2006, p. 40). While these data sets pertain to locations more than 160 kilometers (100 miles) from the easternmost part of the Caliente rail alignment, DOE believes they are representative of the ambient air quality along most of the Caliente rail alignment, because neither area has large emission sources or metropolitan areas that would otherwise affect air quality. However, local natural sources of particulate matter, such as barren land or dry lake beds, could generate higher localized concentrations of particulate matter.

In the vicinity of the eastern portion of the Caliente rail alignment, the closest location for which there are recorded air quality data is Mesquite, Nevada, at which ozone and particulate matter measurements are taken. However, because Mesquite is outside the air quality and climate region of influence (Mesquite is in Clark County) and is more than 100 kilometers (65 miles) from its closest point to the Caliente rail alignment, and because there has been substantial construction activity and population growth in Mesquite in recent years, Mesquite's air quality is not representative of the area of the Caliente rail alignment.

In the vicinity of the western portion of the Caliente rail alignment, the closest location (other than the Yucca Mountain Site) for which there are recent air quality data is Pahrump, Nevada. However, Pahrump, which is in the extreme southern tip of Nye County, is 65 kilometers (40 miles) southeast of the rail alignment, and only monitors particulate matter. In recent years there have been exceedances of the National Ambient Air Quality Standards for particulate matter in Pahrump because there has been substantial construction activity and population growth in the Pahrump Valley. In September 2003, Pahrump entered into a Memorandum of Understanding (DIRS 178128-Nevada Division of Environmental Protection 2003, p. 5) with the U.S. Environmental Protection Agency, the State of Nevada, and Nye County to develop an air quality improvement plan, with quantified emission-reduction measures so that the emission reduction strategies will be adequate to ensure the area stays in attainment of the particulate matter standards and with the objective that the area would be in attainment by 2009. Pahrump has a background monitoring site intended to represent natural background concentrations of the northern Mojave Desert; however, some disturbed land in the vicinity of the monitor makes the site only representative of the local background in the Pahrump Valley. Because of Pahrump's distance from the Caliente rail alignment and heavy construction activity and population growth, its air quality is not representative of the area of the Caliente rail alignment.

DOE began air quality monitoring in the Yucca Mountain vicinity in 1989. Figure 3-59 shows station locations. The air quality network originally consisted of Sites YMP1 and YMP5; DOE added Sites YMP6 and YMP9 in 1992.

DOE designed the air quality and meteorological monitoring program to comply with the U.S. Environmental Protection Agency's *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* (DIRS 101822-EPA 1987, all) and *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (DIRS 108989-EPA 1987, all), and with U.S. Nuclear Regulatory Commission meteorological monitoring guidance (ANSI/ANS-2.5-1984, *Standard for Determining Meteorological Information at Nuclear Power Sites*, and Regulatory Guide 1.23, Rev. 0, *Onsite Meteorological Programs*).

DOE monitored the criteria gaseous pollutants of carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide at YMP1 from October 1991 through September 1995. DOE also monitored the concentration of PM_{10} at YMP1; the ambient air quality monitoring program included sampling of PM_{10} every sixth day, based on the U.S. Environmental Protection Agency's representative schedule of sampling.

YMP5, the second site measuring PM_{10}, represented background conditions away from site activities at Yucca Mountain. Measurements at YMP5 began in April 1989 and continued until 2002.

In October 1992, DOE added two sites to measure PM_{10}:

- YMP6, along the western border of the Nevada Test Site where the Test Site meets the U.S. Air Force land in upper Yucca Wash, measured particulate matter that might be transported from Midway Valley toward the northwest through Yucca Wash (discontinued September 1999).
- YMP9, at Gate 510 on the southern border of the Nevada Test Site, north of Amargosa Valley.

Tables 3-16 and 3-17 summarize the results of the particulate matter air quality monitoring programs. More information on the results of the sampling program is available in *Environmental Baseline File for Meteorology and Air Quality* (DIRS 102877-CRWMS M&O 1999, all); *Meteorological Monitoring Program Particulate Matter Ambient Air Quality Monitoring Report January through December 1996* (DIRS 102876-CRWMS M&O 1997, all); *Particular Matter Ambient Air Quality Data Report for 1989 and 1990* (DIRS 147777-SAIC 1992, all); and *Particular Matter Ambient Air Quality Data Report for 1991* (DIRS 147780-SAIC 1992, all).

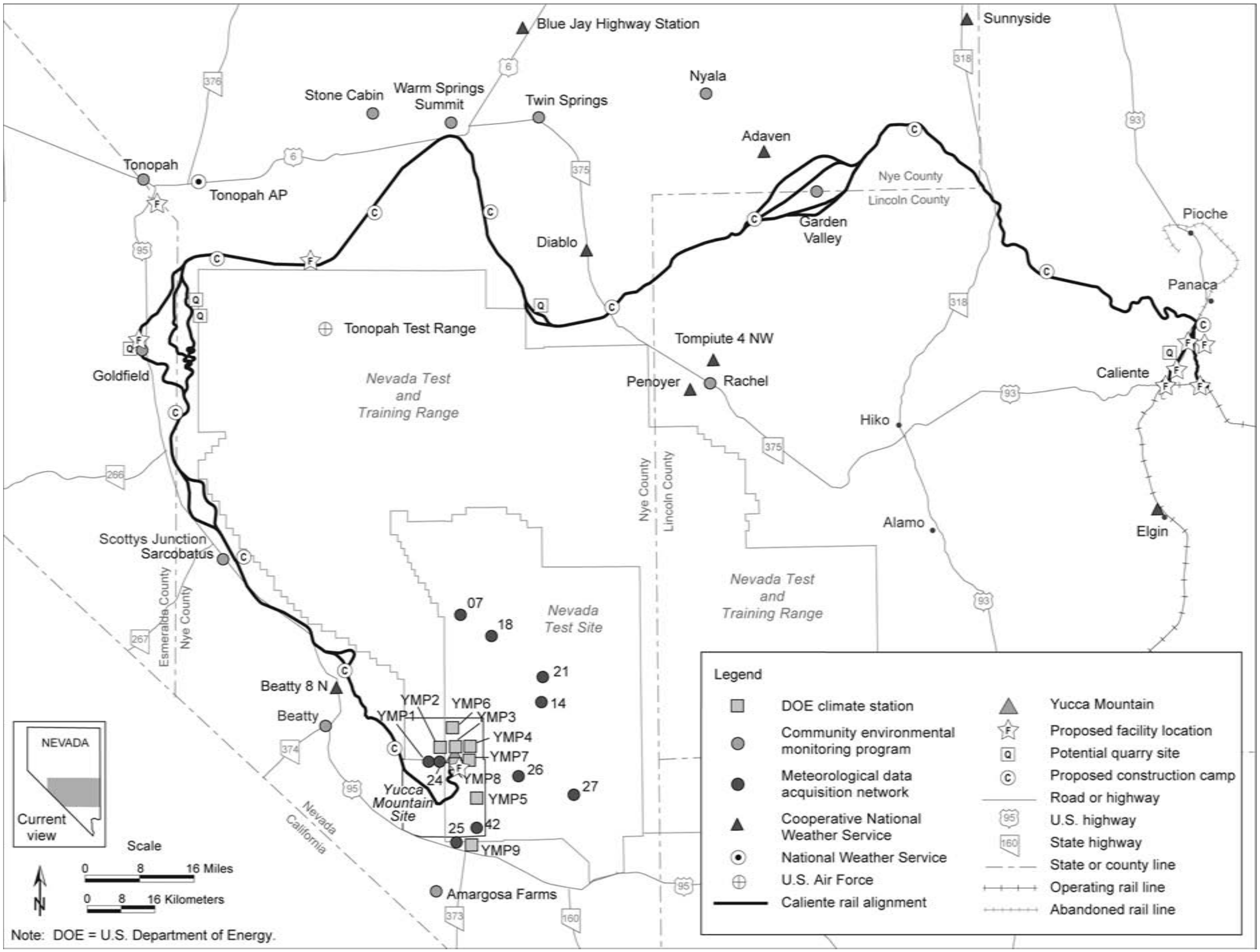


Figure 3-59. Air quality and climate stations along the Caliente rail alignment.

Table 3-16. Summary of PM_{10} concentrations at sites in the vicinity of Yucca Mountain (1989 to 1997).[a,b,c]

Sampler	Averaging time	1989	1990	1991	1992	1993	1994	1995	1996	1997	High
Site YMP1	24-hour highest	41	62	33	30	30	39	21	60	31	62
	Second highest	27	49	25	24	22	26	20	23	21	49
	Annual average	12	12	10	12	10	10	10	10	9	12
Site YMP5	24-hour highest	40	51	45	49	21	42	67	57	26	67
	Second highest	38	43	33	27	20	23	21	35	19	43
	Annual average	13	10	10	12	9	9	10	10	9	13
Site YMP6	24-hour highest	NA	NA	NA	NA	21	25	14	32	59	59
	Second highest	NA	NA	NA	NA	21	20	13	21	18	21
	Annual average	NA	NA	NA	NA	9	7	7	9	8	9
Site YMP9	24-hour highest	NA	NA	NA	31	21	39	15	57	29	57
	Second highest	NA	NA	NA	31	21	19	14	28	19	31
	Annual average	NA	NA	NA	NA	9	8	7	10	8	10
Site YMP6	24-hour highest	NA	NA	NA	NA	21	25	14	32	59	59

a. Sources: DIRS 102877-CRWMS M&O 1999, p. 13; DIRS 102876-CRWMS M&O 1997, p. 13; DIRS 147777-SAIC 1992, p. 13; DIRS 147780-SAIC 1992, p. 13.
b. Concentrations are shown in micrograms per standard cubic meter ($\mu g/m^3$).
c. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; NA = samples were not taken during the corresponding monitoring period.

Table 3-17. Summary of PM_{10} concentrations at sites in the vicinity of Yucca Mountain (1998 to 2005).[a,b,c]

Sampler	Averaging time	1998	1999	2000	2001	2002	2003	2004	2005	High
Site YMP1	24-hour highest	30	18	38	23	52	33	24	32	52
	Second highest	17	34	34	19	37	17	19	29	37
	Annual average	8	8	11	8	10	8	8	9	11
Site YMP5	24-hour highest	26	24	45	27	NA	NA	NA	NA	45
	Second highest	18	21	39	25	NA	NA	NA	NA	39
	Annual average	7	8	12	10	NA	NA	NA	NA	12
Site YMP9	24-hour highest	22	18	36	22	43	39	27	26	43
	Second highest	20	17	33	19	39	38	21	26	39
	Annual average	6	8	11	9	10	11	9	9	11

a. Sources: DIRS 173738-DOE 2002, p. 42; DIRS 168842-DOE 2003, p. 44; DIRS 173740-DOE 2004, p. 36; DIRS 176996-DOE 2005, p. 38; DIRS 179948-DOE 2006, p. 40.
b. Concentrations are shown in micrograms per standard cubic meter ($\mu g/m^3$).
c. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; NA = samples were not taken during the corresponding monitoring period.

Between 1989 and 1997, the highest 24-hour PM_{10} measurement was 67 micrograms per cubic meter. This measurement, made at Site YMP5 in 1995, is approximately 45 percent of the regulatory standard of 150 micrograms per cubic meter (40 CFR 50.4 through 50.11).

The second-highest value at any monitoring site, which is the basis for a violation of the ambient air quality standard, was 49 micrograms per cubic meter at Site YMP1 in 1990, which is 33 percent of the PM_{10} standard.

The annual averages were between 6 and 13 micrograms per cubic meter (Site YMP9 [1998] and Site YMP5 [1989], respectively), which is less than 30 percent of the historical annual standard (50 micrograms per cubic meter).

Table 3-17 lists the annual highest and second-highest 24-hour concentrations, and the annual average PM_{10} concentration for the period 1998 to 2005 for YMP1, YMP5, and YMP9, and shows the measured levels of ambient particulate matter were well below the Nevada particulate matter standards. Table 3-18 lists Site YMP1 results for monitoring of gaseous criteria pollutants (carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide) for each year of the 4-year monitoring period (1991 to 1995); for comparison, the National Ambient Air Quality Standards are also shown.

Ambient concentrations of carbon monoxide and sulfur dioxide were below the threshold of reliable detection of the instrument. Nitrogen dioxide occasionally registered values of a few hundredths of parts per million by volume, typically associated with nearby vehicle activity. The number of hours per operating quarter with measurements above the threshold was between 1 and 161, which occurred from October through December 1993. The results listed in Table 3-18 are expressed in the units of the applicable standard (for example, annual average of nitrogen dioxide), and the listed values are based on the threshold of reliable detection for that instrument.

Table 3-18. Site YMP1 maximum observed ambient gaseous air quality concentrations in comparison to the Nevada Standards for Air Quality and the National Ambient Air Quality Standards (in parts per million by volume).[a]

Pollutant	Nevada and NAAQS[b]	Year 1 (10/91 to 9/92)	Year 2 (10/92 to 9/93)	Year 3 (10/93 to 9/94)	Year 4 (10/94 to 9/95)
Carbon monoxide	35 (1 hour)	0.2	0.2	0.2	0.2
	9[c] (8 hour)	0.2	0.2	0.2	0.2
Nitrogen dioxide	0.053 (annual)	0.0020	0.0020	0.0021	0.0021
Ozone[d] (for Nevada ambient air quality only)	0.12 (1 hour) 0.075 (8 hour)	0.096 (1 hour)	0.093 (1 hour)	0.081 (1 hour)	0.083 (1 hour)
Sulfur dioxide	0.5 (3 hour)	0.002	0.002	0.002	0.002
	0.14 (24 hour)	0.002	0.002	0.002	0.002
	0.03 (annual)	0.002	0.002	0.002	0.002

a. Source: DIRS 102877-CRWMS M&O 1999, p. 14; 40 CFR 50.4 through 50.11.
b. NAAQS = National Ambient Air Quality Standards.
c. Nevada Standards for Air Quality: less than 5,000 feet above mean sea level.
d. The 1-hour average primary and secondary standards of 0.12 parts per million for ozone were withdrawn in 2005, and were replaced with 8-hour average standards of 0.08 parts per million. On March 12, 2008, the U.S. Environmental Protection Agency revised these primary and secondary 8-hour ozone standards from 0.08 parts per million to 0.075 parts per million. The final rule was published in the *Federal Register* on March 27, 2008 (73 *FR* 16436), to be effective on May 27, 2008.

DOE believes these measurements of particulate matter, carbon monoxide, nitrogen dioxide, and sulfur dioxide are representative of the air quality along the Caliente rail alignment because the region of influence has no large emission sources or metropolitan areas that would otherwise affect its air quality. However, in areas close to barren land or dry lake beds, there could be higher particulate matter concentrations.

Ozone was the only gaseous criteria pollutant to routinely register ambient levels above the instrument threshold. Ozone levels never exceeded the regulatory limit for the 1-hour average standard (0.12 parts per million by volume). The highest 1-hour average was 0.096 parts per million. Note that the 1-hour average standard was withdrawn in 2005, and has now been replaced with an 8-hour average standard

(0.08 parts per million). Ozone is formed in the atmosphere under the presence of sunlight, ***nitrogen oxides***, and ***volatile organic compounds***. Ozone typically has the highest concentrations during warm weather because strong sunlight and high temperatures are more conducive to higher ambient concentrations. Approximately 90 percent of the warm-season hours had concentrations between 0.020 and 0.060 parts per million; only 44 hours had concentrations in excess of 0.080 parts per million.

Available data for Death Valley National Park (for 1995 to 2004), 50 kilometers (31 miles) west of the westernmost portion of the Caliente rail alignment, reported a highest 1-hour average ozone concentration of 0.095 parts per million (DIRS 176115-EPA 2005, all), which is similar to the ozone values measured at Yucca Mountain. Ozone concentrations along more eastern parts of the Caliente rail alignment are anticipated to be even lower because of their greater distance from emission sources.

No ambient monitoring data were available for lead. However, DOE expects concentrations of lead to be far below the regulatory standard because there are no industrial sources in the region of influence (or near enough to transport this ***contaminant*** into the region of influence), and lead-based gasoline, previously the principal source of lead in the air, has been phased out.

No ambient monitoring data were available for $PM_{2.5}$; however, because $PM_{2.5}$ is a subset of PM_{10}, $PM_{2.5}$ can be estimated from measurements of ambient PM_{10}. In the region of influence, nearly all PM_{10} would be generated from the resuspension of surface-level soil and mineral materials. A U.S. Department of Agriculture study on wind erosion in the western United States found that over all soils, the fraction of PM_{10} as $PM_{2.5}$ was about 15 percent, ranging from 10 to 30 percent (DIRS 173838-Hagen 2001, p. 1). To be conservative, DOE applied the upper end of this range (30 percent) to the ambient PM_{10} data collected at Yucca Mountain (Sites YMP1, YMP5, and YMP9) over the past 8 years (1998 through 2005), and the resulting data indicated the highest expected 24-hour concentration of $PM_{2.5}$ would be 16 micrograms per cubic meter, and the highest expected annual average concentration would be 4 micrograms per cubic meter. These figures are 46 and 26 percent of the standards for $PM_{2.5}$. Table 3-19 summarizes these results and indicates that $PM_{2.5}$ would be well below the National Ambient Air Quality Standards at all locations along the Caliente rail alignment.

Table 3-19. Maximum observed ambient air quality concentrations at sites in the vicinity of Yucca Mountain (1998 to 2005) compared to the Nevada and National Ambient Air Quality Standards for particulate matter.[a,b,c]

Sampler	Nevada and NAAQS[d]	1998	1999	2000	2001	2002	2003	2004	2005	High
PM_{10}	24 hour: 150	30	24	45	27	52	39	27	32	52
	Annual: 50[e]	8	8	12	10	10	11	9	9	12
Estimated[f] $PM_{2.5}$	24 hour: 35	9	7	14	8	16	12	8	10	16
	Annual: 15	2	2	4	3	3	3	3	3	4

a. Sources: DIRS 173738-DOE 2002, p. 42; DIRS 168842-DOE 2003, p. 44; DIRS 173740-DOE 2004, p. 36; DIRS 176996-DOE 2005, p. 38; DIRS 179948-DOE 2006, p. 40; 40 CFR 50.4 through 50.11.
b. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; $PM_{2.5}$ = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers.
c. Concentrations are shown in micrograms per standard cubic meter.
d. NAAQS = National Ambient Air Quality Standards.
e. The U.S. Environmental Protection Agency revoked the annual PM_{10} standard effective December 18, 2006. (71 *FR* 60853, October 17, 2006).
f. Estimated based on upper-end range of PM_{10} data assuming 30 percent of PM_{10} is $PM_{2.5}$ (DIRS 173838-Hagen 2001, p. 1).

3.2.4.3 Climate

The Caliente rail alignment would cross desert and ***semi-desert*** areas that generally have abundant hours of cloud-free days, low annual precipitation, and large daily ranges in temperature.

To characterize the existing climate, DOE collected meteorological data from 41 meteorological monitoring stations within the Caliente rail alignment region of influence (see Figure 3-59 and Table 3-19).

The following four groups operated these stations:

- National Oceanic and Atmospheric Administration
- Community Environmental Monitoring Program
- DOE Environment, Safety and Health Programs Department Network
- U.S. Air Force

The Meteorological Data Acquisition Network is a network of meteorological stations operated by the National Oceanic and Atmospheric Administration, Air Resources Laboratory/Special Operations and Research Division.

The Community Environmental Monitoring Program is a joint effort between the DOE Nevada Operations Office, the University of Nevada Desert Research Institute, and the Community College System of Nevada, and is a network of monitoring stations in communities surrounding the Nevada Test Site that check the ***environment*** for ***radioactivity*** and check a variety of meteorological parameters. The U.S. Air Force has historically operated a meteorological station from time to time on the Nevada Test and Training Range at the Tonopah Test Range and archives this data with the Air Force Combat Climatology Center.

DOE acquired data not directly available through these programs through the Western Regional Climate Center (DIRS 165987-WRCC 2002, all), which maintains historical climate databases for most of the climate and operational National and Military Weather Service stations throughout the western United States, including a network of stations that collect daily climate observations.

Table 3-20 lists the station operators and their respective elevations in the Caliente rail alignment air quality and climate region of influence. All stations collected temperature and precipitation data, and Table 3-20 also identifies those stations that collected wind speed and direction data. The range of elevations over which weather data were collected is approximately the same as the elevation range of the Caliente rail alignment – from 746 meters (2,449 feet) at the Amargosa Farms Station to 2,293 meters (7,521 feet) at the Warm Springs Summit Station.

The Caliente rail alignment would cross a variety of topographic features, ranging from mountain passes to sage-covered deserts. Alignment elevations range from 1,341 meters (4,398 feet) near the City of Caliente in Lincoln County to 2,293 meters (7,521 feet) at Warm Springs Summit in Nye County and back down to 1,080 meters (3,543 feet) near the end of the Caliente rail alignment at Yucca Mountain. These elevation changes drive a wide variation in temperature and precipitation.

From east to west, the Caliente rail alignment would lie within and be exposed to the climatic conditions of the Nevada counties of Lincoln, Nye, and Esmeralda, as described in Sections 3.2.4.3.1 through 3.2.4.3.3.

Table 3-20. Meteorological stations in the Caliente rail alignment air quality and climate region of influence[a,b] (page 1 of 2).

Station name	Elevation (in feet)[c]	Operator	Wind data
Pioche	6,178	CEMP	Yes
Caliente	4,398	CEMP	Yes
Elgin	3,419	WRCC	NA
Sunnyside	5,298	WRCC	NA
Garden Valley	5,294	CEMP	Yes
Adaven	6,248	WRCC	NA
Tempiute 4 Northwest	4,887	WRCC	NA
Rachael	4,751	CEMP	Yes
Nyala	4,870	CEMP	Yes
Penoyer	4,798	WRCC	NA
Diablo	5,103	WRCC	NA
Blue Jay Highway Station	5,320	WRCC	NA
Twin Springs	5,298	CEMP	Yes
Warm Springs Summit	7,521	CEMP	Yes
Tonopah Test Range	5,546	Air Force	Yes
Stone Cabin	5,864	CEMP	Yes
Tonopah	6,022	CEMP	Yes
Tonopah Airport	5,428	WRCC	NA
Goldfield	5,688	CEMP	Yes
Sarcobatus Flat	4,021	CEMP	Yes
Beatty 8 North	3,548	WRCC	NA
Beatty	3,302	CEMP	Yes
Amargosa Farms	2,449	CEMP	Yes
07	5,455	MEDA	NA
14	4,697	MEDA	NA
18	5,030	MEDA	NA
21	4,960	MEDA	NA
24	4,937	MEDA	NA
25	2,741	MEDA	NA
26	3,716	MEDA	NA
27	4,495	MEDA	NA
42	2,889	MEDA	NA
NTS 60 (YMP1)	3,727	DOE	NA

Table 3-20. Meteorological stations in the Caliente rail alignment air quality and climate region of influence[a,b] (page 2 of 2).

Station Name	Elevation (in feet)[c]	Operator	Wind data
Fortymile Wash (YMP5)	3,122	DOE	NA
Gate 510 (YMP9)	2,748	DOE	NA
Knothead Gap (YMP8)	3,706	DOE	NA
Sever Wash (YMP7)	3,543	DOE	NA
Yucca Mountain (YMP2)	4,847	DOE	NA
Coyote Wash (YMP3)	4,191	DOE	NA
Alice Hill (YMP4)	4,047	DOE	NA
WT-6 (YMP6)	4,313	DOE	NA

a. Source: DIRS 165987-WRCC 2002, all.
b. CEMP = Community Environmental Monitoring Program; DOE = DOE Environment, Safety and Health Programs Department Network; MEDA = Meteorological Data Acquisition Network; NA = not available; NTS = Nevada Test Site; WRCC = Western Regional Climate Center; YMP = Yucca Mountain Project.
c. To convert feet to meters, multiply by 0.3048.

3.2.4.3.1 Lincoln County

In Lincoln County, the Caliente rail alignment would cross two mountain ranges and cross the Dry Lake Valley, representing an elevation range of approximately 1,200 to 2,000 meters (3,900 to 6,600 feet), and would pass through another portion of Lincoln County from approximately Garden Valley to near the Quinn Canyon Range. Annual average temperatures along the rail alignment through Lincoln County range from approximately 13° Celsius (55° Fahrenheit) at lower elevations to approximately 7° Celsius (45° Fahrenheit) at higher elevations. Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during thesummer months. Daily temperature variations are smaller during winter months, and less pronounced at higher elevations. At the lower elevations, summertime mean maximum temperatures are approximately 35° Celsius (95° Fahrenheit), and are accompanied by low relative humidity (commonly less than 10 percent). Winter mean minimum temperatures are around minus 8° Celsius (18° Fahrenheit) in December and January (DIRS 165987-WRCC 2002, all).

In the eastern portion of Lincoln County, maximum precipitation occurs during the winter months (January through March), and a secondary peak occurs during July through September, associated with occasional thunderstorms. At higher elevations, annual average precipitation is greater than 250 millimeters (10 inches); at lower elevations, average precipitation is 250 millimeters or less. Daily precipitation levels can be high, and historical maximums have exceeded 76 millimeters (3 inches) per day in the vicinity of the Caliente rail alignment. These maximums have historically occurred during the winter months, and could cause localized flooding, particularly if the ground has been saturated by recent rainfall. The occasional summer thunderstorms can produce heavy rains that can cause flash floods.

The western portion of Lincoln County is drier, averaging closer to 130 millimeters (5 inches) of precipitation per year, primarily occurring January through April.

From November through April, precipitation in Nye County along the Caliente rail alignment might fall as snow. Mean average snowfall in the lower valleys is about 250 millimeters (10 inches). At higher elevations, the average snowfall is between 500 and 1,000 millimeters (20 and 40 inches) per year.

Local topography strongly influences winds in Lincoln County along the Caliente rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes.

Wind speeds are highest in the spring and occasionally generate dust storms. The extreme highest wind speeds are along ridgetops and mountain summits. Annual average wind speeds in the valleys range from 1.3 meters per second (2.9 miles per hour) at the Caliente station to about 2.2 meters per second (4.9 miles per hour) at the Garden Valley station. Calm conditions (wind speeds of less than 0.6 meter per second [1.3 miles per hour]) are most frequent at the Caliente station, and characterize slightly more than one-third of all hours; the Garden Valley station has calm conditions about 15 percent of the time.

3.2.4.3.2 Nye County

Through southern Nye County, the Caliente rail alignment would lie to the east of the southern Sierra Nevada Range, a large mountain ***barrier*** that prevents much of the moist Pacific Ocean air from reaching the area. The result is lower-elevation areas that are largely desert or semi-desert. The Caliente rail alignment would cross a variety of topographic features within the region, from mountain passes to sage-covered deserts. Elevations range from 2,293 meters (7,521 feet) at Warm Springs Summit to 1,080 meters (3,543 feet) near the end of the Caliente rail alignment at Yucca Mountain, and present a wide variation in temperature and precipitation. In general, the climatic features can be described as abundant hours of cloud-free days, low annual precipitation (less than 250 millimeters [10 inches] per year), and large daily ranges in temperature.

In Nye County, the mean annual temperature along the Caliente rail alignment ranges from approximately 16° Celsius (61° Fahrenheit) at lower elevations to approximately 10° Celsius (50° Fahrenheit) at the highest elevations. Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer months. Daily temperature variations are smaller during winter months, and less pronounced at higher elevations. At the lowest elevations along the Caliente rail alignment, summertime maximum temperatures frequently exceed 38° Celsius (100° Fahrenheit), and are accompanied by low relative humidity (commonly less than 10 percent).

Annual precipitation averages less than 250 millimeters (10 inches) per year at all locations across southern Nye County, and most precipitation occurs during the winter. Along the Caliente rail alignment, precipitation is lowest from the Sarcobatus Flat station to the Beatty station, averaging just 75 to 100 millimeters (3 to 4 inches) per year because of the ***rain shadow*** effects from the Sierra Nevada and Amargosa Range. At higher elevations, a secondary peak in rainfall (associated with increased thunderstorm activity) occurs during the late summer months; at lower elevations, this precipitation often evaporates before reaching the ground. The thunderstorms occasionally produce heavy rains that can cause flash floods. Daily precipitation levels can be high, and historical maximums have reached 60 millimeters (2.4 inches) at the Sarcobatus Flat station, with a number of locations exceeding 40 millimeters (1.6 inches).

From November through April, precipitation in Nye County along the Caliente rail alignment might fall as snow. Mean average snowfall in the lower valleys is about 50 to 130 millimeters (2 to 5 inches). At higher elevations, the average snowfall is between 130 and 380 millimeters (5 and 15 inches) per year.

Local topography in Nye County strongly influences winds along the Caliente rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Wind speeds are highest in the spring, and occasionally generate dust storms at playas. The extreme highest wind speeds are along ridgetops and mountain summits. The maximum wind speed recorded at Warm Springs Summit was 34 meters per second (76 miles per hour), and winds of more than 40 meters per second (90 miles per hour) have been recorded along ridgetops at the Nevada Test Site station. Annual average wind speeds are much lower – from 5.4 meters per second (12 miles per hour) at the Warm Springs Summit station to 1.7 meters per second (3.8 miles per hour) at the Stone Cabin station. Along the Caliente rail alignment through southern Nye County, calm conditions (wind speeds of less than 0.6 meter per second [1.3 miles per hour]) are most frequent at the Stone Cabin station, and characterize wind conditions in the area about 12 percent of the time. In southern Nye County, annual average wind speeds are much lower, with annual average speeds of 2.4 meters per second (5.4 miles per hour) at Sarcobatus Flat and 2.2 meters per second (4.9 miles per hour) at Beatty. Through southern Nye County, calm conditions are most frequent at Sarcobatus Flat station, and characterize wind conditions in the area about 7 percent of the time.

3.2.4.3.3 Esmeralda County

The Caliente rail alignment would cross through a small portion of Esmeralda County near the Goldfield station and would be east of the high peaks of the Sierra Nevada and White Mountain ranges, at an elevation of around 1,700 meters (5,500 feet). This area experiences abundant hours of cloud-free days, low annual precipitation (less than 250 millimeters [10 inches] per year), and large daily ranges in temperature.

Within Esmeralda County, the mean annual temperature along the Caliente rail alignment is approximately 10° Celsius (50° Fahrenheit). Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer months. Summertime mean maximum temperatures are approximately 32° Celsius (90° Fahrenheit), and are accompanied by low relative humidity (commonly less than 10 percent). Winter mean minimum temperatures are approximately minus 7° Celsius (20° Fahrenheit) in December and January.

Annual precipitation in this part of Esmeralda County averages less than 180 millimeters (7 inches) per year, and is heaviest during the winter. During the summer, occasional thunderstorms can produce heavy rains and cause flash floods. Daily precipitation levels occasionally exceed 50 millimeters (2 inches), but on average only 1 day per year has more than 25 millimeters (1 inch) of rain. Precipitation from October through April might fall as snow. Snowfall averages are around 380 millimeters (15 inches).

Local topography in Esmeralda County strongly influences winds along the Caliente rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Highest wind speeds occur in the spring, and occasionally generate dust storms. Annual average wind speeds at the Goldfield station are around 2.7 meters per second (6 miles per hour); slightly more than 5 percent of the time the area experiences calm conditions.

3.2.5 SURFACE-WATER RESOURCES

This section describes surface-water resources along the Caliente rail alignment. Surface-water resources include streams, washes, playas, ponds, wetlands, floodplains, and springs. Section 3.2.5.1 describes the region of influence for surface-water resources along the Caliente rail alignment; Section 3.2.5.2 is a general overview of surface-water features along the rail alignment; and Section 3.2.5.3 describes specific surface-water features for the rail alignment alternative segments and common segments. Sections 3.2.5.2.3 and 3.2.5.2.4 describe wetlands and floodplains, respectively, from a regulatory perspective; Section 3.2.7, Biological Resources, describes wetlands from a habitat perspective. Appendix F (Floodplain and Wetlands Assessment) addresses compliance with Executive Orders 11988, *Floodplain Management*, and 11990, *Protection of Wetlands*, in more detail. Appendix F was also prepared to support the Department's intention to seek compliance with Section 404(r) of the Clean Water Act.

3.2.5.1 Region of Influence

The Caliente rail alignment region of influence for surface-water resources is limited in most cases to the nominal width of the construction right-of-way. Because of the types of land-disturbing activities that would take place during rail line construction, the construction right-of-way would be susceptible to erosion and changes in surface-water flow patterns. Spills (of, for example, fuel, paint, or lubricants) during the railroad construction and operations phases could also affect this area.

In some cases, the region of influence for surface water extends beyond the construction right-of-way. In places where surface-water flow patterns (including floodwaters) could be modified or surface-water drainage could carry eroded soil, sediment, or spills downstream, the region of influence extends beyond the construction right-of-way. Within the region of influence, there could be impacts to floodwaters such that they would back up on the upstream side of the rail line, while there could be impacts to water quality if potential pollutants traveled downstream during a storm event without precipitating out (soils from erosion) or becoming too dilute (petroleum-based lubricants or fuels) to detect. For purposes of analysis, DOE screened the area within 1.6 kilometers (1 mile) of the centerline of the rail alignment for surface-water resources that could be indirectly affected.

Surface-Water Terms

An **ephemeral stream** or ephemeral drainage has a channel bed above the normal water table and only flows in direct response to precipitation or snowmelt within its drainage basin.

An **intermittent stream** or intermittent drainage has a channel bed that fluctuates above or below the normal water table along its length, and might or might not have flow within it during any particular time or at any particular location. The presence of flow within the channel is determined by its channel elevation in relation to the water table, precipitation events, or snowmelt within its drainage basin.

A **wash** or drainage in the western United States generally refers to the dry streambed of an intermittent or ephemeral stream. In this Rail Alignment EIS, wash is used interchangeably with intermittent and ephemeral streams.

A **perennial stream** or perennial drainage receives groundwater into its channel and its stream bed is normally below the water table. During years with normal precipitation, a perennial stream will have constant flow.

A **playa** is normally a dry lake bed that can contain water in response to seasonally high runoff.

Evapotranspiration is a combination of processes through which water is transferred to the atmosphere from evaporation from open water and bare soil, and transpiration from vegetation.

3.2.5.2 General Environmental Setting and Characteristics

Important characteristics of hydrologic systems in the region of influence include ephemeral streams and playas. Ephemeral surface-water features can be dry over multiple seasons or even years during droughts, but can have multiple periods of flow or standing water during wet periods, as during the winter of 2004-2005. Central and southern Nevada are characterized by low precipitation and high annual ***evapotranspiration*** rates typical of desert climates, as described in Section 3.2.4, Air Quality and Climate. Because of the arid climate and the terrain (that is, north-south trending, parallel mountain ranges with broad, intervening valleys) in this area, surface water generally evaporates before it can flow out of the drainage basin. Typically, surface drainage in this area remains within its topographically defined water basin; that is, surface water generally flows to low areas such as lakes, flats, or playas.

Surface-water systems are typically defined in terms of watersheds (or basins). For water planning and management purposes, the State of Nevada is divided into discrete hydrologic units delineated by 14 major hydrographic regions that are subdivided into 256 hydrographic areas (DIRS 103406-Nevada Division of Water Planning 1992, all). In this Rail Alignment EIS, watersheds (or basins) are referred to as hydrographic regions. A region is defined as a geographic area drained by a single major stream or an area consisting of a drainage system comprised of streams and often natural or manmade lakes.

Overall, most surface-water features described in this section are ***ephemeral drainage*** features that intermittently contain flowing water. Meadow Valley Wash and portions of Clover Creek at the beginning of the Caliente rail alignment are the exceptions, where surface-water flow is perennial or more consistently present. This section describes surface-water features in relation to the hydrographic regions in which they are located. Figure 3-60 shows the hydrographic regions within Nevada and the boundaries for the three hydrographic regions the Caliente rail alignment would cross. These regions include the Colorado River Basin, the Central Region, and the Death Valley Basin.

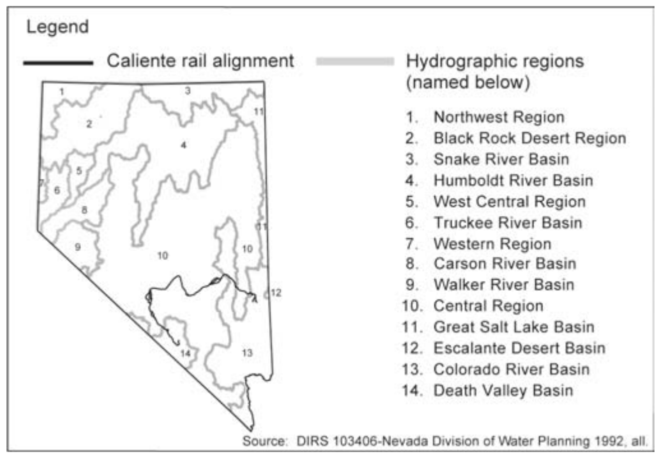


Figure 3-60. Nevada hydrographic regions the Caliente rail alignment would cross.

3.2.5.2.1 Surface Drainage Features (Streams and Playas)

As described in Section 3.2.1, Physical Setting, the Caliente rail alignment would pass through numerous valleys and over or around numerous mountain ranges. The need for relatively gentle curves and gradients sets physical limitations on the design of the rail line that would require the alignment to follow valley floors that go around mountain ranges, or parallel the mountain ranges in transition zones to change elevation gradually (DIRS 180916-Nevada Rail Partners 2007, Appendix B). Within the valley floors, the rail alignment could parallel predominant drainage channels and cross through or near flats and playas. Some streams within low areas are braided channels where stream flow is divided among multiple channels, which the rail alignment could cross in several locations. Near or within mountain ranges, the alignment typically would be perpendicular to the predominant drainage direction. Therefore, the Caliente rail alignment would encounter a wide variety of surface drainage features.

Drainage features have been classified using Strahler's stream order system (DIRS 176728-Goudie et al., ed. 1981, pp. 50 and 51), which is a method of classifying stream segments based on the number of upstream tributaries. Stream order ranks the size and potential power of streams. Orders range from small streams with no branches (1st Order) up to streams the size of the Mississippi River, which is a 10th Order stream. As two 1st Orders come together, they form a 2nd Order stream. Two 2nd Order streams converging form a 3rd Order stream. Streams of lower order joining a higher order stream do not change the order of the higher order stream.

DOE used stream order to define ***notable drainage channels*** and as a method to select the number of ***ephemeral washes*** shown on figures in Section 3.2.5.3. To improve the readability of these figures and provide a means to prioritize the drainage features, the figures depict only rivers, streams, and washes the rail alignment would cross that are 2nd Order streams or higher. Figures in Section 3.2.5.3 do not show all the washes and drainages the rail alignment would cross, but provide enough information to support the analysis of potential impacts to surface-water resources. Section 4.2.5 identifies the estimated number of drainage channels the rail alignment would cross by alternative segment and common segment.

Notable drainage channels, as referenced in the text and shown on figures in Section 3.2.5.3, were determined by choosing those channels with a stream order of 2 or greater based on Strahler's ordering system, with the National Hydrography Dataset as a base map.

3.2.5.2.1.1 Surface-Water Quality. Because of the ephemeral nature of surface water in the southern part of Nevada, water-quality data for the region of influence are limited. The State of Nevada does not formally monitor surface water in the Caliente rail alignment region of influence.

Water-quality data for the State of Nevada are available through the Nevada District of the U.S. Geological Survey and the Nevada Division of Environmental Protection. Surface-water samples are collected from several major river basins in the state and then analyzed for physical and chemical parameters. The routine water-quality monitoring network includes the following river/basin systems: Walker River, Humboldt River, Colorado River, Lake Tahoe Tributaries, Snake River, Truckee River, Carson River, and Steamboat Creek. The Colorado River Basin is the only hydrographic region in the Nevada Division of Environmental Protection's monitoring system within the region of influence for the Caliente rail alignment (DIRS 176306-NDEP 2005, all).

In accordance with federal regulations, each state is required to submit a report on overall water-quality conditions to the U.S. Environmental Protection Agency every 2 years. According to the Nevada Division of Environmental Protection report for 2005 (DIRS 176306-NDEP 2005, all), agriculture and grazing have the greatest impacts on Nevada's waters, mainly because of ***nonpoint source pollution*** (such as irrigation, grazing, and flow-regulation practices). Flow reductions have a great impact on streams, limiting dilution of salts, minerals, and pollutants. Temperature, ***pH***, dissolved oxygen, nutrients, and suspended solids are the main pollutants of concern in the state. Agricultural sources generate large sediment and nutrient loads. Surface-water quality in Nevada varies greatly from location to location and from month to month with change of flow. In general, concentrations of dissolved solids are higher in the southern part of the state than in the northern part, depending largely on water discharge (DIRS 176316-Bostic et al. 2004, all). Because of dilution by precipitation or snowmelt, dissolved solids concentrations are usually highest during periods of low stream flow and lowest during periods of high stream flow.

No site-specific water chemistry data are available for streams or washes the Caliente rail alignment would cross. No streams the alignment would cross are known to be impaired. DOE previously collected and analyzed surface-water samples for chemical characteristics in the Yucca Mountain region. These analytical data are provided in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, p. 3-40).

3.2.5.2.1.2 Stream Flow. The U.S. Geological Survey has stream-gaging stations (many of which have been discontinued) throughout Nevada. Stream-flow data from these monitoring stations are available through the Geological Survey Nevada District. Table 3-21 lists the range of peak discharges for typical or major streams along the Caliente rail alignment. DOE cross-referenced peak discharge measurements at and near the Nevada Test Site with a Geological Survey fact sheet that discusses significant flooding events in the Amargosa River drainage basin in 1995 and 1998 (DIRS 159895-Tanko and Glancy 2001, Table 2).

Most of the drainage channels the Caliente rail alignment alternative segments and common segments would cross typically flow only during significant (heavy) rainfall events, which generally occur only a few times a year. In many years, most of the streams listed in Table 3-21 have little or no flow. From late spring to early fall, precipitation patterns are dominated by convective, short-duration, high-intensity thunderstorms. From late fall to early spring, precipitation patterns are dominated by long-duration, low-intensity, general storm events with both rain and snow possible throughout the area. These two types of precipitation events result in runoff that differs between smaller watersheds (up to 520 square kilometers [200 square miles]) and larger watersheds (greater than 520 square kilometers). For smaller watersheds, the summer thunderstorm events dominate the peak runoff rates, which occur in the tributary channels and washes. However, as watershed size increases, the general storm events eventually dominate the peak rates of runoff. In addition, for all watersheds, the volume runoff is generally greater for the general (winter) storm events than for the thunderstorm (summer) events (DIRS 182755-Parsons Brinckerhoff 2005, p. 12).

In general, stream discharge in Nevada is low in late summer, and then increases through the autumn and winter until the snow melts in the spring. Maximum discharge for the year normally can be expected in May and June, although rain or snow has caused floods from November through March (DIRS 176325-USGS 2006, all). As shown in Table 3-21, the more significant peak-flow scenarios relevant to the Caliente rail alignment occur within the Meadow Valley Wash and Upper Amargosa hydrologic units. The highest peak flows for these hydrographic regions generally occur during late winter due to snowmelt and late summer due to intense precipitation.

The washes that drain the Yucca Mountain Site discharge into the Amargosa River. This ephemeral drainage typically sees very low runoff rates due to minimal precipitation in its basin and is usually dry (DIRS 159895-Tanko and Glancy 2001, p. 1). Precipitation is least along the Caliente rail alignment in this area, from Sarcobatus Flat to Beatty, averaging just 75 to 100 millimeters (3 to 3.9 inches) per year. Most of the annual precipitation typically occurs in late spring to early fall. Fortymile Wash and Topopah Wash are significant tributaries draining the Nevada Test Site area into the Amargosa River with maximum peak flows of 94 cubic meters (3,300 cubic feet) per second and 42 cubic meters (1,500 cubic feet) per second, respectively, during late winter to late summer (see Table 3-21). Section 3.2.5.2.4 describes two significant flooding events (March 1995 and February 1998) in the Amargosa River drainage basin on and near the Nevada Test Site.

3.2.5.2.2 Waters of the United States

Some of the surface-water features along the Caliente rail alignment, such as ephemeral drainages, streams, ponds, and lakes, are considered waters of the United States, especially if there is an interstate connection to commerce. Section 404 of the Clean Water Act (33 U.S.C. 1344) and implementing regulations (33 CFR Part 323) require the U.S. Army Corps of Engineers to regulate discharges of dredge or fill material into waters of the United States. Discharges of dredge or fill material essentially includes all land-disturbing activities accomplished via the use of mechanized equipment. The placement of structures, such as bridge embankments, bridge piers and abutments, and culverts, would be activities potentially discharging fill materials into waters of the United States. Chapter 6 of this Rail Alignment EIS discusses compliance with Section 404 of the Clean Water Act in more detail.

Table 3-21. U.S. Geological Survey annual peak flow measurements for selected sites in streams of hydrographic areas along the Caliente rail alignment[a] (page 1 of 3).

Hydrologic unit gaging station (station number)	Drainage area (square miles)[b]	Annual peak flow range (cubic feet per second)[c]	Typical peak flow month(s)	Years of record (number of counts)
Areas in the Nevada Test Site				
Meadow Valley Wash (Eccles alternative segment, Caliente alternative segment, Caliente common segment 1)				
Meadow Valley Wash near Caliente (09418500)	1,700	4.1 to 2,400	February and March	1951-2004 (53)
Caselton Wash near Panaca (09418150)	70.2	12 to 1,700	July through August	1963-1981 (19)
Meadow Valley Wash at Eagle Canyon near Ursine (09417500)	290	22 to 700	January and February	1963-2003 (14)
Dry Lake Valley (Caliente common segment 1)				
Dry Lake Valley tributary near Caliente (10245270)	11	0 to 160	July	1967-1981 (15)
White River (Caliente common segment 1)				
White River near Lund (09415550)	700	0 to 44	March	1991-2003 (8)
Crystal Spring near Hiko (09415590)	No data	13 to 20	June through October	1986-2001 (11)
White River tributary near Sunnyside (09415560)	20	0 to 600	August and September	1966-1982 (15)
Sand Spring-Tikaboo Valleys (Caliente common segment 1; Garden Valley alternative segments 1, 2, 3, and 8; Caliente common segment 2)				
Penoyer Valley tributary near Tempiute (10247860)	1.5	0 to 130	July through September	1964-1981 (18)
Hot Creek-Railroad Valleys (Caliente common segment 2; South Reveille alternative segments 2 and 3; Caliente common segment 3)				
Big Creek near Warm Springs (10247200)	12	5.3 to 22	May	1991-1994 (4)
Hot Creek tributary near Warm Springs (10247010)	2.1	0 to 100	August	1964-1981 (17)
Ralston-Stone Cabin Valleys (Caliente common segment 3; Goldfield alternative segments 1, 3, and 4)				
Ralston Valley tributary near Tonopah (10249140)	0.2	0 to 48	July and August	1961-1981 (21)
Cactus-Sarcobatus Flats (Goldfield alternative segments 1, 3, and 4; Caliente common segment 4; common segment 5)				
Stonewall Flat tributary near Goldfield (10248970)	0.53	0 to 150	June through August	1964-1985 (20)
Upper Amargosa (Oasis Valley alternative segments 1 and 3; common segment 6)				
Pah Canyon Wash above Fortymile Wash confluence (102512495)	6.3	90	February	1998 (1)

Table 3-21. U.S. Geological Survey annual peak flow measurements for selected sites in streams of subbasins along the Caliente rail alignment[a] (page 2 of 3).

Hydrologic unit gaging station (station number)	Drainage area (square miles)[b]	Annual peak flow range (cubic feet per second)[c]	Typical peak flow month(s)	Years of record (number of counts)
Areas in the Nevada Test Site				
Upper Amargosa (Oasis Valley alternative segments 1 and 3; common segment 6) (continued)				
Unnamed tributary to Fortymile Wash north of Delirium Canyon (102512496)	1.1	180	February	1998 (1)
Delirium Canyon Wash above Fortymile Wash confluence (102512497)	2.4	120	February	1998 (1)
Unnamed tributary to Fortymile Wash south of Delirium Canyon (102512499)	0.81	70	February	1998 (1)
Fortymile Wash at narrows (10251250)	260	0 to 3,000	March	1982-1998 (8)
Yucca Wash near mouth (10251252)	17	0 to 940	February and March	1982-1998 (10)
Pagany Wash near the Prow (102512531)	0.47	20 to 60	February and March	1995-1998 (2)
Pagany Wash #1 near Well UZ (102512533)	0.82	0 to 17	February and March	1993-1998 (2)
Drillhole Wash above UZ (102512535)	0.68	0 to 30	March	1994-1998 (3)
Wren Wash at Yucca Mountain (1025125356)	0.23	0 to 30	March	1994-1998 (3)
Split Wash below Quac Canyon Wash (102512537)	0.33	0 to 13	February	1994-1998 (3)
Split Wash at Antler Ridge (1025125372)	2.4	0 to 2	February	1994-1998 (3)
Drillhole Wash at mouth (10251254)	16	0 to 790	July	1982-1998 (10)
Fortymile Wash near Well J (1310251255)	304	0 to 3,000	March through July	1984-1998 (7)
Dune Wash near Busted Butte (10251256)	6.8	0 to 14	August	1982-1995 (9)
Topopah Wash at Little Skull Mountain (10251260)	104	0 to 1,500	August	1984-1998 (8)
Beatty Wash near Beatty (10251215)	95	0 to 900	July through March	1989-1998 (5)
Amargosa River at Beatty (10251217)	460	1.1 to 1,000	March through August	1994-2004 (10)

Table 3-21. U.S. Geological Survey annual peak flow measurements for selected sites in streams of subbasins along the Caliente rail alignment[a] (page 3 of 3).

Hydrologic unit gaging station (station number)	Drainage area (square miles)[b]	Annual peak flow range (cubic feet per second)[c]	Typical peak flow month(s)	Years of record (number of counts)
Areas near the Nevada Test Site				
Upper Amargosa (Oasis Valley alternative segments 1 and 3; common segment 6) (continued)				
Fortymile Wash near Amargosa Valley (10251258)	320	0 to 3,300	February through July	1969-2004 (23)
Topopah Wash at Highway 95 near Amargosa Valley (10251261)	150	20	February	1998 (1)

a. Sources: DIRS 176325-USGS 2006, p. 29; DIRS 159895-Tanko and Glancy 2001, Table 2.
b. To convert square miles to square kilometers, multiply by 2.59.
c. To convert cubic feet per second to cubic meters per second, multiply by 0.028317.

DOE surveyed all drainages within 400 meters (0.25 mile) of the Caliente rail alignment that are within interstate hydrologic basins to determine if those drainages could be classified as waters of the United States (DIRS 183595-PBS&J 2006, p. 1). This survey also identified and delineated wetlands along the Caliente rail alignment. The alignment-specific discussions in Section 3.2.5.3 detail the results of the survey. Subsequent to DOE surveys performed along the rail alignment, the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers released new guidance to be used when making determinations of waters of the United States subject to jurisdiction under the Clean Water Act. This guidance provides criteria for making these determinations for adjacent wetlands and non-navigable tributaries of waters of the United States, particularly in relation to ephemeral waters. As a result of this guidance, it is likely that many of the drainages along the rail alignment would not be considered waters of the United States (see Section 4.2.5.2.1 for further discussion).

The term **waters of the United States** is defined in 33 CFR 328.3a. The U.S. Army Corps of Engineers and U.S. Environmental Protection Agency regulate the placement of dredged or fill material into these waters. The definition incorporates channels with ephemeral and intermittent flow that exhibit specific physical features, including channel shape and surrounding vegetation, that would provide indications of an ***ordinary high water mark***.

Ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (33 CFR 328.3e).

The U.S. Army Corps of Engineers is responsible for determining whether drainages and wetlands along the rail alignment are regulated under Section 404; therefore, all conclusions in this analysis about the classification of washes and wetlands as waters of the United States are tentative. A delineation of wetlands along the proposed Caliente rail alignment was submitted to the U.S. Army Corps of Engineers in October 2007 with a request that a jurisdictional determination be made to identify which wetlands are regulated under Section 404 of the Clean Water Act. Table 4-56 provides the estimated total amount of wetlands (jurisdictional and nonjurisdictional) requiring fill along the Caliente rail alignment.

3.2.5.2.3 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor that determines how soil develops and the types of plant and animal communities living in the soil and on its surface (DIRS

178724-Cowardin et al. 1979, p. 3). Wetlands can support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetland (***hydric***) ***soils***.

According to the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers, the regulatory definition of a Section 404 jurisdictional wetland is (33 CFR 328.3b) "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The U.S. Department of Agriculture Natural Resources Conservation Service and U.S. Fish and Wildlife Service define wetlands somewhat differently, but all four agencies include three basic elements for identifying wetlands: ***hydrology***, soils, and vegetation. Wetland communities are recognized as providing many valuable functions that improve the human environment. Wetlands that have surface-water connections to or are adjacent to (bordering, contiguous, neighboring) other waters of the United States are regulated under Section 404 of the Clean Water Act. Wetlands that are isolated – that is, they have no permanent or temporary surface-water connections to interstate water bodies or are not considered adjacent – are not typically regulated under Section 404 unless the use of these isolated wetlands could affect interstate commerce.

Surveys in support of this Rail Alignment EIS have identified wetlands along the Caliente rail alignment (DIRS 183595-PBS&J 2006, all). Tables in Section 3.2.5.3 list wetlands identified during these surveys. Appendix F discusses wetlands along the Caliente rail alignment in more detail, and Section 3.2.7, Biological Resources, discusses wetlands from a habitat perspective.

3.2.5.2.4 Floodplains

The presence of floodplains in the Caliente rail alignment region of influence largely depends on the meteorology and hydrology of the area. Much of the rail alignment would be in areas that are subject to intense rainfall over a short duration (1 to 3 hours), which typically occurs in late spring to early fall. Precipitation in late fall to early spring is dominated by low-intensity rainfall or snow over a long duration (2 to 4 days). In both cases, precipitation has the potential to produce flooding (DIRS 182755-Parsons Brinckerhoff 2005, pp. 12 to 14). Evapotranspiration rates throughout the region of influence are high; therefore, most of the rainfall from summer storms is lost relatively quickly unless a storm is intense enough to produce runoff, or unless there are more storms before the water evaporates (DIRS 182755-Parsons Brinckerhoff 2005, p. 18). Evapotranspiration rates are lower during the winter, and water from precipitation or melting snow has a better chance of resulting in streamflow, thereby increasing the chances of flooding. Much of the runoff quickly infiltrates into rock fractures or into the dry soils, some is carried down alluvial fans in arroyos, and some drains onto dry lakebeds where it might stand for weeks as a lake (DIRS 182755-Parsons Brinckerhoff 2005, p. 18).

Although flow in most washes is rare, the area is subject to flash flooding from intense summer thunderstorms and sustained winter precipitation. When it occurs, intense flooding can include mud and debris flows in addition to water runoff. Thunderstorms in the area can be local and intense, creating runoff in one wash while an adjacent wash receives little or no rain. In rare cases, however, storm and runoff conditions can be extensive enough to result in flow being present throughout the drainage systems. For example, conditions recorded during March 1995 and February 1998 at the Amargosa River and its tributaries indicated that the channels all flowed simultaneously along its primary stream channels to Death Valley. The 1995 event was the first documented case of this flow condition. During the 1995 event, the peak flow near the location where the existing Yucca Mountain access road crosses Fortymile Wash was approximately 100 cubic meters (3,500 cubic feet) per second (DIRS 182755-Parsons Brinckerhoff 2005, p. 18).

A majority of the large flood-causing events in and around the Caliente rail alignment on smaller watersheds are the result of short-duration, high-intensity summer thunderstorm events. These storms have caused significant flood damage to various watersheds both in and surrounding the rail line watersheds. For example, a flood event on August 1, 1968, on an Amargosa River tributary near Mercury recorded peak flood flow of 97 cubic meters (3,400 cubic feet) per second (DIRS 182755-Parsons Brinckerhoff 2005, p. 12). Historic floods in large watersheds have been caused by both short-duration, high-intensity summer thunderstorms and by long-duration, continuous winter general storms, including rain and snow events. For example, a flood event on February 24,1969, on the Armargosa River near Beatty recorded peak flood flow of 453 cubic meters (16,000 cubic feet) per second (DIRS 182755-Parsons Brinckerhoff 2005, p. 13)

In accordance with the requirements of 10 CFR Part 1022, DOE reviewed available authoritative information to determine whether the Caliente rail alignment would be located in wetlands or floodplains. The results of that effort (DIRS 182755-Parsons Brinckerhoff 2005, p. 10) indicated that the only flood map or flood studies available for the areas of the Caliente rail alignment were those completed by the Federal Emergency Management Agency in the form of Flood Insurance Rate Maps. Furthermore, and consistent with the remoteness of the project area, DOE found that Federal Emergency Management Agency maps cover only about 45 percent of the rail alignment (see Appendix F, Table F-1). DOE completed flood studies for several washes on the eastern slope of Yucca Mountain at the repository site in support of the Yucca Mountain FEIS (DIRS 155970-DOE 2002, Figure 3-12 and pp. 3-37 to 3-39).

In accordance with 10 CFR Part 1022, DOE prepared a floodplain and wetland assessment (see Appendix F) for the Caliente rail alignment. Appendix F provides a detailed discussion of the floodplains the Caliente rail alignment would cross, including figures of the relevant floodplains identified on Federal Emergency Management Agency maps and those identified near the repository site.

3.2.5.2.5 Springs

Springs are the only natural source of perennial surface water throughout the Caliente rail alignment region of influence. Typically, these springs flow year round. The springs often infiltrate naturally into the ground or undergo evapotranspiration, or are captured near the source for local use (such as irrigation). DOE used the U.S. Geological Survey Geographic Names Information System, the National Hydrologic Dataset, and several DOE field studies completed in support of this Rail Alignment EIS to identify springs along the Caliente rail alignment (DIRS 183595-PBS&J 2007, all; DIRS 182755-Parsons Brinckerhoff 2005, all). The best available data were used to identify springs along the proposed Caliente rail alignment. Any additional springs identified would be addressed during the final design phase of the railroad.

3.2.5.3 Surface-Water Features along Alternative Segments and Common Segments

DOE compiled this information using the National Wetland Inventory database, a U.S. Geological Survey dataset of hydrologic features known as the National Hydrological Dataset (DIRS 177714-MO0607NHDFLM06.000), a dataset from the U.S. Geological Survey Geographic Names Information System (DIRS 176979-MO0605GISGNISN.000), and DOE wetland surveys conducted in support of this Rail Alignment EIS (DIRS 183595-PBS&J 2006, all). Specific hydrologic features are divided into two categories: those within 150 meters (500 feet) of the rail alignment centerline and those between 150 meters and 1.6 kilometers (1 mile) from the rail alignment centerline. Both of these categories fall within the region of influence for surface-water resources. The first category is also within the nominal width of the rail line construction right-of-way.

Sections 3.2.5.3.1 through 3.2.5.3.12 describe surface-water resources for each Caliente rail alignment alternative segment and common segment moving along the rail line from east to west (from Caliente, Nevada, to Yucca Mountain). Tables in these sections provide summaries of surface-water features identified in the Caliente rail alignment region of influence. Figures in these sections show the proposed rail line location as it crosses Nevada's physiographic features. A key for these map areas is provided in Chapter 2, Figure 2-4.

3.2.5.3.1 Interface with the Union Pacific Railroad Mainline

DOE is considering two alternative segments to connect the rail line to the existing Union Pacific Railroad Mainline: the Caliente alternative segment and the Eccles alternative segment (Figure 3-61). DOE would construct an Interchange Yard at the beginning of either of these two alternative segments. There are two options for siting the Staging Yard along the Caliente alternative segment (Caliente-Upland and Caliente-Indian Cove) and one potential site for the Staging Yard along the Eccles alternative segment (Eccles-North). Potential quarry CA-8B would be to the west of the Caliente alternative segment approximately 4.8 kilometers (3 miles) north of Caliente (see Figure 3-61).

3.2.5.3.1.1 Caliente Alternative Segment. The Caliente alternative segment would originate in the City of Caliente, near the junction of Clover Creek and Meadow Valley Wash. For nearly its entire length, the Caliente alternative segment would be constructed along an abandoned rail ***roadbed***.

From Caliente, the alternative segment would run north across Meadow Valley for approximately 16 kilometers (9.9 miles) running parallel to and crossing Meadow Valley Wash (Table 3-22 and Figure 3-61).

Table 3-22. Hydrologic features potentially relevant to the Caliente alternative segment.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from the Delmar Mountain Range, the Clover Mountains, the Chief Range, and the Cedar Range down to Meadow Valley through Meadow Valley Wash, Clover Creek, and Miller Spring Wash.	The alignment would run along the Meadow Valley Wash for nearly 9.9 miles and cross Meadow Valley Wash three times. The alignment would cross 12 tributaries leading into Meadow Valley Wash, including Bennett Springs Wash, Cobalt Canyon Wash, Miller Spring Wash, Clover Creek, Antelope Canyon Wash, and White Wash. The alignment would run adjacent to or across wetland areas for approximately 5.7 miles of DOE-delineated wetlands within Meadow Valley Wash. Indian Cove option for the Staging Yard would be in a wetland. Caliente Hot Springs 0.01 mile east. Unnamed spring 0.06 mile northwest.	The alignment would be within 1 mile of Casselton Wash, Little Red Wash, and 18 unnamed tributaries. Ponds/reservoirs along valley floor. Unnamed spring 0.44 mile southeast. Unnamed spring 0.52 mile southeast. Unnamed spring 0.47 mile southwest.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 63.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

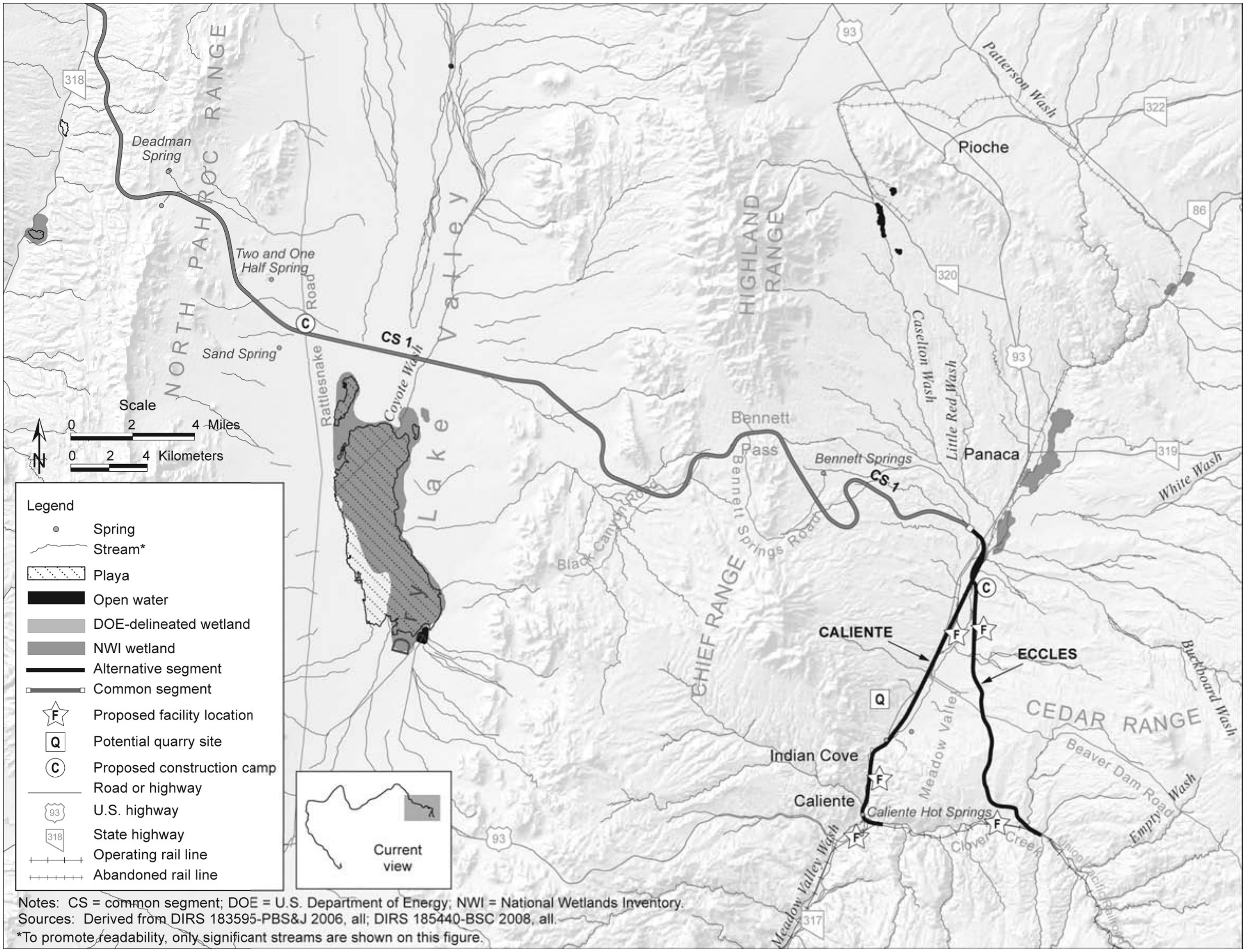


Figure 3.-61. Surface drainage within map area 1.

Both Meadow Valley Wash and Clover Creek are part of the interstate tributary system of the Colorado River, a navigable waterway. The Caliente alternative segment would cross several stream channels and washes. DOE field surveys identified five of these drainage channels that classify as waters of the United States under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, Figure 3A and Table 3), including Clover Creek, Meadow Valley Wash, Bennett Springs Wash, and Antelope Canyon Wash. ***Construction camp*** 1 would be in Meadow Valley approximately 2.5 kilometers (1.6 miles) south of the beginning of Caliente common segment 1 (DIRS 180922-Nevada Rail Partners 2007, Figure 4-A).

DOE identified two possible locations where ballast from quarry CA-8B would be loaded onto ballast trains along the Caliente alternative segment (DIRS 180922-Nevada Rail Partners 2007, p. 3-6), which are dependent upon the location of the Staging Yard. If DOE were to select the Indian Cove Staging Yard, ballast would be loaded at that yard (see Figure 3-62). If DOE were to select the Upland Staging Yard, it would construct a quarry siding immediately south of Beaver Dam Road and to the east of the mainline track (see Figure 3-62). Potential quarry CA-8B would be approximately 2 kilometers (1.2 miles) west of the Caliente alternative segment. The siding that would be constructed to support the Indian Cove Staging Yard would cross three unnamed washes identified as waters of the United States. The Upland option for the Staging Yard would cross one unnamed wash identified as a water of the United States within the Staging Yard area.

According to the U.S. Geological Survey, Meadow Valley Wash near Caliente (at gaging station 09418500) has a drainage area of 4,300 square kilometers (1,700 square miles) (see Table 3-21). The Geological Survey collected 53 years of streamflow data (1951 through 2004); the annual peak flow range for streamflow was 0.12 cubic meter (4.1 cubic feet) per second to 68 cubic meters (2,400 cubic feet) per second (see Table 3-21). The maximum discharge of 68 cubic meters per second was recorded on March 5, 1978. There are several irrigation diversions upstream of the gaging station. There are no gaging stations within the region of influence for the Caliente alternative segment (DIRS 176325-USGS 2006, all). No water-quality data are available for drainage channels along the Caliente alternative segment.

There is a relatively large extent of wetlands in the southern portion of the Caliente alternative segment. This segment would be constructed on or adjacent to an existing rail roadbed that runs adjacent to or across DOE-delineated wetland areas for approximately 9.2 kilometers (5.7 miles) along Meadow Valley Wash (see Figures 3-62 and 3-63). DOE delineated all wetlands within 30 meters (100 feet) of the alignment along this portion of the Caliente alternative segment (DIRS 183595-PBS&J 2006, p. 1). The Department did not examine a larger area because it would limit rail line construction activities in this area as much as possible and maintain disturbances within wetlands to an area within 30 meters of the rail alignment centerline. In those areas where the rail line would cross wetlands, the rail line would be constructed along an existing rail roadbed on upland fill raised above the wetlands in width from about 7 to 16 meters (23 to 52 feet) (DIRS 183595-PBS&J 2006, Figure 4A). The Indian Cove option for the Staging Yard would be in a wetland (DIRS 183595-PBS&J 2006, Figure 4A). Based on field observations, the wetlands extend beyond the rail alignment DOE surveyed. The entire meadow is assumed to be a wetland area. There are no wetlands at the location of the Upland option for the Staging Yard. The Interchange Yard would not be in wetlands, but there are wetlands at the south end of the ballast quarry siding associated with this Staging Yard option. Appendix F of this Rail Alignment EIS provides additional information about wetlands.

The Federal Emergency Management Agency has mapped floodplains only for the very southern portion of the Caliente alternative segment. This mapping shows that the alternative segment would cross 100-year floodplains at its starting point in Clover Creek and within Meadow Valley Wash north of the City of Caliente (see Figure 3-64). Based on the topography of these areas, it is reasonable to assume that the portions of Meadow Valley Wash farther upstream to the north would have similar flood levels to the mapped areas. The southern end of the Indian Cove option for the Staging Yard would lie in the mapped

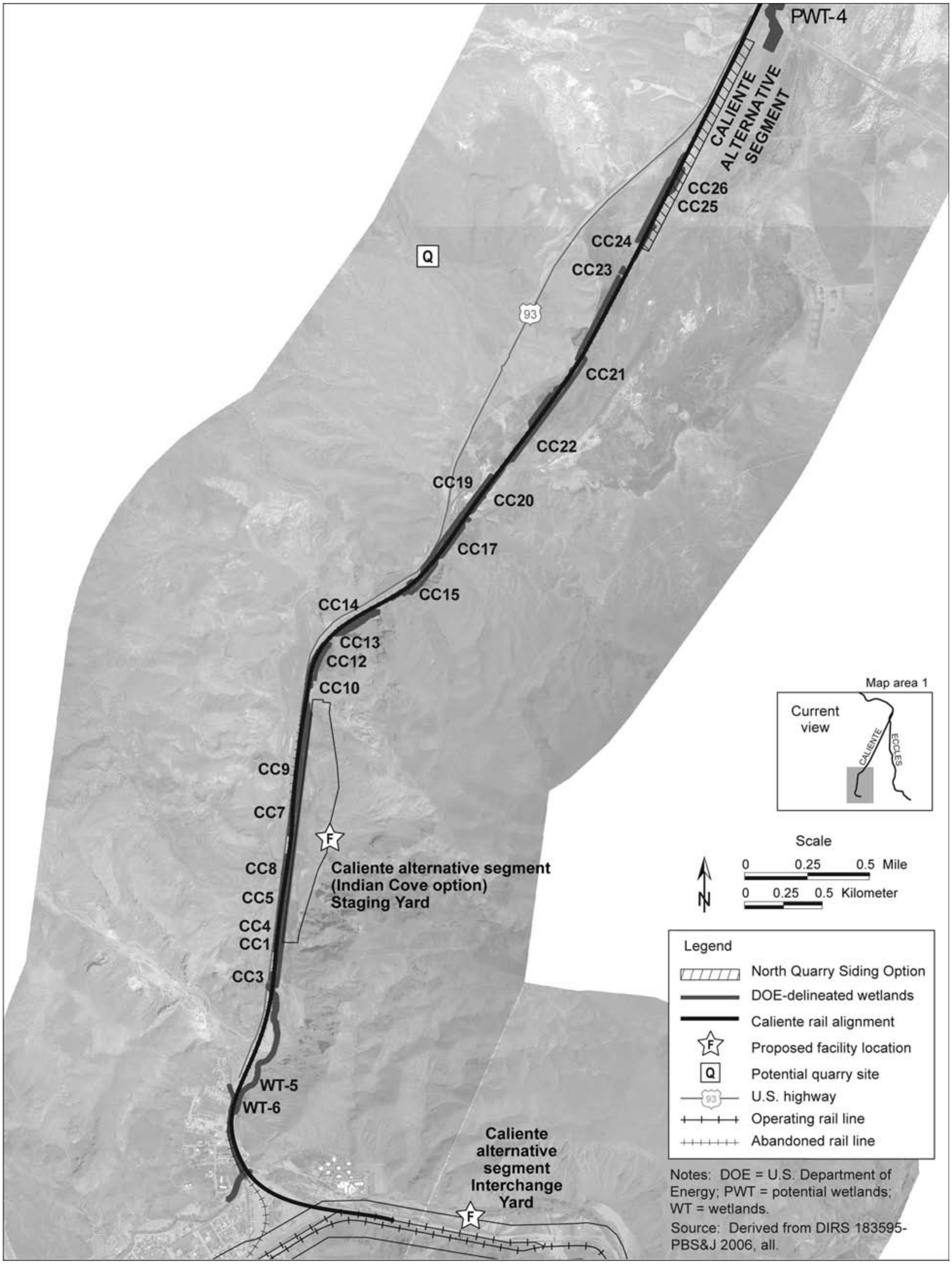


Figure 3-62. Wetlands along the southern portion of the Caliente alternative segment.

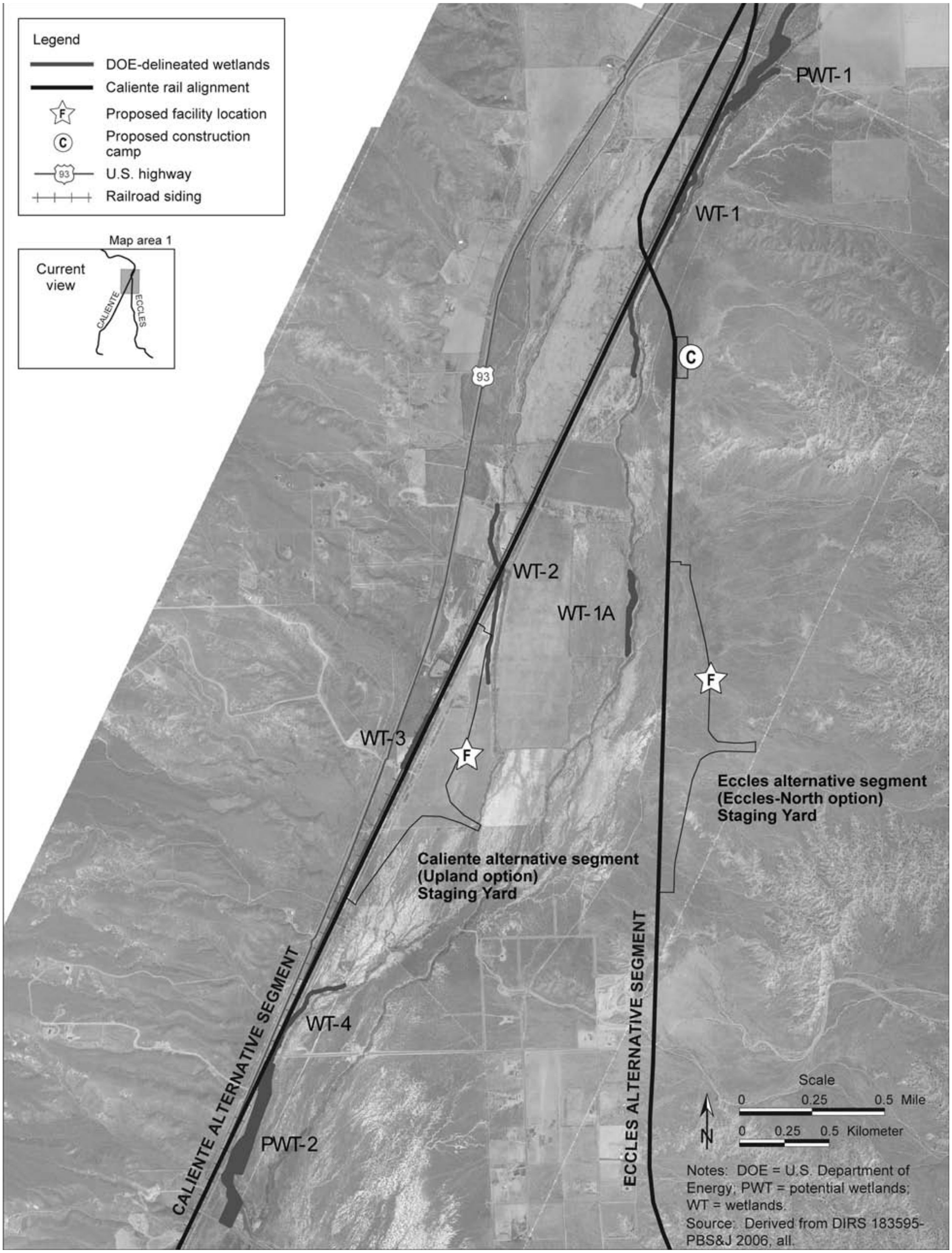


Figure 3-63. Wetlands along the northern portion of the Caliente alternative segment.

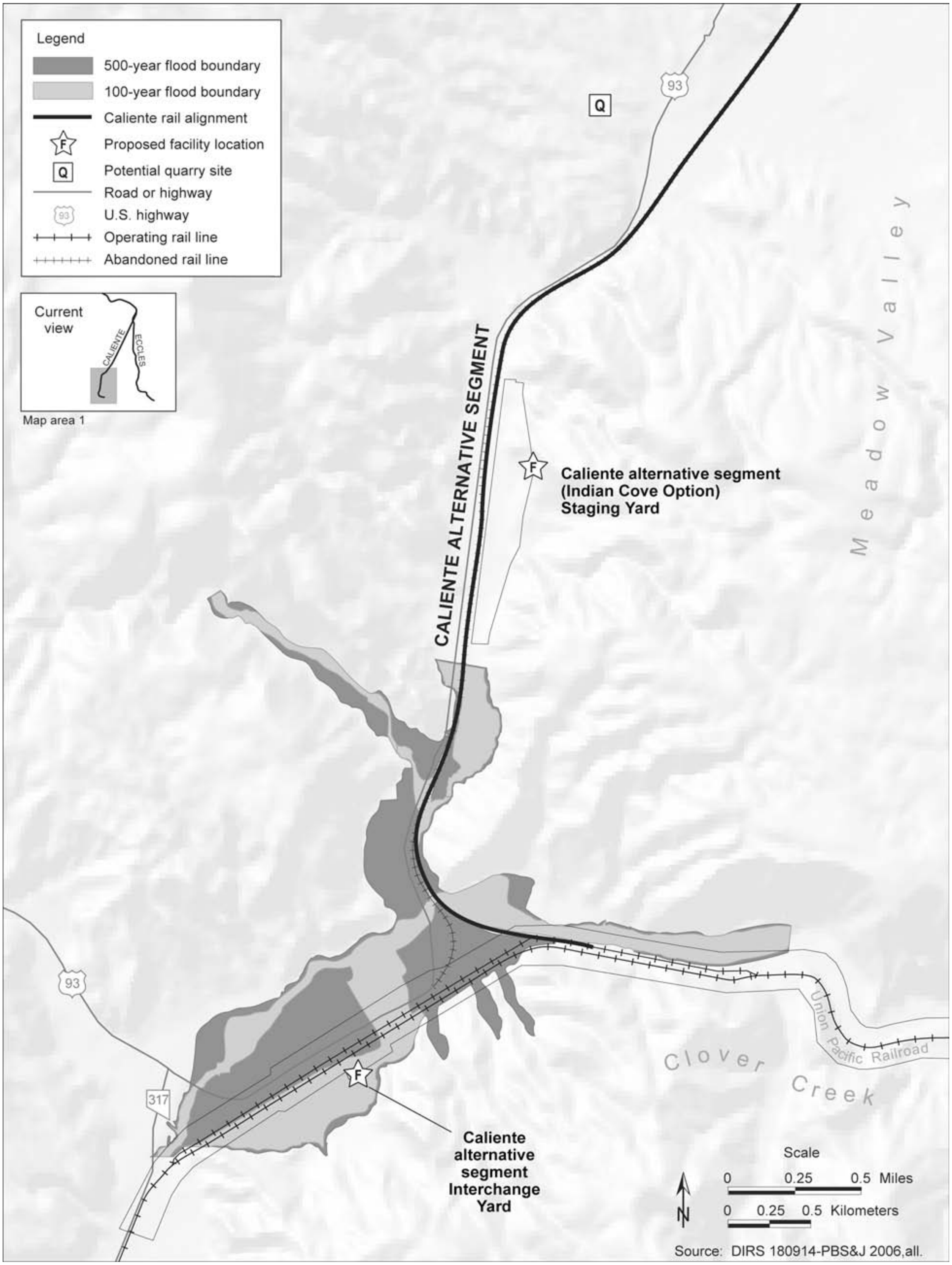


Figure 3-64. FEMA floodplain map for the Caliente alternative segment.

100-year floodplain. Appendix F further describes the floodplains associated with the Caliente alternative segment.

There are two springs within the Caliente alternative segment construction right-of-way: Caliente Hot Springs is 0.02 kilometer (0.01 mile) east and there is an unnamed spring 0.1 kilometer (0.06 mile) northwest of the alternative segment. There are three other unnamed springs at distances of 0.71 kilometer (0.44 mile) southeast, 0.83 kilometer (0.52 mile) southeast, and 0.75 kilometer (0.47 mile) southwest of the alternative segment. See Table 3-22 for a list of springs.

3.2.5.3.1.2 Eccles Alternative Segment. The Eccles alternative segment would start at the Eccles Siding of the Union Pacific Railroad at Dutch Flat, which is within the Clover Creek drainage, approximately 8 kilometers (5 miles) east of the City of Caliente. Dutch Flat is basically a wide area in an otherwise relatively narrow, east-west oriented canyon where Clover Creek, an ephemeral stream at that location, parallels an existing rail line. The Eccles alternative segment would cross the bed of Clover Creek to connect to the Union Pacific Railroad Mainline in this location. Proceeding north from the Eccles/Dutch Flat area, the Eccles alternative segment would cross Meadow Valley Wash upstream of Caliente and downstream of Panaca, just before joining with Caliente common segment 1 (Table 3-23 and Figure 3-61). The Interchange Yard location proposed for the Eccles alternative segment would be adjacent to and extend into Clover Creek (see Appendix F for additional information). There are no potential quarry sites along this alternative segment (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Table 3-23. Hydrologic features potentially relevant to the Eccles alternative segment.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from the Delmar Mountain Range, the Clover Mountains, the Chief Range, and the Cedar Range down to Meadow Valley through Meadow Valley Wash, Clover Creek, and Miller Spring Wash.	The segment would cross Meadow Valley Wash, Clover Creek, and unnamed tributaries leading into Meadow Valley Wash and Clover Creek. Notable crossings would include Bennett Springs Wash, Miller Spring Wash, Empty Wash, and White Wash. Alignment would cross a total of 15 washes. The segment would cross DOE-delineated wetlands along Meadow Valley Wash just south of the end of the segment. The Interchange Yard would extend into Clover Creek.	The segment would lie within 1 mile of Casselton Wash, Little Red Wash, and many unnamed tributaries. DOE-delineated wetlands within 0.75 mile of the origin of the Eccles alternative segment. DOE-delineated wetlands within 0.25 mile.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 63.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

Clover Creek is part of the interstate tributary system of the Colorado River, a navigable waterway. All of the washes along this segment are characterized by ephemeral flow. There are no gaging stations within the region of influence for the Eccles alternative segment (DIRS 176325-USGS 2006, all). There are no water-quality data available for drainage channels along this alternative segment.

Of the washes or drainage channels the Eccles alternative segment would cross, DOE field surveys identified 11 stream segments that are designated as waters of the United States under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, Figures 3A and 3B, and Table 3), including Clover Creek, Meadow Valley Wash, Miller Spring Wash, Empty Wash, White Wash, and Bennett Springs Wash. The proposed Interchange Yard for the Eccles alternative segment would cross Clover Creek, which is classified as a water of the United States (DIRS 183595-PBS&J 2006, Figure 3A). The Eccles-North Staging Yard would cross one wash identified as a water of the United States. There are no water-quality data available for drainage channels along this alternative segment.

DOE delineated five wetland areas within 1.2 kilometers (0.75 mile) of the origin of the Eccles alternative segment, one of which is associated with a spring. Although these wetlands would be outside the rail line construction right-of-way, two of them would be within the construction footprint for the Interchange Yard (see Figure 3-65). DOE delineated another wetland area within 0.4 kilometer (0.25 mile) of this alternative segment approximately 1.8 kilometers (1.1 miles) south of where the Eccles alternative segment crosses the Caliente alternative segment as shown on Figure 3-62. The alternative segment would also cross wetlands associated with the Meadow Valley Wash just to the south of the end of the segment. Appendix F provides additional information about these wetlands.

The Federal Emergency Management Agency has no published flood maps for the area of the Eccles alternative segment. Existing flood maps of Clover Creek near Caliente indicate the floodplain associated with Clover Creek terminates before it reaches the Eccles alternative segment. However, flooding that occurred in 2005 in and around Clover Creek, Meadow Valley Wash, and Muddy River washed out and undermined portions of an existing rail line in this area. Rail line construction would require encroachment into Clover Creek. The Interchange Yard along the Eccles alternative segment would cross Clover Creek and be in the floodplain. Appendix F provides more information on floodplains.

3.2.5.3.2 Caliente Common Segment 1 (Dry Lake Valley Area)

From Meadow Valley, Caliente common segment 1 would pass through Bennett Pass, Black Canyon, and Dry Lake Valley (Table 3-24 and Figures 3-61 and 3-66). The common segment would then cross State Highway 318 and the White River Valley before passing around the northern end of the Seaman Range and terminating in Coal Valley. Construction camp 2 would be adjacent to Caliente common segment 1 approximately 37 kilometers (23 miles) northwest of the beginning of the common segment.

Construction camp 3 would be directly adjacent to the common segment approximately 15 kilometers (9.3 miles) northeast of the junction of common segment 1 with the Garden Valley alternative segments. There are no potential quarry sites along this common segment (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Common segment 1 would run 1.4 kilometers (0.87 mile) to the north of an unnamed playa in Dry Lake Valley that is 47 square kilometers (18 square miles) in size. During periods of heavy rainfall, runoff from the Highland, Chief, North Pahroc, and Seaman Ranges can produce ephemeral lakes in this playa. There are no flow data available indicating the seasonal duration of the ephemeral lakes. There is ephemeral flow from streams draining upland areas such as Coyote Wash. Flow data for a Dry Lake Valley tributary indicate an annual peak flow range of 0 to 4.4 cubic meters (160 cubic feet) per second (see Table 3-21).

Caliente common segment 1 would continue northwest from Dry Lake Valley, where it would cross State Highway 318 and the White River. The White River Valley hydrographic area has a drainage area of 1,800 square kilometers (700 square miles) (see Table 3-21). The closest U.S. Geological Survey gaging station to common segment 1 is on the White River near Lund, Nevada, approximately 51 kilometers (32 miles) north (upstream) of common segment 1. At the station near Lund, the river's drainage basin is 1,800 square kilometers; annual mean streamflow was 0.79 cubic meter (28 cubic feet) per second recorded in 1993, and 1.3 cubic meters (44 cubic feet) per second in 2001 (DIRS 176325-USGS 2006).

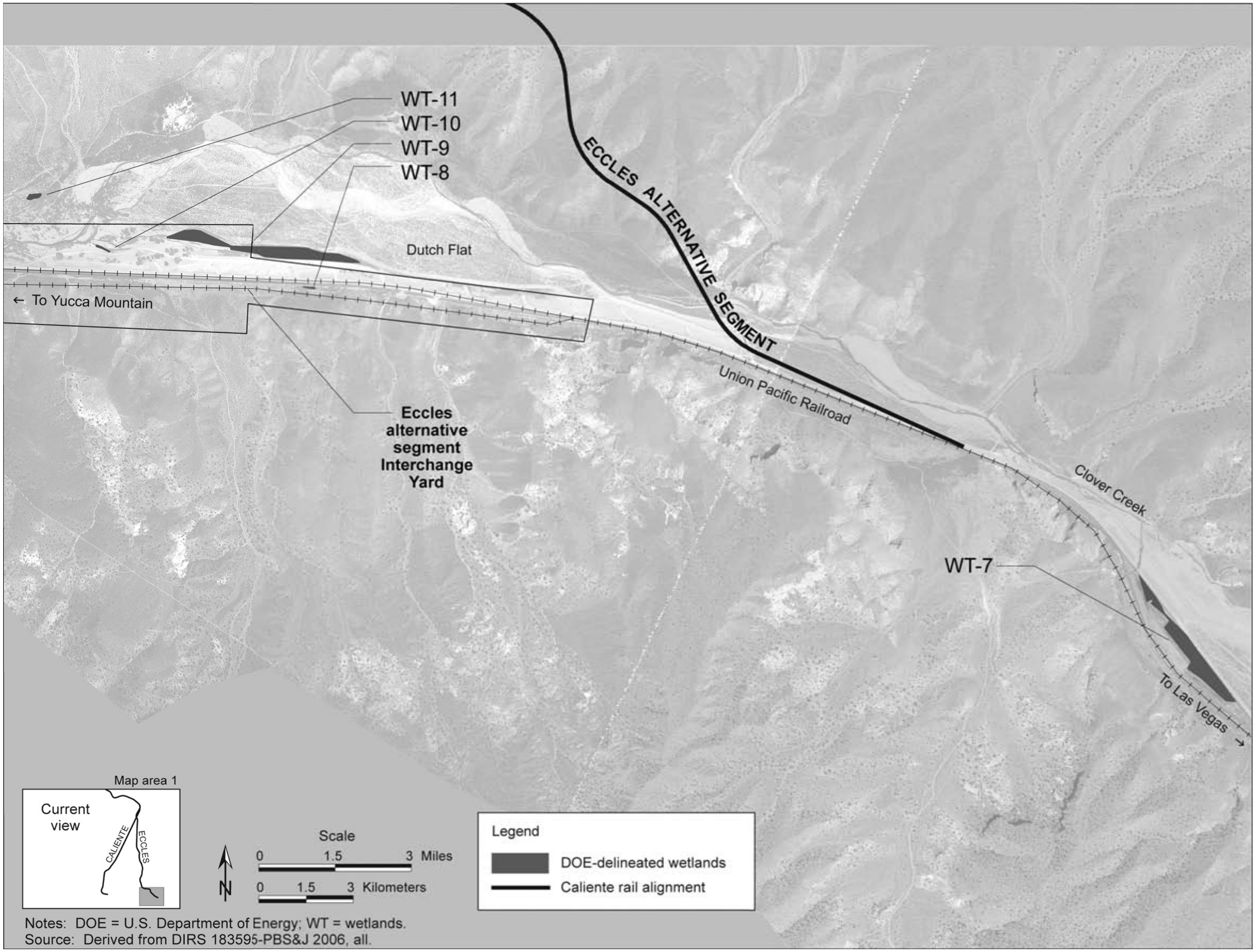


Figure 3-65. Wetlands in vicinity of the Eccles Interchange Yard.

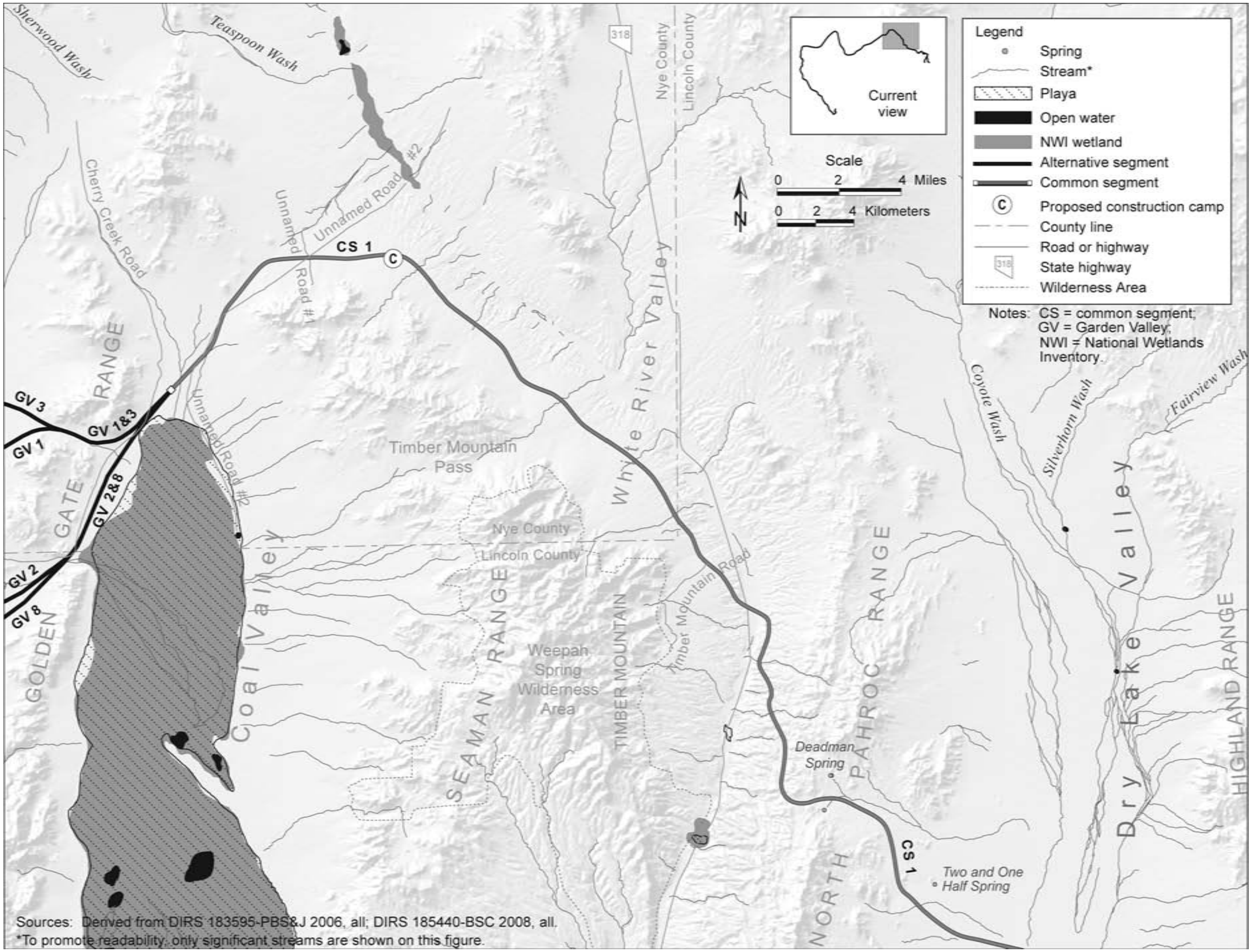


Figure 3-66. Surface drainage within map area 2.

From White River Valley, common segment 1 would pass around the northern end of the Seaman Range and then down into Coal Valley. Coal Valley contains a large playa approximately 30 kilometers (19 miles) long and 8 kilometers (5 miles) wide, with its northern tip reaching the termination of common segment 1. The National Wetlands Inventory dataset identifies Coal Valley Playa as a wetland; however, DOE field studies in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the alignment (DIRS 180696-Potomac-Hudson Engineering 2007, p. 3).

Caliente common segment 1 would cross 17 stream channels or washes designated as waters of the United States tributaries of the Colorado River (a navigable river) along its route, as classified by DOE field studies completed in support of this Rail Alignment EIS (DIRS 183595-PBS&J 2006, Figure 3C). DOE also surveyed the White River and its associated drainages and determined that even though the White River drained into the Colorado River in the past, there is no surface-water connection between the two drainage systems. Drainages associated with the White River have been altered over time by changes in topography and geological conditions.

DOE determined that the bottom of the White River Valley is flat and has no discernable channel bed and bank (indicators used to identify waters of the United States) in the area where the rail alignment would cross. At that location, and at other locations to the south, sediment deposited from channels flowing into the valley have blocked downstream flow. Additional field observations within the White River Valley south of the rail alignment (historically downstream) confirmed the lack of a discernable channel bed and bank. Because there are no physical indicators of a stream channel in this portion of the White River Valley, it has been determined that the White River and associated tributaries do not have connectivity to the Colorado River system. Because they have no connectivity to the Colorado River system and do not appear to have a connection with interstate or foreign commerce, they are not considered waters of the United States in this analysis (DIRS 183595-PBS&J 2006, p. 7).

No water-quality data are available for drainage channels along Caliente common segment 1.

In the North Pahroc Range pass (between White River Valley to the west and Dry Lake Valley to the east), Caliente common segment 1 would pass within 600 meters (2,000 feet) of a small group of three isolated wetlands. DOE delineated these isolated, nonjurisdictional (not regulated under Section 404 of the Clean Water Act), wetlands during the field survey in support of this Rail Alignment EIS (DIRS 183595-PBS&J 2006, Figure 4S). Appendix F provides additional information on these wetlands.

The Federal Emergency Management Agency has published one flood map for part of the area that Caliente common segment 1 would cross. This map covers a portion of land in White River Valley and the adjacent north end of the Seaman Range. According to this flood map, common segment 1 would not cross any floodplains, but the map does show a floodplain approximately 2 kilometers (1.2 miles) northeast of the rail alignment along the White River. It is reasonable to assume that the White River channel is a floodplain. It is also reasonable to assume that the playas of the Dry Lake Valley have associated floodplains. Appendix F provides additional information on floodplains.

There is a series of springs that would be outside the construction right-of-way but within 1.6 kilometers (1 mile), near the summit of the North Pahroc Range pass. Table 3-24 lists these springs. Bennett Springs is on private land in the general area of the eastward approach to Bennett Pass.

Table 3-24. Hydrologic features potentially relevant to Caliente common segment 1.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from the Highland Range and the Chief Range. On the east side of these mountain ranges, flow travels down to Meadow Valley Wash. On the west side, the flow travels down through Bennett Pass and Dog Hollow to Coyote Wash and farther to Dry Lake Valley and Cliff Reservoir. Drainage from the east side of the North Pahroc Range to Dry Lake Valley Playa and Cliff Reservoir. Drainage from the Seaman Range and the North Pahroc Range to White River. Drainage from the western side of the Seaman Range to Coal Valley and on to Coal Valley Reservoir.	Segment would cross headwater tributaries of Bennett Springs Wash, Coyote Wash, and 20 unnamed tributaries. Alignment would cross seven of the unnamed tributaries multiple times. Alignment would cross White River and 54 unnamed tributaries, and two unnamed tributaries to the Coal Valley Playa. Alignment would cross a total of 144 washes.	Alignment would be within 1 mile of Casselton Wash and Little Red Wash. Alignment would cross within 0.75 mile of Dry Lake Valley Playa. White River Reservoir, Rye Patch Reservoir, pond/reservoir in the foothills of the Seaman Range. Three DOE-delineated isolated wetlands within 0.39 mile. Bennett Springs 0.68 mile north. Black Rock Spring 0.72 mile south. Deadman Spring 0.66 mile north. Sand Spring 0.74 mile south. Two and One Half Spring 0.86 mile north. Unnamed spring 0.39 mile south.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 62 and 63.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

3.2.5.3.3 Garden Valley Alternative Segments

In Garden Valley, the Caliente rail alignment has four alternative segments (Table 3-25 and Figure 3-67). The four alternative segments that would cross Garden Valley are designated Garden Valley 1, Garden Valley 2, Garden Valley 3 (the northernmost route), and Garden Valley 8 (the southernmost route). Construction camp 4 would be along Joe Barney Pass Road, approximately 4.8 kilometers (3 miles) northeast of the junction of any of the Garden Valley alternative segments with Caliente common segment 2 (Figure 3-67). There are no potential quarry sites along the Garden Valley alternative segments (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

All four of the Garden Valley alternative segments would cross through the Golden Gate Range, but at two different locations. The southerly alternative segments (Garden Valley 2 and 8) would pass through the topographic feature designated as Water Gap and the northerly alternative segments (Garden Valley 1 and 3) would cross an unnamed pass approximately 7.2 kilometers (4.5 miles) north of Water Gap. In Garden Valley, intermittent surface water from the Quinn Canyon Range, the Grant Range, and the Worthington Mountains drains via Cottonwood Creek and its tributaries through the Golden Gate Range Water Gap. After the Garden Valley alternative segments pass through the Golden Gate Range, they would cross Garden Valley at different locations on their way to a common point on the north end of the Worthington Mountains. Along Garden Valley alternative segments 1 and 3, surface water flows from the Quinn Canyon Range, the Grant Range, and Worthington Mountains via Cottonwood Creek, Bruno Creek, Sand Creek, Pine Creek, Cherry Creek, and unnamed tributaries through the Golden Gate Range Water Gap to join drainage from the Seaman Range and flow farther to Coal Valley. In Coal Valley, the

Table 3-25. Hydrologic features potentially relevant to the Garden Valley alternative segments[a] (page 1 of 2).

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Garden Valley alternative segment 1		
Drainage from the Quinn Canyon Range, the Grant Range, and the Worthington Mountains across Garden Valley and through the Golden Gate Range to join drainage from the Seaman Range and flow farther to Coal Valley and to Coal Valley Reservoir. Alternative segment encompasses a small headwater section of the Sand Spring Valley drainage system.	Segment would cross Cottonwood Creek, Pine Creek, Cherry Creek, Bruno Creek, Sand Creek, and 20 other tributaries. Coal Valley Playa.	30 unnamed washes/tributaries for described drainage systems. Ponds/reservoirs. Modes Hole Spring 0.83 mile north.
Garden Valley alternative segment 2		
Drainage from the Quinn Canyon Range, the Grant Range, and the Worthington Mountains across Garden Valley and through the Golden Gate Range to join drainage from the Seaman Range and flow farther to Coal Valley and to Coal Valley Reservoir. Alternative segment encompasses a small headwater section of the Sand Spring Valley drainage system.	Segment would cross Cottonwood Creek, the Golden Gate Range water gap, and 17 other tributaries. The segment would follow the drainage of Garden Valley down though the Golden Gate Range Water Gap and cross the drainage system in multiple places. Coal Valley Playa.	22 unnamed washes/tributaries for described drainage systems.
Garden Valley alternative segment 3		
Drainage from the Quinn Canyon Range, the Grant Range, and the Worthington Mountains across Garden Valley and through the Golden Gate Range to join drainage from the Seaman Range and flow farther to Coal Valley and to Coal Valley Reservoir. Alternative segment encompasses a small headwater section of the Sand Spring Valley drainage system.	Segment would cross Cottonwood Creek, Pine Creek, Cherry Creek, Bruno Creek, Sand Creek, and 23 other tributaries. Coal Valley Playa.	Pond/reservoir. Modes Hole Spring 0.25 mile east.

Table 3-25. Hydrologic features potentially relevant to the Garden Valley alternative segments[a] (page 2 of 2).

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Garden Valley alternative segment 8		
Drainage from the Quinn Canyon Range, the Grant Range, and the Worthington Mountains across Garden Valley and through the Golden Gate Range to join drainage from the Seaman Range and flow farther to Coal Valley and to Coal Valley Reservoir. Alternative segment encompasses a small headwater section of the Sand Spring Valley drainage system.	Segment would cross Cottonwood Creek, the Golden Gate Range Water Gap, and 16 other tributaries. Coal Valley Playa.	Ponds/reservoirs. Put Back Spring 0.25 mile west.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 61 and 62.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

water from Garden Valley seeps into basin fill sediments. Garden Valley alternative segment 3, which would loop a bit farther to the north, would cross these drainage features closest to their source in the Quinn Canyon Range. There are no streamflow or water-quality data available for the ephemeral washes the Garden Valley alternative segments would cross.

The Garden Valley alternative segments would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin. Therefore, there are no stream channels or washes identified along the proposed segments designated as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p.7).

The National Wetlands Inventory dataset identifies Coal Valley Playa as a wetland; however, DOE field studies in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the rail alignment (DIRS 180696-Potomac-Hudson Engineering 2007, p. 3). Garden Valley alternative segment 2 would skirt (within 1 kilometer [0.62 mile]) Coal Valley Playa. Coal Valley Playa is an area expected to be susceptible to flooding and standing water.

The Federal Emergency Management Agency has not published flood maps of this region; however, it is likely that areas in Garden Valley experience periodic flooding. Garden Valley alternative segment 2 would cross the drainage feature designated as Water Gap, which is described as a topographically constricted area through which several small drainage channels run. Although the area is normally dry, Water Gap must be considered a suspect area for flooding. Appendix F discusses floodplains and wetlands.

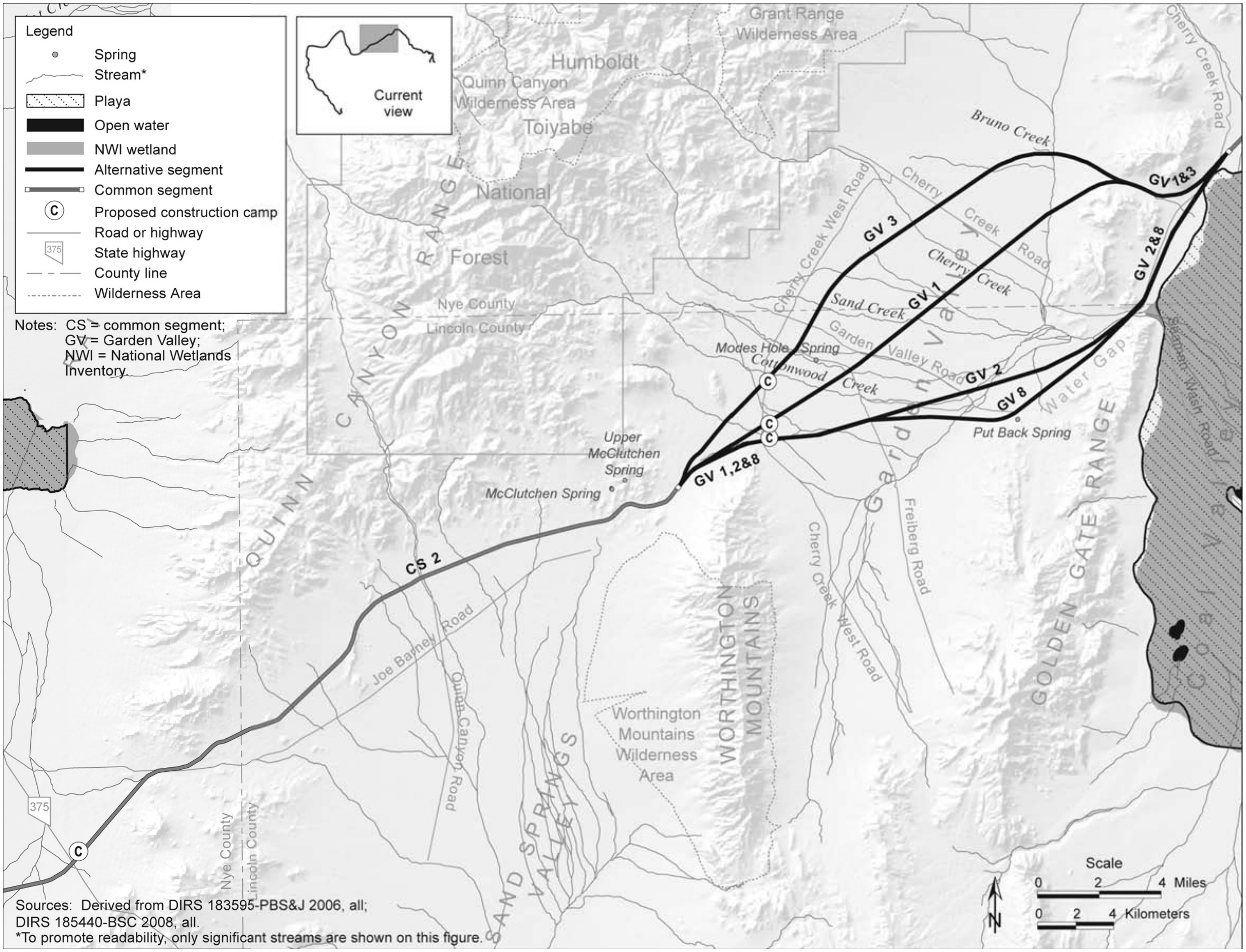


Figure 3-67. Surface drainage within map area 3.

There are two springs within the region of influence for the Garden Valley alternative segments. Modes Hole Spring is 1.3 kilometers (0.78 mile) east of Garden Valley alternative segments 1 and 3, and Put Back Spring is 0.42 kilometer (0.25 mile) west of Garden Valley alternative segment 8 (see Figure 3-67).

3.2.5.3.4 Caliente Common Segment 2 (Quinn Canyon Range Area)

Leaving the west end of Garden Valley, Caliente common segment 2 would cross west along the northern edge of Sand Spring Valley, skirting the Quinn Canyon Range, before it crossed into Railroad Valley, and then Reveille Valley (Table 3-26 and Figures 3-67 and 3-68). Construction camp 5 would be along Caliente common segment 2 approximately 11 kilometers (6.5 miles) east of the junction of Caliente common segment 2 and the South Reveille alternative segments. There are no potential quarry sites along common segment 2 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-D).

Caliente common segment 2 would cross several stream channels or washes, as listed in Table 3-26. The segment would run perpendicular to drainage flow from the Quinn Canyon Range to a playa in Sand Spring Valley. After crossing Sand Spring Valley, Caliente common segment 2 would enter Railroad Valley and cross State Highway 375. After crossing State Highway 375 in Railroad Valley, Caliente common segment 2 would cross unnamed washes that originate in the northern tip of the Belted Range (Gray Top Mountain) and drain to the northeast and north in Railroad Valley toward a playa area. Caliente common segment 2 would terminate south of the Reveille Range. There is a notable unnamed wash less than 0.8 kilometer (0.5 mile) to the north of the end of Caliente common segment 2.

Caliente common segment 2 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin. Therefore, there are no stream channels or washes identified along the segment designated as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7). There are no streamflow or water-quality data available for the streams and washes Caliente common segment 2 would cross.

The National Wetlands Inventory dataset does not indicate the presence of wetlands along Caliente common segment 2. Appendix F provides additional information on wetlands along the Caliente rail alignment.

Table 3-26. Hydrologic features potentially relevant to Caliente common segment 2.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from the Worthington Mountains and the southern tip of the Quinn Canyon Range to playas in Sand Spring Valley and Railroad Valley, respectively. Drainage from southern end of Reveille Range and northern tip of the Belted Range (Gray Top Mountain) to Railroad Valley.	Segment would cross 27 unnamed tributaries and 8 tributaries to Railroad Valley Wash.	McCutchen Spring 0.65 mile north. Upper McCutcheon Spring 0.76 mile north. Cedar Pipeline Ranch Spring 1 mile south.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 61.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

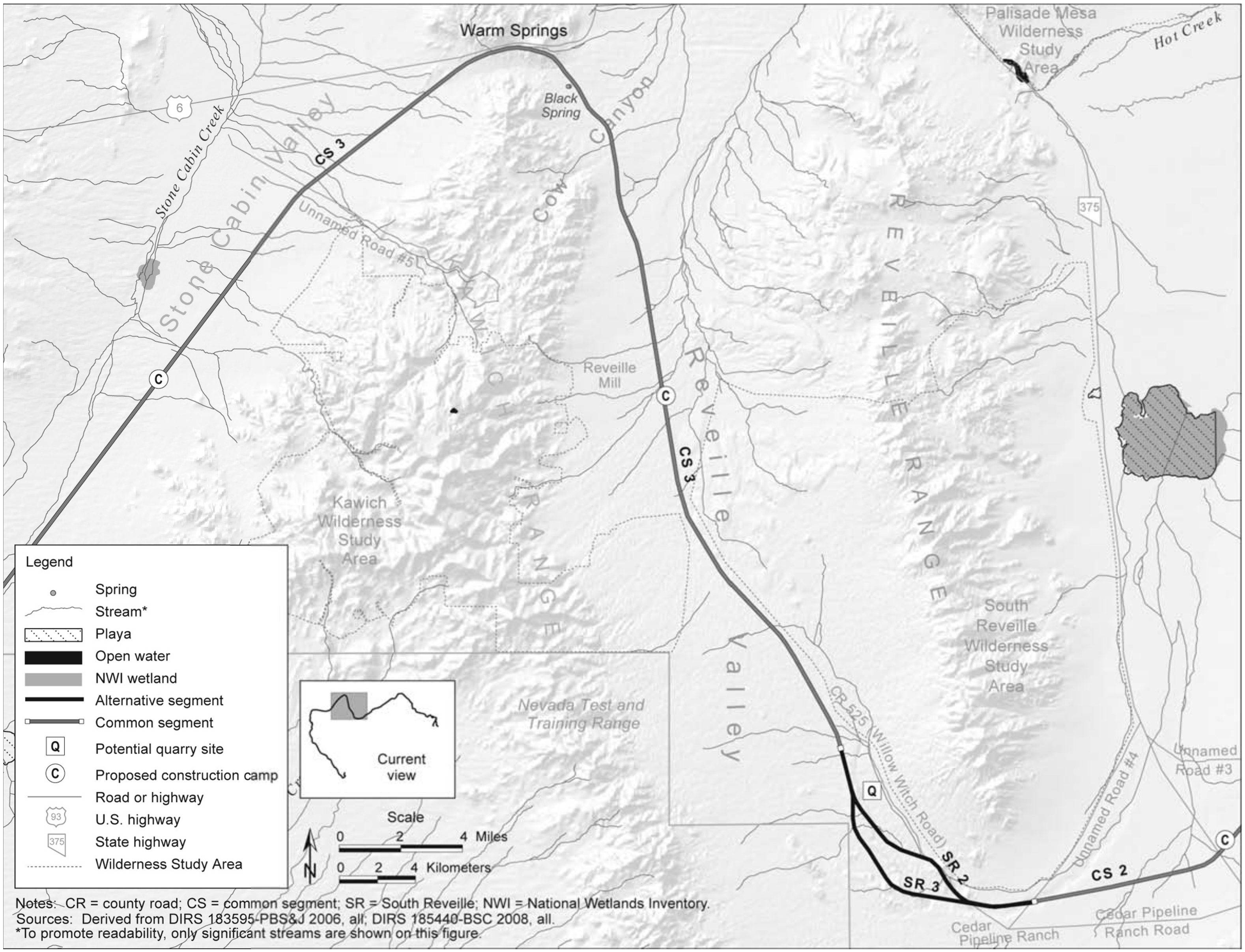


Figure 3-68. Surface drainage within map area 4.

Federal Emergency Management Agency flood maps cover only the west end of Caliente common segment 2 in Railroad and Reveille Valleys. The maps show that Caliente common segment 2 would not cross any floodplains. Appendix F provides additional information on floodplains along the Caliente rail alignment.

McCutchen Spring would be 1 kilometer (0.65 mile) north and Upper McCutcheon Spring would be 1.2 kilometers (0.76 mile) north of Caliente common segment 2.

3.2.5.3.5 South Reveille Alternative Segments

Caliente common segment 2 would end near the south end of the Reveille Range where DOE is considering two short alternative segments (South Reveille 2 and 3) (Table 3-27 and Figure 3-68). There are two potential quarry sites, NN-9A and NN-9B, in Reveille Valley to the east of the junction of the South Reveille alternative segments and Caliente common segment 3. Potential quarry site NN-9A would be about 490 meters (1,600 feet) east of where the South Reveille alternative segments converge (as shown on Figure 3-68) before joining Caliente common segment 3. Quarry site NN-9B would be within 300 meters (1,000 feet) north of South Reveille alternative segment 2 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Both alternative segments would be within areas that receive drainage from the Kawich Range and the Reveille Range, which then flows into Railroad Valley. South Reveille alternative segment 2 would proceed north up Reveille Valley, along a notable unnamed braided wash, crossing it several times.

South Reveille alternative segment 3 would run farther west before proceeding up Reveille Valley, thus avoiding the wash in this area. Both alternative segments would cross tributaries associated with this braided channel. There are no washes within the areas of the two potential South Reveille quarry sites. However, potential quarry NN-9A would overlie an unnamed tributary of the braided channel.

Table 3-27. Hydrologic features potentially relevant to the South Reveille alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
South Reveille alternative segment 2		
Drainage from the Kawich Range and the Reveille Range to Reveille Valley and on to Railroad Valley.	Segment would cross tributaries to the unnamed notable braided wash running from Reveille Valley into Railroad Valley. Segment would run along and cross the same notable braided wash from Reveille Valley into Railroad Valley for approximately of 1.9 miles. Segment would cross a total of 9 washes.	None.
South Reveille alternative segment 3		
Drainage from the Kawich Range and the Reveille Range to Reveille Valley and on to Railroad Valley.	Segment would cross tributaries to the unnamed braided wash running from Reveille Valley into Railroad Valley. Segment would cross a total of 11 washes.	None.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 61.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

South Reveille alternative segments 2 and 3 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin. Therefore, there are no stream channels or washes identified along the alternative segments that are designated as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7). There are no streamflow or water-quality data available for the streams and washes these alternative segments would cross.

The National Wetlands Inventory dataset does not indicate the presence of wetlands along either of the South Reveille alternative segments. Appendix F provides additional information on wetlands located along the Caliente rail alignment.

Federal Emergency Management Agency flood maps cover all of the land area of these two short alternative segments. Although South Reveille alternative segment 2 would run alongside a notable unnamed braided wash, it would not cross it. South Reveille 2 would run through a 3.1-kilometer (1.9-mile) stretch of the 100-year floodplain associated with five of the tributaries that drain to the notable unnamed braided wash. South Reveille alternative segment 3, farther away from the wash, would not cross any 100-year floodplains. Appendix F provides additional information on the floodplains South Reveille alternative segment 2 would encounter.

There are no springs within the South Reveille alternative segments regions of influence.

3.2.5.3.6 Caliente Common Segment 3 (Stone Cabin Valley Area)

Caliente common segment 3 would run northward through the Reveille Valley (Table 3-28 and Figures 3-68 and 3-69) and then skirt the western side of the Kawich Range in a southerly direction approximately 3.2 to 4.8 kilometers (2 to 3 miles) from and parallel to Stone Cabin Valley. If Goldfield alternative segment 1 or 3 were selected, DOE would construct the Maintenance-of-Way Trackside Facility in the southwestern portion of Stone Cabin Valley near the northern boundary of the Nevada Test and Training Range. If DOE were to select Goldfield alternative segment 1 or 3, the Maintenance-of-Way Trackside Facility would be constructed on the north side of Caliente common segment 3 approximately 26 kilometers (16 miles) east of its junction with the Goldfield alternative segments (Figure 3-69). The proposed location of the Maintenance-of-Way Trackside Facility would cross one notable drainage. Construction camps 6, 7, and 8 would be along Caliente common segment 3. There are no surface-water features at or near the proposed locations of the Maintenance-of-Way Trackside Facility or construction camps. There are no potential quarry sites along this common segment (DIRS 180922-Nevada Rail Partners 2007, Figure 3-F).

Drainage from the east side of the Kawich Range and drainage from the Reveille Range flows to Reveille Valley and on to Hot Creek Valley. Drainage from the west side of the Kawich Range flows down to Stone Cabin Valley. Common segment 3 would cross three tributaries to the unnamed braided channel that flows toward Railroad Valley, tributaries that flow on to Hot Creek Valley, including Cow Canyon Wash, and tributaries of Willow Creek in Stone Cabin Valley. The Cow Canyon wash drains northeast to a notable north-flowing wash on the floor of the Reveille Valley.

After crossing Warm Springs Summit, Caliente common segment 3 would turn to the southwest and proceed through Stone Cabin Valley skirting the western side of the Kawich Range in a southerly direction generally parallel to Stone Cabin Valley. Closer to the northern boundary of the Nevada Test and Training Range, common segment 3 would turn west and cross the braided drainage path designated as Willow Creek. Willow Creek provides drainage for the southern end of the Monitor Range (including Monitor Hill) and the western portion of the Kawich Range. Tributaries such as Saulsbury Wash feed into this drainage from north of U.S. Highway 6, and the drainage terminates at Mud Lake Playa, approximately 5.1 kilometers (3.2 miles) south of the termination of common segment 3. It is joined by a

Table 3-28. Hydrologic features potentially relevant to Caliente common segment 3.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from the Kawich Range and the Reveille Range to Reveille Valley and on to Hot Creek Valley.	36 tributaries/washes, 33 flowing toward Reveille Valley and on to Hot Creek Valley; the other 3 unnamed washes flowing toward a playa in Railroad Valley.	Mud Lake Playa. Black Spring 0.19 mile east.
Drainage from the Kawich Range and the Reveille Range to Stone Cabin Valley and Reveille Valley, respectively. Drainage from the west side of the Kawich Range flows to Stone Cabin Valley. Drainage from the east side of the Kawich Range flows to Reveille Valley and on to Hot Creek Valley.	Segment would cross 6 tributaries of Stone Cabin Creek/Willow Creek and 15 tributaries of Hot Creek, including Cow Canyon Wash. Segment would run parallel to drainage running to the Reveille Range. Segment would cross Ralston Valley Wash, Saulsbury Wash, and Willow Creek (also referred to as Stone Cabin Creek), and 32 unnamed tributaries. Maintenance-of-Way Trackside Facility would cross one notable drainage.	
Drainage from the west side of the Kawich Range, Monitor Range, Monitor Hills, and San Antonio Mountains to Stone Cabin Valley and Ralston Valley and on to Mud Lake Playa and Cactus Flats.		

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 54, 55, 59, and 61.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

second notable tributary of Mud Lake Playa flowing north to southwest out of the central portion of Ralston Valley. A large portion of Mud Lake Playa is within the Nevada Test and Training Range. Common segment 3 would skirt along the northern and western boundaries of this large playa, approximately 1.4 kilometers (0.89 mile) away from the playa.

Caliente common segment 3 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 183595-PBS&J 2006, p. 7). No streamflow or water-quality data are available for the streams and washes common segment 3 would cross.

The National Wetlands Inventory map classifies Mud Lake Playa as a wetland; however, field studies conducted in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the rail alignment (DIRS 180696-Potomac-Hudson Engineering 2007, p. 3). DOE did not identify any other wetlands along common segment 3. Appendix F provides additional information on wetlands along the Caliente rail alignment.

Most of common segment 3 would cross land that has Federal Emergency Management Agency flood map coverage. According to these maps, common segment 3 would not cross floodplains until it neared the vicinity of Mud Lake Playa and its tributaries. From the east, common segment 3 would first encounter a floodplain associated with Stone Cabin Creek and Saulsbury Wash as they converge on the area of the playa. The segment would then cross the floodplain of a notable wash draining the central

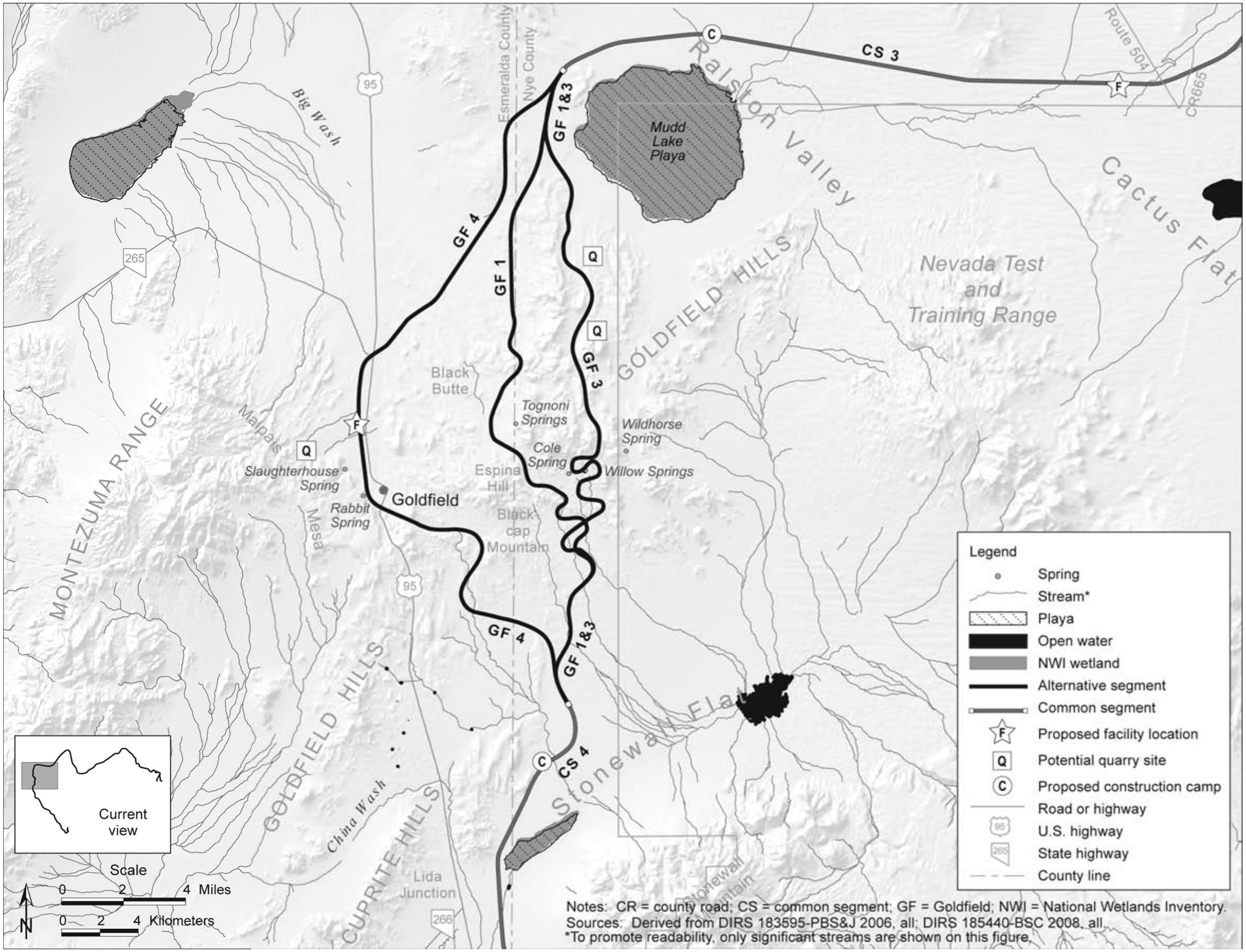


Figure 3-69. Surface drainage within map area 5.

Ralston Valley and finally cross through two legs of a drainage system coming down from western Ralston Valley. Appendix F provides more information on the floodplains common segment 3 would cross.

Black Spring is within the Caliente common segment 3 region of influence, approximately 0.31 kilometer (0.19 mile) east of the common segment.

3.2.5.3.7 Goldfield Alternative Segments

Turning south at Mud Lake Playa, the Caliente rail alignment has three proposed alternative segments: the western alternative segment (Goldfield 4), a central alternative segment (Goldfield 1), and an eastern alternative segment (Goldfield 3) (Table 3-29 and Figure 3-69). From the point where Caliente common segment 3 would end, Goldfield alternative segment 4 would proceed toward the southwest, passing around the west side of the community of Goldfield. Goldfield alternative segment 1 would pass southward through the center of the Goldfield Hills, first generally along the boundary between Esmeralda and Nye Counties, along the eastern side of Goldfield, and then winding southeastward toward a point beyond which the alternative segment would coincide with the southern portion of Goldfield alternative segment 3. The eastern alternative segment (Goldfield 3) would trend south-southeastward, in a meandering path, to the east of Goldfield and to the west of the western boundary of the Nevada Test and Training Range. The Goldfield alternative segments would end at the western part of Stonewall Flat, approximately 16 kilometers (10 miles) southeast of Goldfield.

If DOE were to select Goldfield alternative segment 1 or 3, the Maintenance-of-Way Trackside Facility would be on the north side of Caliente common segment 3 approximately 18 kilometers (11 miles) east of its junction with the Goldfield alternative segments. There is one notable drainage in the proposed location for the facility. DOE could construct the Maintenance-of-Way Headquarters Facility south of Tonopah. Depending on the location the Department selected, ephemeral washes could be encountered in this area. If DOE were to select Goldfield alternative segment 4, a combined Maintenance-of-Way Trackside and Headquarters Facility would be constructed along Goldfield alternative segment 4 north of Goldfield. There are three unnamed washes crossing the proposed location for the Maintenance-of-Way Trackside and Headquarters Facility.

There are three potential quarry sites along the Goldfield alternative segments – two along Goldfield alternative segment 3 and one that would be accessible from Goldfield alternative segment 4. Quarry sites NS-3A and NS-3B would be northeast of Goldfield 3 approximately 4 kilometers (2.5 miles) south of its junction with Caliente common segment 3. Quarry site ES-7 would be to the west of Goldfield 4 approximately 24 kilometers (15 miles) southwest of its junction with common segment 3 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-F).

Generally, drainage within the area of the Goldfield alternative segments flows from the Goldfield Hills, the Montezuma Range, and the Chispa Hills to Mud Lake, Mud Lake Playa, Alkali Lake Playa, and Stonewall Flat. While still north of Goldfield, Goldfield alternative segments 1 and 4 would cross a notable tributary to Indian Springs Canyon Wash, which drains the northwestern side of the Montezuma Range. Indian Springs Canyon Wash merges with Big Wash along the east side of U.S. Highway 95 and then terminates approximately 10 kilometers (6.2 miles) west of U.S. Highway 95 at the Alkali Lake Playa. As they passed through the community of Goldfield and the Chispa Hills, each alternative segment would cross numerous unnamed tributaries, as listed in Table 3-29.

In the area where Goldfield alternative segments 1, 3, and 4 would end (just before the start of Caliente common segment 4), the alternative segments would cross another notable drainage – an unnamed wash that drains the southeastern Goldfield Hills and into Mud Lake. Goldfield 4 would actually cross this

Table 3-29. Hydrologic features potentially relevant to the Goldfield alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Goldfield alternative segment 1		
Drainage from the Goldfield Hills and Chispa Hills to Mud Lake, Mud Lake Playa, Alkali Lake Playa, and Stonewall Flat.	Segment would cross tributary to Big Wash and unnamed tributaries that flow to Mud Lake, Stonewall Flat Playa, Mud Lake Playa, and Alkali Lake Playa. Segment would cross a total of 25 washes. Maintenance-of-Way Facility (Goldfield 1 or 3 option) would cross one unnamed wash.	Mud Lake Playa 0.94 mile west. Cole Spring 0.64 mile east. Tognoni Springs 0.76 mile east.
Goldfield alternative segment 3		
Drainage from the Goldfield Hills and Chispa Hills to Mud Lake, Mud Lake Playa, Alkali Lake Playa, and Stonewall Flat.	Segment would cross unnamed tributaries that flow to Mud Lake, Stonewall Flat Playa, and Mud Lake Playa. Segment would cross unnamed wash draining southeastern Goldfield Hills to Stonewall Flat. Segment would cross a total of 15 washes. Willow Springs 0.09 mile north. Maintenance-of-Way Facility (Goldfield 1 or 3 option) would cross one unnamed wash.	Mud Lake Playa 0.83 mile west. Cole Spring 0.21 mile west. Wildhorse Spring 0.94 mile east.
Goldfield alternative segment 4		
Drainage from the Montezuma Range, Goldfield Hills, and Chispa Hills to Mud Lake, Mud Lake Playa, Alkali Lake Playa, and Stonewall Flat.	Segment would cross 26 unnamed tributaries that flow to Mud Lake, Stonewall Flat Playa, Alkali Lake Playa, and Mud Lake Playa. Maintenance-of-Way Facility (Goldfield 4 option) would cross three unnamed washes.	Rabbit Spring 0.14 mile west. Slaughterhouse Spring 0.60 mile west.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 59.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

same drainage feature four times – twice at points farther up the hill, then again in the area where it would be the same as the other two Goldfield alternative segments. Goldfield alternative segments 1 and 3 and a small portion of Goldfield alternative segment 4 would skirt around the western end of Mud Lake Playa, approximately 1.3 to 1.5 kilometers (0.83 to 0.94 mile) away.

The Goldfield alternative segments would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin. Therefore, there are no stream channels or washes identified along the alternative segments designated as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7). No streamflow or water-quality data are available for the stream channels and washes these alternative segments would cross.

The potential quarry sites to the northeast of the Goldfield alternative segments, NS-3A and NS-3B, would excavate and extract rock from two hills along the east side of Goldfield alternative segment 3 and a hill centered along Goldfield alternative segment 3. An unnamed wash that would run nearly parallel to Goldfield 3 flows between the two hills DOE would quarry as part of the NS-3A quarry site. This unnamed wash appears to originate from the hills that would be excavated and flows toward Mud Lake Playa. The proposed access road to potential quarry NS-3A would cross one unnamed wash that flows toward Mud Lake Playa. The NS-3B quarry site would not intersect any washes. The potential quarry site to the west of the Goldfield alternative segments, ES-7, would not intersect any surface-water features; however, the proposed access road to this quarry would run alongside and cross one unnamed wash draining this area and would cross another. The first half of this road would run along existing roads, while the final stretch would be newly constructed (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

The National Wetlands Inventory dataset does not indicate the presence of wetlands or identify any hydric soils along the Goldfield alternative segments. Appendix F provides additional information on wetlands along the Caliente rail alignment.

Federal Emergency Management Agency flood maps cover the northern and southern portions of the Goldfield alternative segments, but not the central area that includes the community of Goldfield. According to these maps, the alternative segments would cross a small portion of the floodplain associated with Mud Lake Playa and each alternative segment would cross a small portion of the floodplain associated with the notable drainage channel leading to Stonewall Flat Playa. Appendix F provides more information about this floodplain.

There are several springs in the region of influence for all three Goldfield alternative segments (see Table 3-29). Willow Springs would be within the rail line construction right-of-way 0.14 kilometer (0.09 mile) north of Goldfield alternative segment 3. Cole Spring would be 1 kilometer (0.64 mile) east and Tognoni Springs 1.2 kilometers (0.76 mile) east of Goldfield alternative segment 1. Wildhorse Spring would be 1.5 kilometers (0.94 mile) east and Cole Spring would be 0.33 kilometer (0.21 mile) west of Goldfield 3. Rabbit Spring would be 0.22 kilometer (0.14 mile) and Slaughterhouse Spring 0.97 kilometer (0.6 mile) west of Goldfield alternative segment 4.

3.2.5.3.8 Caliente Common Segment 4 (Stonewall Flat Area)

South of the Goldfield Hills, Caliente common segment 4 would run south, crossing Stonewall Flat and Alkali Flat (both within Lida Valley) (Table 3-30 and Figures 3-69 and 3-70). Construction camp 9 would be alongside the common segment approximately 5 kilometers (3 miles) south of its junction with the Goldfield alternative segments. There are no potential quarry sites along this common segment (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

The U.S. Geological Survey has designated Stonewall Flat and Alkali Flat as playas. Common segment 4 would pass around the southwest end of Stonewall Flat Playa and then to the east of Alkali Flat Playa. Surface water from Stonewall Flat discharges to Lida Valley. The estimated runoff for Stonewall Flat is 490,000 cubic meters (17 million cubic feet) per year (DIRS 101811-DOE 1996, Section 4.2.5.1). Common segment 4 would cross this drainage path. There are no ***perennial streams*** in any of the surrounding basins; rather, the many washes that drain the upland areas convey ephemeral flow that ponds on the playas during periods of intense precipitation. Common segment 4 would cross 10 unnamed channels from Stonewall Mountain and the Cuprite Hills.

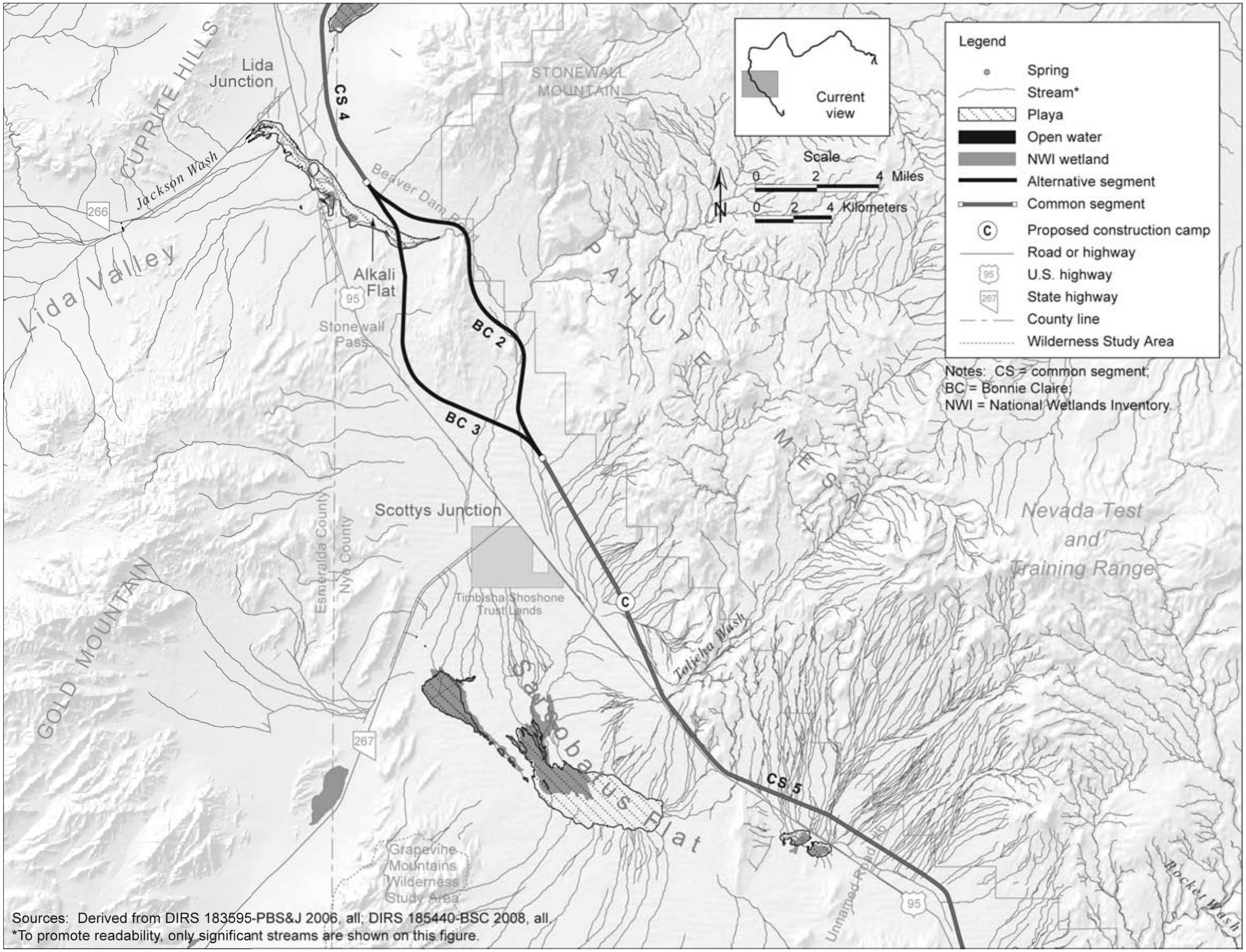


Figure 3-70. Surface drainage within map area 6.

Table 3-30. Hydrologic features potentially relevant to Caliente common segment 4.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from northwest side of Stonewall Mountain and the Cuprite Hills to Stonewall Flat Playa and Lida Valley Alkali Flat Playa.	Jackson Wash, China Wash, and seven unnamed washes.	Alkali Flat/Lida Valley Playa, Stonewall Flat Playa.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 59.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

Caliente common segment 4 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin.

Therefore, there are no stream channels or washes identified along the segment designated as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7). No streamflow or water-quality data are available for the stream channels and washes this common segment would cross.

The National Wetlands Inventory map identifies the playas associated with Stonewall Flat as wetlands; however, field studies conducted in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the alignment (DIRS 180696-Potomac-Hudson Engineering 2007, p. 6). There are no wetlands within the region of influence for common segment 4. Appendix F provides additional information on wetlands along the Caliente rail alignment.

Federal Emergency Management Agency flood maps provide coverage for a good portion of common segment 4. The maps show that the common segment would cross 1 kilometer (0.6 mile) of the 100-year floodplain associated with the drainage between Stonewall Flat Playa and Alkali Flat Playa in Lida Valley. Appendix F provides more information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of Caliente common segment 4.

Bonnie Claire 2 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin. Therefore, none of the washes along Bonnie Claire 2 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water (DIRS 183595-PBS&J 2006, p. 3).

There are no wetlands within the region of influence for Bonnie Claire 2.

3.2.5.3.9 Bonnie Claire Alternative Segments

Bonnie Claire alternative segment 2 would begin south of Stonewall Flat, exit Lida Valley, and turn to the east, entering Sarcobatus Flat, a large playa. Sarcobatus Flat is bounded by Pahute Mesa on the east and Gold Mountain on the west (Table 3-31 and Figure 3-70). There are no construction camps or quarries proposed for Bonnie Claire 2. Bonnie Claire 2 would be in an area that receives drainage from Stonewall Mountain, the foothills of Gold Mountain, and Northern Pahute Mesa, which flows toward Lida Valley, Alkali Flat, and the Bonnie Claire area of Sarcobatus Flat. Unnamed washes run northeast to southwest,

Table 3-31. Hydrologic features potentially relevant to the Bonnie Claire alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Bonnie Claire alternative segment 2		
Drainage from Stonewall Mountain, the foothills of Gold Mountain, Stonewall Pass, and Northern Pahute Mesa to Lida Valley, Alkali Flat, and Bonnie Claire area within Sarcobatus Flat.	Segment would cross 31 unnamed washes, including an unnamed braided wash.	Alkali Flat/Lida Valley Playa.
Bonnie Claire alternative segment 3		
Drainage from the foothills of Gold Mountain, Stonewall Mountain, Stonewall Pass, and Northern Pahute Mesa to Lida Valley, Alkali Flat, and Bonnie Claire area within Sarcobatus Flat.	Segment would cross Alkali Flat/Lida Valley Playa. Segment would cross 23 washes.	None.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 59, 60, and 68.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

providing a path for overland flow from Pahute Mesa, including the south and southeast sides of Stonewall Mountain to Sarcobatus Flat. Bonnie Claire 2 would cross a notable braided wash at the north end of Sarcobatus Flat before running adjacent to the same wash for several kilometers. This braided wash flows from Stonewall Pass to the Bonnie Claire area of Sarcobatus Flat. There are no streamflow or water-quality data available for the stream channels and washes Bonnie Claire 2 would cross.

Federal Emergency Management Agency flood maps cover most of Bonnie Claire 2, but do not include a portion of the land on the eastern side of the segment, which is shown on the maps as an old boundary of the Nevada Test and Training Range. Flood mapping does not extend east of this boundary. The flood maps also show a floodplain for an unnamed drainage feature from Pahute Mesa. The floodplain ends just south of Bonnie Claire 2 near one of the old Nevada Test and Training Range boundaries. It is possible that this floodplain would extend far enough to the northeast to be encountered by Bonnie Claire 2; however, the distance is too far to support such an assumption. In addition, Bonnie Claire 2 would run farther up in the foothill area where the wash would involve few tributaries. Appendix F provides additional information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of Bonnie Claire 2.

Bonnie Claire 3 would begin south of Stonewall Flat, exit Lida Valley, and continue south into Sarcobatus Flat, a large playa. Sarcobatus Flat is bounded by Pahute Mesa on the east and Gold Mountain on the west (Table 3-31 and Figure 3-70). There are no potential quarry sites or proposed construction camps along Bonnie Claire 3.

Bonnie Claire 3 would be in an area that receives drainage from Stonewall Mountain, the foothills of Gold Mountain, and the Northern Pahute Mesa, which flows toward Lida Valley, Alkali Flat, and the Bonnie Claire area of Sarcobatus Flat. Unnamed washes run northeast to southwest, providing a path for overland flow from Pahute Mesa, including the south and southeast sides of Stonewall Mountain to Sarcobatus Flat.

Bonnie Claire 3 would pass through Alkali Flat Playa, a major playa shown in Figure 3-70, and cross a notable braided wash in Sarcobatus Flat. This braided wash flows from Stonewall Pass to the Bonnie Claire area of Sarcobatus Flat. There are no streamflow or water-quality data available for the stream channels and washes Bonnie Claire 3 would cross.

Bonnie Claire 3 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 183595-PBS&J 2006, p. 3). Therefore, none of the washes along Bonnie Claire 3 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

There are no wetlands within the region of influence for Bonnie Claire 3.

Federal Emergency Management Agency flood maps cover most of Bonnie Claire 3, but do not include a portion of the land on the eastern side of the segment, which is shown on the maps as an old boundary of the Nevada Test and Training Range. Flood mapping does not extend east of this boundary. Bonnie Claire 3 would cross a 100-year floodplain associated with Alkali Flat Playa. The flood maps also show a floodplain for an unnamed drainage feature from Pahute Mesa. The floodplain ends just south of Bonnie Claire 3 at one of the old Nevada Test and Training Range boundaries. The floodplain is close enough to Bonnie Claire alternative segment 3 that it is reasonable to assume it would be at a similar width if it extended farther up the wash to where Bonnie Claire 3 would cross. Appendix F provides additional information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of Bonnie Claire 3.

3.2.5.3.10 Common Segment 5 (Sarcobatus Flat Area)

Common segment 5 would begin approximately 3.1 kilometers (1.9 miles) east of U.S. Highway 95 and trend generally southeast, through the Sarcobatus Flat Area, and along the east side of U.S. Highway 95 (Table 3-32 and Figures 3-70 and 3-71). Common segment 5 would end approximately 6.4 kilometers (4 miles) north of Springdale. Construction camp 10 would be adjacent to the rail alignment and east of U.S. Highway 95. Numerous ephemeral washes draining downslope of Pahute Mesa would run through the construction camp. There are no potential quarry sites along common segment 5 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Common segment 5 would cross washes that drain the Tolicha Peak area of Pahute Mesa. Drainage from Pahute Mesa flows from the east into Sarcobatus Flat. The alluvial flat terrain between Tolicha Peak and U.S. Highway 95 is characterized by numerous braided washes. Although Sarcobatus Flat is an extensive topographic feature, there is only one portion designated as a minor playa that would be close to the rail alignment. The northern edge of this small playa is adjacent to U.S. Highway 95, and would be approximately 1.7 kilometers (1.1 miles) south of common segment 5 to the southeast of the point where Tolicha Wash crosses U.S. Highway 95. The segment would then cross surface drainage originating from Tolicha Peak and Springdale Mountain. No streamflow or water-quality data are available for the stream channels and washes common segment 5 would cross.

Common segment 5 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS183595-PBS&J 2006, p. 3). Therefore, none of the washes along common segment 5 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

Table 3-32. Hydrologic features potentially relevant to common segment 5.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from Pahute Mesa and Bullfrog Hills flows to playas within Sarcobatus Flat and Bonnie Claire Lake within Sarcobatus Flat.	Segment would cross Tolicha Wash and 123 other washes. The alluvial flat terrain between Tolicha Peak and U.S. Highway 95 is characterized by numerous braided washes. Washes within this type of soil and terrain can shift in number and geography with a variation of precipitation intensity.	Dry lake bed 0.31 mile south.

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 59, 60, 64, and 68.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

The National Wetlands Inventory map identifies the playas associated with Sarcobatus Flat as wetlands, but field studies conducted in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the rail alignment (DIRS 180696-Potomac-Hudson Engineering 2007, p. 6). Appendix F provides more information about wetlands in this area.

Federal Emergency Management Agency flood maps provide coverage for almost all of common segment 5. The maps show that the segment would cross a 100-year floodplain associated with Tolicha Wash where it drains toward Sarcobatus Flat. Appendix F provides more information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of common segment 5.

3.2.5.3.11 Oasis Valley Alternative Segments

Oasis Valley alternative segment 1 would begin north of Oasis Mountain and would run southeast for approximately 9.8 kilometers (6.1 miles) before joining common segment 6 (Table 3-33 and Figure 3-71). Construction camp 11 would be along the west side of Oasis Valley 1 approximately 3.1 kilometers (1.9 miles) north of its junction with common segment 6. Several ephemeral washes flowing downslope from Bullfrog Hills and mountains to the east would run through the construction camp. There are no potential quarry sites along Oasis Valley 1 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Oasis Valley alternative segment 1 would cross the Amargosa River and its tributaries. Although referred to as a river, the Amargosa River and tributary branches and washes receive ephemeral flows from winter and summer storms, and perennial flows near springs and seeps. For most of the year, the tributaries carry no water. The Amargosa River has approximately 20 branches and 40 tributary washes in Oasis Valley. The main branch enters the valley from the north through Thirsty Canyon. Most of the drainage into Oasis Valley is from Pahute Mesa (including Oasis and Springdale Mountains to the north) and the Bullfrog Hills to the southwest. There are no streamflow or water-quality data available for this area; however, there is regional data for the Death Valley Basin (DIRS 176325-USGS 2006, all).

The Amargosa River interstate drainage system flows to Death Valley in California. A survey of washes along the Caliente rail alignment identified the Amargosa River and one tributary that Oasis Valley 1 would cross as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7 and Figure 3D).

There are no wetlands identified within the region of influence for Oasis Valley 1.

Federal Emergency Management Agency flood maps provide complete coverage for Oasis Valley 1. The maps show that the segment would cross a 100-year floodplain associated with the Amargosa River. Appendix F provides more information about this floodplain.

There are numerous springs in Oasis Valley and Thirsty Canyon near where Oasis Valley 1 would cross. Oasis Valley 1 would pass within 0.48 kilometer (0.30 mile) of several springs identified as the upper Oasis Valley Ranch Springs (DIRS 169384-Reiner et al. 2002, Figure 3). These springs are near the

Table 3-33. Hydrologic features potentially relevant to the Oasis Valley alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Oasis Valley alternative segment 1		
Drainage from Bull Frog Hills and the Pahute Mesa, including the Amargosa River and Amargosa River tributaries.	Segment would cross the Amargosa River and 23 unnamed washes.	Unnamed springs: 0.30 mile west 0.30 mile west 0.34 mile west 0.34 mile west 0.37 mile west 0.38 mile west 0.42 mile west 0.43 mile west 0.47 mile west 0.93 mile west 0.30 mile west 0.95 mile west
Oasis Valley alternative segment 3		
Drainage from Bull Frog Hills and the Pahute Mesa, including the Amargosa River and Amargosa River tributaries.	Segment would cross the Amargosa River, and 27 washes/tributaries to the Amargosa River.	Colson Pond (spring fed) 0.32 mile southwest. Small wetland 0.31 mile from Colson Pond. Unnamed springs: 0.12 mile west 0.65 mile west 0.73 mile west 0.74 mile west 0.80 mile west 0.80 mile west 0.83 mile west 0.86 mile west 0.89 mile west 0.94 mile west 0.95 mile west 0.99 mile west

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 64.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

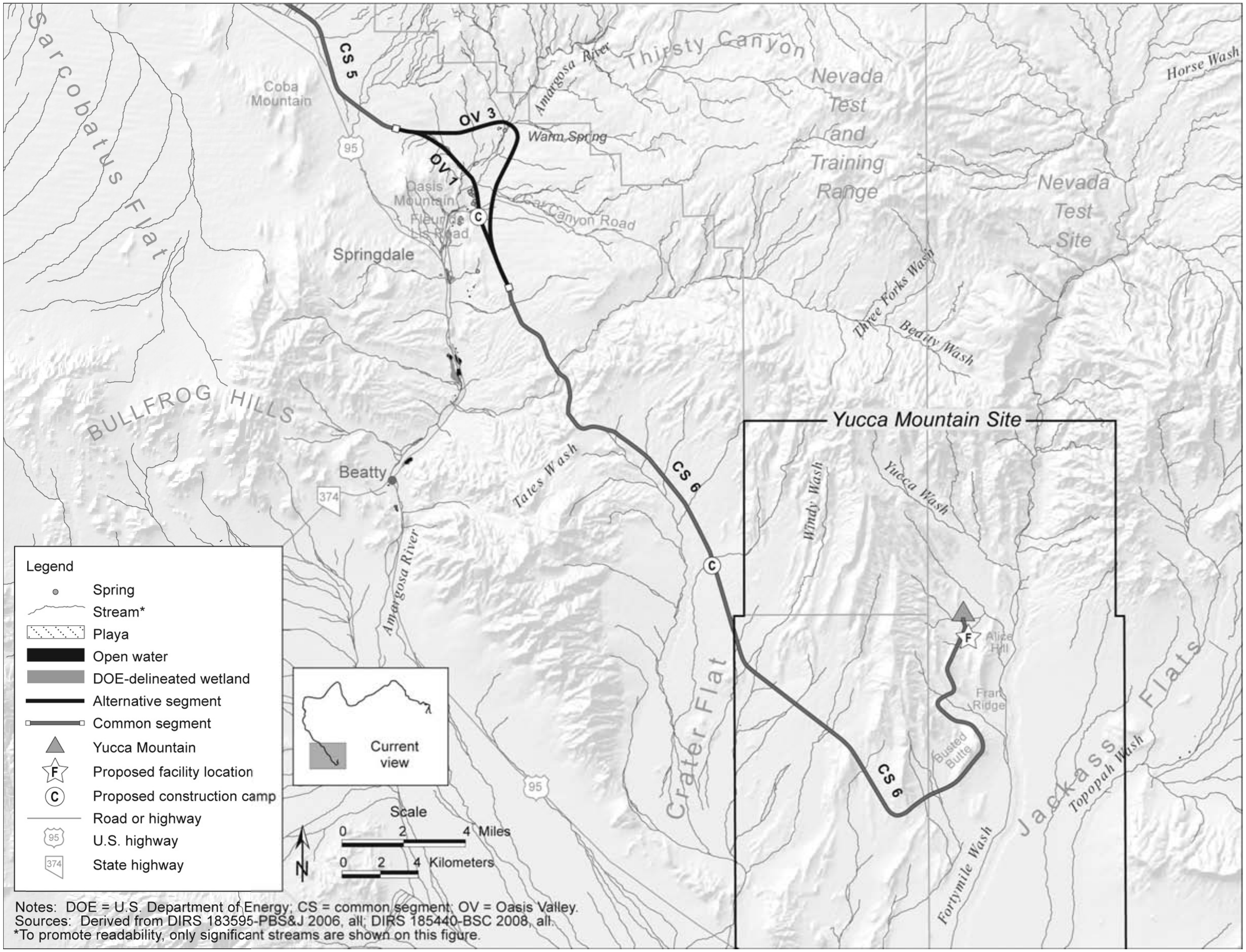


Figure 3-71. Surface drainage within map area 7.

narrows through which the Amargosa River leaves Oasis Valley. Table 3-33 lists these springs. Oasis Valley alternative segment 3 would begin north of Oasis Mountain, generally run east and then south for approximately 14 kilometers (8.8 miles) and would cross Oasis Valley approximately 0.24 kilometer (0.15 mile) northeast of Colson Pond before converging with common segment 6 (Table 3-33 and Figure 3-71). There are no potential quarry sites or proposed construction camps along Oasis Valley 3.

Oasis Valley 3 would cross the Amargosa River and its tributaries, as described above for Oasis Valley alternative segment 1.

A survey of washes along the Caliente rail alignment identified the Amargosa River, which Oasis Valley 3 would cross, as a water of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, p. 7 and Figure 3D).

DOE field surveys identified a small wetland associated with an unnamed seep approximately 0.5 kilometer (0.31 mile) from Colson Pond (DIRS 183595-PBS&J 2006, Figure 4T). Appendix F provides additional information about this wetland.

Federal Emergency Management Agency flood maps provide complete coverage for Oasis Valley 3. The maps show that the segment would cross a 100-year floodplain associated with the Amargosa River. Appendix F provides more information about this floodplain.

There are numerous springs in Oasis Valley and Thirsty Canyon near where Oasis Valley 3 would cross (see Table 3-33). Colson Pond is spring fed and would be within 0.24 kilometer (0.15 mile) of the alternative segment. This spring is commonly known as Colson Pond Spring (DIRS 169384-Reiner et al. 2002, Plate 2), but is also referred to as Warm Spring.

3.2.5.3.12 Common Segment 6 (Yucca Mountain Approach)

Common segment 6 would begin at the south juncture of the end of the Oasis Valley alternative segments and proceed to the southeast toward Yucca Mountain (Table 3-34 and Figure 3-71). The proposed location for construction camp 12 is adjacent to the rail line approximately 9.7 kilometers (6 miles) south of the ***geologic repository*** operations area. There are no potential quarry sites along common segment 6 (DIRS 180922-Nevada Rail Partners 2007, Figure 3-B).

Common segment 6 would cross terrain that drains from the southern end of Pahute Mesa and the Yucca Mountain Range to Crater Flat and the Amargosa River. The first significant tributary common segment 6 would cross is Beatty Wash and its tributaries, which provide drainage from Timber Mountain and Tram Ridge at the northern reaches of Yucca Mountain, to Oasis Valley and the Amargosa River at a point approximately 4.8 kilometers (3 miles) northeast of the community of Beatty. Beatty Wash is one of the largest tributaries of the Amargosa River. Common segment 6 would cross Beatty Wash at the north end of the Yucca Mountain Range, approximately 5.4 kilometers (3.4 miles) southeast of Oasis Valley. After crossing Beatty Wash, common segment 6 would proceed to the southeast toward Yucca Mountain, where it would cross several tributaries of Tates Wash. Approximately 26 kilometers (16 miles) from the start of common segment 6, the segment would cross Windy Wash and unnamed washes carrying drainage from the eastern side of Yucca Mountain. The segment would then continuearound the southern tip of the Yucca Mountain Range before turning northeast, skirting the eastern edge of Busted Butte and continuing between Bow and Fran Ridges.

Near the Yucca Mountain Site, Fortymile Wash, a major wash that flows to the Amargosa River, drains the eastern side of Yucca Mountain (DIRS 169734-BSC 2004, p. 7.1-3). The tributaries draining into Fortymile Wash at Yucca Mountain include Yucca Wash to the north; Drill Hole Wash, which, together

Table 3-34. Hydrologic features potentially relevant to common segment 6.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from northern Yucca Mountain Range, including Tram Ridge, and Timber Mountain. Drainage from Yucca Mountain Range to Crater Flat and Amargosa Valley.	Segment would cross Beatty Wash, Tates Wash, Windy Wash, Busted Butte Wash, and 39 unnamed washes.	Fortymile Wash Midway Valley Wash

a. Sources: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 64 and 65.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

with a tributary in Midway Valley, drains most of the repository site; and Busted Butte Wash (also known as Dune Wash) to the south. Common segment 6 would cross Busted Butte Wash, some of its unnamed tributaries, and unnamed tributaries of Drill Hole Wash. The segment would not actually cross Drill Hole Wash, but the wash would be within the common segment 6 region of influence. Fortymile Wash runs parallel to the end of common segment 6 at the Yucca Mountain Site, but common segment 6 would not cross the wash. Fortymile Wash is the most prominent drainage through Jackass Flats to the Amargosa River (DIRS 155970-DOE 2002, p. 3-36, Figure 3-11).

All of common segment 6 is within the Amargosa River interstate drainage system in the Death Valley Basin. Of the numerous washes along common segment 6, 14 were identified as waters of the United States, as designated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, Figures 3D and 3E). The Rail Equipment Maintenance Yard would be where the proposed rail line ends at Yucca Mountain. There are no perennial streams, natural bodies of water, or naturally occurring wetlands at Yucca Mountain (DIRS 155970-DOE 2002, p. 3-35). The facility would overlie an ephemeral stream but would not cross any waters of the United States.

No streamflow or water-quality data are available for drainage channels along common segment 6. There are no wetlands identified within the region of influence for common segment 6. Appendix F provides additional information on wetlands identified along the Caliente rail alignment.

Slightly more than half of common segment 6 has coverage on Federal Emergency Management Agency flood maps. These maps show that common segment 6 would cross a short span of the 100-year floodplain associated with Beatty Wash. Although the flood maps do not provide coverage for the area of the repository on the eastern side of Yucca Mountain, DOE has performed flood studies on several washes in that area, as addressed in the Yucca Mountain FEIS. An overlay of the Caliente rail alignment with Yucca Mountain FEIS Figure 3-12 indicates that common segment 6 would cross short stretches of 100-year floodplains associated with Busted Butte Wash and Drill Hole Wash. The rail line would terminate just before reaching a floodplain associated with Midway Valley Wash (also known as Sever Wash) (DIRS 155970-DOE 2002, pp. 3-38 and 3-39, and Figure 3-12). Appendix F further describes the floodplains associated with common segment 6.

There are no springs identified within 1.6 kilometers (1 mile) of common segment 6. Ute Springs, 270 meters (890 feet) west of U.S. Highway 95 in Oasis Valley, would be within about 0.6 to 0.88 kilometer (0.37 to 0.55 mile) of potential alternative well sites OV9 through OV12 near U.S. Highway 95 (DIRS 169384-Reiner et al. 2002, Plate 2).

3.2.6 GROUNDWATER RESOURCES

This section describes groundwater resources along the Caliente rail alignment. Section 3.2.6.1 describes the region of influence for groundwater resources; Section 3.2.6.2 is a general overview of groundwater features along the Caliente rail alignment; and Section 3.2.6.3 describes more specific features for each of the Caliente rail alignment alternative segments and common segments.

3.2.6.1 Region of Influence

The region of influence for groundwater resources along the Caliente rail alignment includes aquifers that would underlie areas of railroad construction and operations, portions of groundwater aquifers DOE would use to obtain water for construction and operations support and that would be affected by these groundwater withdrawals, and nearby springs, seeps or other surface-water-right locations that might be affected by such groundwater withdrawals. The horizontal extent of the region of influence varies depending on the particular aspects of the specific project activity, as follows:

- DOE used the nominal width of the rail line construction right-of-way and the footprints of construction and operations support facilities to define where there would be construction or other land disturbances. These areas could be susceptible to changes in groundwater ***infiltration***, discharge (for example, spring discharge), or quality. There could also be damage to, or loss of use of, an existing well (including potential need for well abandonment), if that well fell within the rail roadbed or was disturbed during construction activities. Review of the available information on the locations of existing wells indicates that rail roadbed construction would not disturb any existing wells. However, the precise locations of existing wells have not been field-verified and actual well locations might vary from the coordinates identified and cataloged for the wells in State of Nevada and U.S. Geological Survey (USGS) well databases (see Section 3.2.6.2.1).

- DOE used an initial screening-level distance of 1.6 kilometers (1 mile) on either side of the rail alignment centerline and an initial radius of 1.6 kilometers surrounding each proposed new well if that well would be outside of the nominal width of the construction right-of-way to define areas in the general vicinity of the rail alignment and proposed well locations that could also be affected by changes in groundwater discharge or quality at existing wells, springs, seeps, and other surface-water-right locations.

- DOE used a distance criterion of 150 meters (500 feet) on either side of the proposed rail alignment centerline to identify whether there could be damage to, or loss of use of, an existing well if that well fell within the rail roadbed or was disturbed during construction activities.

- DOE considered both the individual groundwater basins (hydrographic areas) that underlie the Caliente rail alignment and the railroad construction and operations support facilities and adjacent hydrographic areas for evaluating areas that might be affected by proposed groundwater withdrawals for construction or operations support. This would include areas that could be susceptible to changes in groundwater discharge or flow to an adjacent groundwater basin.

3.2.6.2 General Hydrogeologic Setting and Characteristics

This section is an overview of the general hydrogeologic setting and characteristics of groundwater underlying the area along the Caliente rail alignment. Water-resource features, primarily those associated with groundwater, are described primarily in relation to the hydrographic areas in which they lie.

Groundwater in central and southern Nevada is affected by low precipitation and high annual evaporation rates typical of desert climates. Most ***recharge*** to aquifers in the region of influence is derived from precipitation falling in the higher parts of the interbasin mountain ranges (DIRS 103136-Prudic, Harrilll, and Burbey 1993, pp. 2, 58, 84, and 88).

> **Acre-foot** is a unit commonly used to measure water volume. It is the quantity of water required to cover 4,047 square meters (1 acre) to a depth of 0.3048 meter (1 foot), and is equal to 1,233.5 cubic meters (325,851 gallons). Section 3.2.6 lists perennial yields, committed groundwater resources, and consumptive use in acre-feet because it is the common unit used by industry and government agencies.

3.2.6.2.1 Groundwater Hydrographic Areas and Groundwater Use in Nevada

To classify hydrographic regions and areas and to facilitate the management of groundwater resources within the State of Nevada, the state has been divided into a series of groundwater basins (designated as hydrographic areas) (DIRS 176488-State of Nevada 2006, all; DIRS 177741-State of Nevada 2005, all; DIRS 106094-Harrill, Gates, and Thomas 1988, all).

A total of 260 hydrographic areas are recognized within the western United States Great Basin; all or parts of 232 hydrographic areas fall within Nevada (DIRS 106094-Harrill, Gates, and Thomas 1988, all; DIRS 177741-State of Nevada 2005, all).

Three types of aquifers are the principal sources of groundwater found in central and southern Nevada, as follows (DIRS 172905-USGS 1995, all):

- Alluvial valley fill: Composed primarily of unconsolidated alluvial sand and gravel. The distribution of sediment size is directly associated with distance from the mountains. In general, the coarsest materials (such as gravel and boulders) were deposited near the mountains, and the finer materials (such as sand, silt, and clay) were deposited in the central parts of the basins or in the lakes and playas. Alluvial fans are important hydrologic features within the hydrographic basins, sometimes serving as targets for groundwater development, and with alluvial valley-fill portions of the basins receiving some of their recharge through the coarse sediment deposits in the alluvial fans. Alluvial deposits consisting of alluvial sand and gravel are present along the courses of modern ephemeral streams or ancestral streams that generally parallel the long axes of the basins. Alluvial deposits underlie most of the Caliente rail alignment. Groundwater in the alluvial valley-fill aquifers generally flows from recharge areas in the surrounding mountains toward the axial centers of the alluvial basins. Groundwater flow characteristics can vary with location depending on the geometry, composition, and hydraulic properties of the alluvial deposits comprising the alluvial aquifer and the degree of hydraulic connection to adjacent aquifers. For example, groundwater flow could be relatively uniform and roughly horizontal in shallow aquifers with the groundwater flow pattern generally following the local topography, or flow behavior could be controlled in deeper alluvial flow systems if horizontal confining units or confining layers or lateral flow boundaries are present. Sand- and gravel-rich alluvial aquifers can yield water readily to wells and are the aquifers most commonly developed.
- Volcanic rock aquifers: Composed primarily of tuffs (ash flows, ash falls), rhyolite, or basalt. Groundwater movement in these materials is often controlled by the number and degree of joint interconnections, ***fractures*** or faults, or vesicle (small cavities in minerals or rock) interconnection in lavas.
- Carbonate rock aquifers: Composed primarily of limestones and dolomites. The carbonate rocks are commonly highly fractured and are locally fragmented. Groundwater flow in the carbonate rock aquifers is controlled by interconnected fractures.

Tectonic forces superimposed faulting on existing groundwater-bearing formations (aquifers) in this region. As a result, several aquifer units underlying the Caliente rail alignment are fractured and faulted in some locations. These faults and fractures locally can influence groundwater flow patterns within the affected aquifer areas, with such features being capable of acting as either barriers to, or conduits for, groundwater flow (see Appendix G).

Within the Basin and Range Province, any or all of the three basic aquifer types discussed above might be present within a particular area and might constitute three separate, hydraulically distinct, sources of groundwater. Alternatively, any or all of the three aquifer types might underlie an area but might be hydraulically connected to form a single groundwater source (DIRS 172905-USGS 1995, all).

Groundwater levels fluctuate seasonally and annually in response to changes in withdrawal (consumptive use) and climatic conditions, with levels generally rising from late winter to early summer and generally declining from summer to early winter (DIRS 172904-Berris et al. 2002, p. 6). In 2000, an estimated 1.75 billion cubic meters (1.42 million ***acre-feet***) of groundwater were pumped in Nevada (DIRS 175964-Lopes and Evetts 2004, p. 7). Irrigation and stock watering was the primary groundwater use, accounting for approximately 46 percent of the total groundwater withdrawal, followed by mining (approximately 26 percent), drinking-water systems (approximately 14 percent), geothermal production (approximately 8 percent), self-supplied domestic (approximately 5 percent), and miscellaneous (1 percent) (DIRS 175964-Lopes and Evetts 2004, p. 7) (see Figure 3-72). Virtually all major groundwater development in Nevada has been in alluvial valley fill, with withdrawals from approximately the upper 460 meters (1,500 feet) of these aquifers. The carbonate rock aquifers in eastern and southern Nevada supply water to numerous springs (DIRS 106094-Harrill, Gates, and Thomas 1988, all).

> **Perennial yield** is the amount of useable 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 utilized for beneficial use.
>
> The State of Nevada may identify a hydrographic area as a **designated groundwater basin** where permitted groundwater rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration, including a state declaration of preferred uses (for example, municipal and industrial, domestic supply) (DIRS 103406-Nevada Division of Water Planning 1992, p. 18). Designated groundwater basins are also referred to as administered groundwater basins.

Figure 3-73 shows generalized regional groundwater flow patterns in the vicinity of the Caliente rail alignment. Available information regarding groundwater “interbasin” inflow and outflow (groundwater flow across hydrographic area boundaries) characteristics for hydrographic areas (groundwater basins) within central Nevada (DIRS 177524-Anning and Konieczki 2005, pp. 10 and 11, and Plate 1) indicates interbasin groundwater outflow or groundwater inflow through alluvial valley-fill aquifer materials or through consolidated rock aquifers appears to occur at some locations; at other locations, there appears to be no substantial interbasin groundwater flow occurring through either or both of these aquifer units. The figure depicts generalized flow directions within alluvial valley-fill units and within consolidated rock aquifers, in areas where such flow is inferred to be occurring across hydrographic area boundaries.

This section describes groundwater resources in relation to hydrographic areas. Figure 3-74 shows the 19 hydrographic areas the Caliente rail alignment could cross, depending on alternative segments selected. Table 3-35 lists the estimated annual ***perennial yields*** for the 19 hydrographic areas, and identifies which are State of Nevada-***designated groundwater basins***. The hydrographic areas are listed in the order the Caliente rail alignment would cross them, beginning near Caliente or Clover Creek Valley, moving westward across Nevada toward Goldfield, and then southward toward Yucca Mountain.