



January 2026
Cortez Rail Project



Cortez Rail Alternatives Analysis Report

Prepared for Nevada Gold Mines

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Prepared for

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ABBREVIATIONS

BLM	Bureau of Land Management
CAP	criteria air pollutant
CDP	census-designated place
CFR	<i>Code of Federal Regulations</i>
CO ₂ e	carbon dioxide equivalent
CWA	Clean Water Act
cy	cubic yard
DRI	Nevada's Desert Research Institute
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GHG	greenhouse gas
GSG	greater sage grouse
iPaC	information for Planning and Consultation
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NGM	Nevada Gold Mines
NHD	National Hydrography Dataset
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NWI	National Wetland Inventory
project	Cortez Rail Project
RHA	Rivers and Harbors Act
ROW	right-of-way
SGCN	species of greatest conservation need
STB	U.S. Surface Transportation Board
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOTS	Waters of the State

Executive Summary

Nevada Gold Mines (NGM) proposes to develop the Cortez Rail Project (the project), which would include new north-south commercial freight rail lines in Nevada to connect the Cortez Mine to processing facilities at the Goldstrike Mine. The objective of the project is to provide a safer, more cost-effective, and more environmentally friendly alternative to trucking gold ore from the Cortez Mine to processing facilities along public roadways in the project area.

The new rail lines would be built in two distinct segments: the Crescent Segment and the Boulder Segment. Alternative rail alignments were considered for each segment. Each alignment would connect to the existing Union Pacific Railroad (UPRR) mainline. The total length of new rail along both segments would total approximately 55 miles, depending on the alignment alternative selected from each segment.

The project would also include rail sidings, a right-of-way (ROW), and railroad support facilities. Depending on the final configuration and design of the project, the project could also include at-grade road crossings, utility work, and trail crossings.

Rail line construction projects that would provide common carrier rail service, such as this project, are under the jurisdiction of the U.S. Surface Transportation Board (STB). The STB must evaluate the potential for the proposed project to result in environmental impacts under the National Environmental Policy Act (NEPA). This report is intended to provide background information on the preliminary alternatives of the project and the affected environment of the project area and a preliminary evaluation of potential impacts of the alignment alternatives. The information in this report is used to support a comparison of alignments in each segment.

The natural environment elements considered in this report include wetlands and floodplains; surface waters; terrestrial species and habitats; aquatic species and habitats; threatened and endangered species; and geology and soils. The human environment includes transportation systems; noise and vibration; energy; land use, recreation, and visual resources; cultural and Tribal resources; socioeconomics; and air quality and greenhouse gases (GHGs). The project area is in the Great Basin region. This region is composed of basin and range topography with valleys and mountain ranges, often along fault boundaries. Existing geologic hazards in the region include seismic hazards, landslides, and liquefaction. The region has a low population density. There are approximately 7,400 people that live within the census tracts that intersect the study area. Land in the project area is largely undeveloped and is owned by private landowners and federal, local, and state government agencies. Land in the region is used for housing, recreation, grazing, mining, and agriculture. Transportation systems in the project area include the UPRR, I-80, SR 278 and 306, and other minor statewide routes and rural roads. The primary existing sources of noise include transportation systems and land uses such as mining and agriculture. Recreation opportunities include access to public land and established trails. There are few developed recreational opportunities in the region.

Numerous cultural and Tribal resources are present in the project area. The U.S. Environmental Protection Agency (USEPA) has listed the project area as being in attainment with National Ambient Air Quality Standards (NAAQS). The project area also contains existing overhead electrical transmission lines and underground gas pipelines. Construction and operation of the alignments within each segment would have the potential to affect wetlands, floodplains, and surface waters. The project area also includes habitats suitable for terrestrial and aquatic species and may contain threatened and endangered species.

The project team used quantitative and qualitative comparative analysis to compare the potential impacts of the proposed rail segments and the alignment alternatives. Matrices were developed to compare the potential impacts of each alignment alternative on the natural and human environments that could be quantified. The matrices include criteria that, when applied to alignment alternatives, provide a meaningful and direct comparison of potential impacts amongst the alignment alternatives. The strengths and weaknesses of each alternative were identified based on the information presented in the matrices.

1 Introduction

1.1 Project Overview

The Cortez Mine is a tier-one¹ gold mine owned by Nevada Gold Mines (NGM). The gold ore produced at the Cortez Mine requires processing at nearby NGM roasting facilities, which use high heat processes to recover gold from ore. Nearby roasting facilities are located at the Goldstrike and Gold Quarry mines, both of which are owned by NGM.

Under existing conditions, gold ore from the Cortez Mine is hauled to the roasting facilities over public and private roads using large semi-trucks pulling double trailers. Each truck has a maximum capacity of 40 tons of gold ore. Currently, up to 20 truck trips per hour are made, or a total of 480 trips per day. These truck trips contribute to road congestion, road accident risk, environmental impacts, and greenhouse gas (GHG) emissions.

Under the Cortez Rail Project (the project), NGM proposes to construct new commercial freight rail lines in Nevada. The rail lines would operate as commercial freight lines to connect the Cortez Mine to the roasting facilities at the Goldstrike Mine, and to provide common carrier rail service, as may be requested by shippers. The rail routes between the Cortez Mine and the roasting facilities would also include use of the existing Union Pacific Railroad (UPRR) east-west mainline. The proposed NGM-built rail lines would allow NGM to transport gold ore from the Cortez Mine to the processing facilities by rail instead of semi-truck. The project is expected to result in one loaded train trip per day and one unloaded train trip per day. More information about project-related train trips is included in Section 1.3, Project Description.

1.2 Project Objective

The objective of the project is to provide a safer, more cost-effective, and more environmentally friendly alternative to trucking gold ore from the Cortez Mine to other nearby processing facilities along public roadways in the project area. Construction and operation of the proposed project is anticipated to reduce road congestion, road accidents, air pollutants, GHG emissions, and truck driver shortages by taking semi-trucks off the road. Transporting the gold ore by rail would also be more cost-effective than hauling the gold ore by truck.

1.3 Project Description

NGM owns the Cortez and Goldstrike mines. The project would construct new common carrier rail lines to connect these facilities using two rail segments: the Crescent and Boulder segments (see Figure 1). Both segments would generally run north-south, and the length of new rail constructed

¹ A tier-one asset is an asset with the reserve potential to deliver a minimum 10-year lifespan with an annual production of at least 500,000 ounces of gold.

would total approximately 55 miles, depending on the alignments selected from each segment. As discussed further in Section 3, NGM has identified a number of possible rail alignments for each of the proposed segments.

The proposed project would also include rail sidings at certain locations, a right-of-way (ROW) ranging in width from 50 to 100 feet in most locations, and ancillary railroad support facilities. Ancillary railroad support facilities would support loading, unloading, and maintenance and would include stockpiles, rail loops, conveyor systems, and access roads. Depending on the final configuration, the project could include at-grade road crossings, gas pipeline crossings, and water body crossings. More details regarding the built and natural features crossed by the proposed project are described in Section 4.

The use of borrow sources for rail construction materials is proposed during construction. Soil and rock material would be taken from nearby properties and would be used to construct the railbed. Construction depots would be used as laydown yards for construction materials and equipment. All borrow sources and depots would be reclaimed after construction is complete.

The anticipated train traffic would be one unit train daily. Each unit train would have between 50 and 110 cars, depending on gold ore production. An empty train would travel from the UPRR line to the Cortez Mine by starting on one of the Crescent Segment alignments near Beowawe, Nevada. At the point that the Crescent Segment alignment begins, the train would be operated by a third-party rail operator. The train would then proceed to Cortez, where it would be loaded. Then, it would travel back to Beowawe, where UPRR operators would take over and drive the train to the Goldstrike Mine. After unloading at the Goldstrike Mine, the empty train would return to Beowawe. These trains are anticipated to operate 350 days per year, and the other 15 days of the year would be used for maintenance and turnaround days.

Operation of the proposed project would not increase mining or production at the Cortez Mine.

1.4 Project Setting

The project area is within Eureka and Lander Counties in northeastern Nevada. Figure 1 depicts the project region and project area. These areas of Nevada primarily fall into the “Central Basin and Range” Level III Ecoregion (Bryce et al. 2003). This ecoregion is characterized by mid- to high-elevation ranges interspersed with rolling hills, alluvial fans, and valleys. Higher elevation mountain slopes contain woodlands, mountain brush, and scattered forests. Valleys and lower elevation slopes are typically shrub- and grass-covered or shrub-covered. The Central Basin and Range is “internally drained by rivers flowing off the east slopes of the Sierra Nevada and by the Humboldt River, one of the longest internally drained river systems in North America” (Bryce et al. 2003). Land in the region is primarily used for grazing, mining, agriculture, and recreational purposes.

1.5 Report Objectives and Contents

Rail line construction projects such as this project are under the jurisdiction of the U.S. Surface Transportation Board (STB). The STB must evaluate the potential for the proposed project to result in environmental impacts under the National Environmental Policy Act (NEPA). This report is intended to provide background information on the preliminary alternatives of the project and the affected environment of the project area. Section 1 of this report provides a description and overview of the project. Section 2 describes the development of the alignments. Section 3 provides a description of the alignments. Section 4 describes the natural and human environment surrounding the alignments and provides a preliminary assessment of environmental constraints associated with each segment. Section 5 contains a matrix and narrative that evaluates the constraints of each alignment.

2 Alternatives Development

This section will briefly describe the factors that went into the development of preliminary alignment alternatives. Section 2.1 describes the design criteria for the different alignments in this report. Section 2.2 provides a brief overview of environmental constraints that are analyzed in Section 4 of this report. Using the design criteria outlined in Section 2.1 and the environmental constraints outlined in Section 2.2, NGM developed the alignments within each segment.

2.1 Design Criteria

Alignment alternatives within each segment were developed by NGM during the planning phase of the project. NGM has designed the alignments in this report around numerous design criteria. When designing these alignments, the following design criteria were considered:

- **Operating Speed:** Lead tracks were designed to accommodate train speeds up to 25 miles per hour. Loop tracks were designed to accommodate trains at less than 10 miles per hour.
- **Ruling Grade:** For lead tracks, the track grade was designed to not exceed 1.5% to 2%. For the areas leading to the rail loops near the mine sites, the track grade was designed to not exceed 1% and was compensated for curvature². For areas where rail cars would be loaded and unloaded, the track grade was designed to not exceed 0.4%.
- **ROW Width:** The ROW was designed to be a minimum of 50 feet in width; however, the ROW width depends on the underlying topography, which influences the need for areas of cut and fill. Generally, the ROW is wider where deep cuts or fills are required to maintain the ruling grade.
- **Flooding:** The track was designed so that the 100-year flood elevation would not exceed track subgrade elevation at structure.
- **Land Ownership:** Alignments were designed to avoid certain types of landownerships. For example, alignments were designed to avoid and minimize impacts on private land.
- **Road Crossings:** Alignments were designed to reduce the number of road crossings.
- **Existing Land Grade:** Most alignments were sited in areas that would not exceed a maximum railroad grade of 1%.
- **Land Use:** Alignments were designed to avoid conflicting land uses and potentially significant environmental impacts.

² Compensated for curvature refers to a reduction in the grade or slope of the rail track to offset the additional power required by a train to navigate a curve compared to a straight path.

2.2 Environmental Factors Considered

This report identifies environmental factors that were considered in the comparative evaluation of potential rail alignments. This report includes a discussion of the following natural and human environmental factors:

- Wetlands and floodplains
- Surface waters
- Terrestrial species and habitat
- Aquatic species and habitat
- Threatened and endangered species
- Geology and soils
- Transportation systems
- Noise and vibration
- Energy
- Land use, recreation, and visual resources
- Cultural and Tribal resources
- Historic resources
- Socioeconomics
- Air quality and GHGs

Among these environmental factors, there are several constraints that could influence or limit the construction of a rail line. These constraints include, but are not limited to, interactions with wetlands and waterbodies, the presence of sensitive species and habitats, public road crossings, public trail crossings, the presence of public recreation areas, and land ownership. These constraints are discussed in more detail in Section 4, Environmental Factors.

3 Description of Alignments

3.1 Alignments Under Evaluation

The project is divided into two distinct segments of proposed rail line. These segments include the Crescent Segment and the Boulder Segment and are depicted in Figures 1, 2, and 11. Each of these segments contains several conceptual rail alignment alternatives. All alignments would generally run north-south. Each alignment would connect to the existing UPRR east-west mainline with two tie-ins and then would reach the ultimate destination within each segment. The two tie-ins to the existing UPRR mainline for each segment would allow trains to travel in either direction when coming and going from the ultimate destination. Note that the distances given below are based on conceptual and preliminary design data that will continue to be refined as the project progresses. The distances are approximate and also provide a general order of comparative magnitude amongst the different alignments within each segment.

3.1.1 *Crescent Segment Alignments*

Crescent Segment conceptual alignments are depicted in Figure 2. All alignments within the Crescent Segment would end at the north with a tie-in to the existing UPRR mainline. The exact location of the tie-in to the mainline to the north would vary based on each alignment. However, all alignments would tie-in east-southeast of Beowawe. All alignments within the Crescent Segment would have the same southern terminus, a rail loop at the Cortez Mine.

3.1.1.1 **Crescent Valley Bypass East Alignment**

As depicted in Figure 3, the Crescent Valley Bypass East Alignment would be approximately 33.9 miles long. The Crescent Valley Bypass East Alignment is designed to avoid the approximately 500-person population of the census-designated place (CDP) known as Crescent Valley. This alignment would generally run on the east side of SR 306. Traveling south off the UPRR mainline tie-in east-southeast of Beowawe, this alignment would travel southwest for 1.5 miles, at which point the alignment would generally parallel SR 306 for 8.9 miles. After this point, the alignment would travel on the east side of Crescent Valley due south for 2.8 miles, then would travel due west for 1.0 mile, then would continue to follow SR 306 generally south for 9.6 miles. From there, this alignment would travel approximately 6 miles south-southeast until reaching the southern terminus loop.

3.1.1.2 **Crescent Valley Bypass West Alignment**

As depicted in Figure 4, the Crescent Valley Bypass West Alignment would be approximately 33.6 miles long. The Crescent Valley Bypass West Alignment is designed to avoid the CDP known as Crescent Valley. This alignment is the westernmost alignment within the Crescent Segment and would generally run on the west side of SR 306. Traveling south off the UPRR mainline tie-in to the east-southeast of Beowawe, this alignment would cross SR 306 and then travel parallel to SR 306 for approximately

20.8 miles before crossing SR 306. After crossing SR 306 again, the alignment would continue on for 0.5 mile, where it would then follow the same path as the Crescent Valley Bypass East Alignment.

3.1.1.3 Private Land Avoidance Alignment

As depicted in Figure 5, the Private Land Avoidance Alignment would be approximately 35.6 miles long. The Private Land Avoidance Alignment was designed to avoid privately owned lands. Traveling south off of the UPRR mainline tie-in east-southeast of Beowawe, this alignment would travel generally south for approximately 21 miles, where it would then travel southwest for 10.7 miles before connecting to the southern terminus loop at the Cortez Mine. The Private Land Avoidance Alignment is NGM's preferred alignment for the Crescent Segment.

3.1.1.4 Spa Road Alignment

As depicted in Figure 6, the Spa Road Alignment would be approximately 35.7 miles long. Traveling south off the UPRR mainline tie-in to the east-southeast of Beowawe, this alignment would travel generally south for approximately 12.9 miles, after which it would change direction and travel southeast for 4.3 miles. From there, it would cross Dean Dann Spa Road and travel southwest for 13.3 miles, after which the alignment would turn south for 1.25 miles, reaching the southern terminus loop at the Cortez Mine.

3.1.1.5 Hot Springs Bypass Alignment

As depicted in Figure 7, the Hot Springs Bypass Alignment would be approximately 36.2 miles long. This alignment would have a similar route as the Spa Road Alignment; however, it would curve around and avoid the Crescent Valley Hot Springs, a natural geothermal spring located approximately 3.5 miles east of the community of CDP of Crescent Valley. With the exception of two westward curves, the Hot Springs Bypass Alignment would run east of and generally parallel to the Spa Road Alignment. This alignment would follow the same route as the Spa Road Alignment east of SR 306 and Crescent Valley and would travel southeast for 4.3 miles. From there, the remainder of the Hot Springs Bypass Alignment would be the same as the Spa Road Alignment.

3.1.1.6 Frenchie Road Direct Alignment

As depicted in Figure 8, the Frenchie Road Direct Alignment would be approximately 36.6 miles long. From the UPRR mainline, this alignment would travel southeast for approximately 2 miles alongside Willow Coral Pass and would cross Rose-Ranch Beowawe Road, Hill Road, and Willow Coral Pass. After 2 miles, this alignment would split southwest at the intersection of Willow Coral Pass and Spa to Dry Hills Road. At this intersection, the alignment would travel southwest along Spa to Dry Hills Road for 5.5 miles. After 5.5 miles and 1 mile east of Gold Spring Point, the remainder of the Frenchie Road Direct Alignment would follow the same route as the Private Land Avoidance Alignment, ultimately reaching the southern terminus loop at the Cortez Mine.

3.1.1.7 Frenchie Road Switchback Alignment

As depicted in Figure 9, the Frenchie Road Switchback Alignment would be approximately 36.8 miles long. From the UPRR mainline, this alignment would travel south, east, and then south again (in a switchback fashion). After the switchback, the Frenchie Road Switchback Alignment would follow the same route as the Frenchie Road Direct Alignment path and would continue south-southwest along the same path for 9.5 miles until a point north of the intersection of Dean Dann Spa Road and Spa to Dry Hills Road, where it would follow the same route as the Private Land Avoidance Alignment, ultimately reaching the southern terminus loop at the Cortez Mine.

3.1.1.8 Trailblazer Alignment

As depicted in Figure 10, the Trailblazer Alignment would be approximately 39.0 miles long. The Trailblazer Alignment is the easternmost alignment in the Crescent Segment. From the UPRR mainline near Barth, the Trailblazer Alignment would travel southward for 2 miles. After 2 miles, near Rose-Ranch Beowawe Road, the Trailblazer Alignment would travel along Stitzel Pass, a dirt road, for approximately 3.6 miles. After 3.6 miles, the Trailblazer Alignment would diverge from Stitzel Pass and continue south-southwest for 19.5 miles. At this point, the Trailblazer Alignment would follow the same route as the Private Land Avoidance Alignment, ultimately reaching the southern terminus loop at Cortez Mine. Of all of the alignments in this segment, the Trailblazer Alignment would pass through the most uneven and steepest terrain.

3.1.2 Boulder Segment Alignments

Boulder Segment conceptual alignments are depicted in Figure 11. The northern terminus for all alignments within the Boulder Segment would be a rail loop at the Goldstrike Mine. With the exception of the Private Land Avoidance Rhoads Alignment, all alignments would have the same northern terminus, and the rail loop of the Private Land Avoidance Rhoads Alignment would be located approximately 0.9 mile further to the northeast. All alignments within the Boulder Segment would have the same southern terminus, a tie-in to an existing rail spur at the TS Power Plant. The TS Power Plant is approximately 24 miles northeast of Battle Mountain, Nevada. This existing rail spur at the TS Power Plant connects to the UPRR mainline to the south near the Western Pacific Railroad Dunphy Station near Dunphy, Nevada.

3.1.2.1 Dunphy Road West Alignment

As depicted in Figure 12, the Dunphy Road West Alignment would be approximately 19.3 miles long. This alignment was designed to run along the west side of Dunphy/Boulder Flat Road.³ Starting from the existing rail spur near the TS Power Plant, this alignment would travel east for 1.3 miles. After traveling east, the alignment would continue north for about 8 miles along the west side of

³ Dunphy/Boulder Flat Road is identified as Boulder Flat Road on maps maintained by Eureka County but may be referred to as Dunphy Road by local residents.

Dunphy Road/Boulder Flat Road, crossing through an existing solar energy facility before crossing to the east side of the road. After traveling another approximately 3 miles north, the alignment would turn northeast and continue along the east side of the road for 4.7 miles, crossing two parcels of private land not owned by NGM and ultimately reaching the northern terminus rail loop at the Goldstrike Mine.

3.1.2.2 Dunphy Road East Alignment

As depicted in Figure 13, the Dunphy Road East Alignment would be approximately 19.3 miles long. This alignment was designed to run along the east side of Dunphy/Boulder Flat Road. As with the Dunphy Road West Alignment, the Dunphy Road East Alignment would start at the existing rail spur at the TS Power Plant and travel east for 1.3 miles. After traveling east, the alignment would continue north for 8.3 miles on the east side of Dunphy Road, again passing through the solar energy facility. After this point, the Dunphy Road East Alignment would follow the same route as the Dunphy Road West Alignment, ultimately reaching the northern terminus rail loop at the Goldstrike Mine.

3.1.2.3 Private Land Avoidance East Alignment

As depicted in Figure 14, the Private Land Avoidance East Alignment would be approximately 20.1 miles long. This alignment was designed to bypass private lands in the northern portion of the Boulder Segment that are not currently owned by NGM. It was also designed to avoid crossing through the solar energy facility near the TS Power Plant. As with both Dunphy Road alignments, the Private Land Avoidance East Alignment would start at the existing rail spur at the TS Power Plant and travel east for approximately 1.3 miles. After crossing Dunphy/Boulder Flat Road, the alignment would turn north and travel approximately 6.4 miles around the solar energy facility near the TS Power Plant before moving closer to Dunphy/Boulder Flat Road about 0.6 mile north of the Sierra Pacific Power Company's Boulder Valley Road substation. From that point, the alignment would run parallel along the east side of the road for approximately 4.8 miles before turning toward the northeast to travel along an approximately 4.0-mile route that runs through the hills east of Dunphy/Boulder Flat Road and around two private parcels not owned by NGM. After that point, the alignment would follow the same route as the Dunphy Road East and West Alignment routes, ultimately reaching the northern terminus rail loop at the Goldstrike Mine.

3.1.2.4 Private Land Avoidance West Alignment

As depicted in Figure 15, the Private Land Avoidance West Alignment would be approximately 19.8 miles long. Similar to the Private Land Avoidance East Alignment, this alignment was designed to avoid private lands near the northern terminus of the Boulder Segment and to avoid crossing through the solar energy facility near the TS Power Plant. This alignment is mostly identical to the Private Land Avoidance East Alignment, except in the area toward the north where that alignment travels northeast for approximately 4 miles to avoid private lands not owned by NGM. At this location, the Private Land Avoidance West Alignment would instead travel for approximately 5.2 miles to the north and northeast along the west side of Dunphy/Boulder Flat Road, through the

hills and around two private parcels not owned by NGM. The alignment would then continue along the northwest side of Dunphy/Boulder Flat Road to a northern terminus rail loop at Goldstrike Mine in the same location as proposed under the previously described alignments.

3.1.2.1 Private Land Avoidance Rhoads Alignment

As depicted in Figure 16, the Private Land Avoidance Rhoads Alignment would be approximately 20.8 miles long. It would follow the same route as the Private Land Avoidance East Alignment and Private Land Avoidance West Alignment from the existing rail spur near the TS Power Plant up until the alignment turns toward the northeast. At that point, the Private Land Avoidance Rhoads Alignment would continue to the northeast, parallel to the east side of Dunphy/Boulder Flat Road and avoiding the hills to the east and west of the road, passing through private land not owned by NGM, and continuing for approximately 5.2 miles before terminating at the northern terminus rail loop at the Goldstrike Mine. Unlike the other alternative alignments for the Boulder Segment, the northern terminus rail loop would be shifted about 0.9 mile to the northeast to be closer to the mine's existing facilities under this option. The Private Land Avoidance Rhoads Alignment is NGM's preferred alignment for the Boulder Segment.

3.1.2.2 Solar Bypass West Alignment

As depicted in Figure 17, the Solar Bypass West Alignment would be approximately 18.0 miles long. This alignment was designed to avoid the existing solar energy facility near the TS Power Plant by routing the proposed rail line around it to the west. Starting from the existing rail spur at the TS Power Plant, this alignment would travel north for 10.8 miles. After this point, Solar Bypass West Alignment would follow the same route as the Dunphy Road East and West alignments, ultimately reaching the northern terminus rail loop at the Goldstrike Mine.

3.2 No Action Alternative

Under NEPA, the evaluation of a No Action Alternative is required. Under a No Action Alternative scenario for this project, no new rail lines would be constructed. NGM would continue to operate under existing conditions, meaning that gold ore would continue to be hauled using trucks. Truck trips would continue to occur as they do under existing conditions. The No Action Alternative is not considered further in this report and will be analyzed at a later time by the STB during their NEPA process.

3.3 Construction

The construction of the chosen alignment would proceed in a defined sequence, starting with surveying the clearing limits and the final centerline for the track. This would be followed by site clearing and grubbing, establishment of staging areas, embankment formation, construction of the track and associated structures, site cleanup, and final reclamation. NGM intends to limit all construction activities to the ROW, which would typically be 50 feet wide but would vary depending

on topography. The proposed ROW would be larger if fill slopes or excavation cut slopes would need to extend outside of the 50-foot-wide ROW. In such cases, the boundary of the ROW would include the toe and top of the slope for all cut and fill locations.

It is anticipated that the construction area would be surveyed and the construction limits would be defined. Following definition of the construction limits, the construction area would be cleared and graded. To conduct grading, heavy machinery such as graders, dozers, scrapers, loaders, track hoes, and dump trucks would be used. Grading and other civil work would take approximately 50 construction workers. Whenever feasible, the construction ROW would serve as the haul route for transporting fill material.

After the subgrade is built, a layer of crushed rock—typically about 12 inches thick, depending on final engineering plans—would be added on top. This layer, known as the sub-ballast, helps support the ballast section above it, provides drainage, and spreads the load more evenly across the subgrade. Along the new alignment, the cut and fill slopes would be stabilized using native seed or other suitable methods. Next, ties and rails would be placed. To construct the track, track tampers and regulators, speed swings, skid steers, and welding trucks would be used. Construction of the track would take approximately 25 construction workers.

4 Environmental Factors

This section describes the natural and human environment in the project area and provides a preliminary evaluation of the sensitive resources crossed by or near conceptual alignment alternatives to support a comparison of alignments in each segment. Each section includes a description of baseline conditions for each environmental resource, an overview of potential impacts of each alignment, and a comparison of alignments.

4.1 Natural Environment

4.1.1 *Wetlands and Floodplains*

4.1.1.1 Baseline Conditions

The term “wetlands” refers to “those areas that are inundated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 *Code of Federal Regulations* [CFR] Part 328.3(b)). Other waterbodies are also regulated by U.S. Army Corps of Engineers (USACE) as “Waters of the U.S.”; these include lakes, small ponds, and streams.

All wetlands in Nevada are considered Waters of the State (WOTS), a broad classification defined in Nevada Revised Statutes (NRS) 445.A.415. All WOTS are regulated by the Nevada Division of Environmental Protection’s (NDEP’s) Bureau of Water Quality Planning, excluding those that are regulated by the USACE under authority of Section 404 of the Clean Water Act (CWA) or under authority of Section 10 of the Rivers and Harbors Act (RHA) of 1899. WOTS include all streams; lakes; ponds; impounding reservoirs; marshes; water courses; waterways; wells; springs; irrigation systems and drainage systems; all bodies or accumulations of water, surface and underground, and natural or artificial. Currently, no wetland classification rating system is in place for the state of Nevada.

Wetlands in Nevada include marshes, wet meadows, springs, riparian areas, intermittent and perennial streams, lakes, vernal pools, and playas. There is variety in hydrology, soils, vegetation, and site characteristics between (and within) wetland types. Some sites are very enduring and resilient to disturbance, while other sites are more sensitive and may disappear in drier years. For example, many wetlands within the project area are likely to occur along riparian fringes, which are generally ephemeral and intermittent in nature. Similarly, different wetland types provide different ecosystem functions, but each serve important roles in the ecosystem (NDNH 2023). Wetlands in the project area indicated by Nevada’s Desert Research Institute (DRI) are shown in Figures 18 and 19.

A floodplain is an area of land, often adjacent to bodies of water like rivers or streams, that is susceptible to flooding from various sources. Floodplains typically stretch from the banks of a river

channel to the base of the enclosing valley and experience flooding during periods of high discharge. Floodplains generally extend well beyond the regulated WOTS and waters of the U.S. described above, and floodplains within the project area are predominantly located along the Humboldt River and within the lower valley basins of the project area. Floodplains are generally mapped as flood hazard zones typically used to support planning and development decisions. Construction and activities in floodplains are regulated by the Federal Emergency Management Agency (FEMA) and local jurisdictions. Floodplains in the project area indicated by FEMA-mapped flood hazard zones are shown in Figures 18 and 19.

4.1.1.2 Potential Effects

Potential impacts to wetlands from the project could result from both construction and operation activities, including temporary construction work, the permanent placement of fill within wetlands, and the ongoing presence of project features, all of which may lead to long-term effects on wetland areas. Impacts to wetlands could result from the construction and operation of the rail line by conversion of wetlands into railway, railway embankments, and ROWs. Potential construction impacts could occur from land clearing, excavation, grading, and fill placement activities that permanently remove, fill, or otherwise alter existing wetland hydrology or habitat features.

Similarly, project construction and operation activities—including temporary construction work, the placement of fill within floodplains, and the permanent presence of project features—could result in long-term impacts to floodplains, including changes in floodplain capacity, flow diversion and constriction, and reduced floodwater retention. The extent and intensity of floodplain impacts would depend on the nature of the construction and operation activities, their proximity to floodplains, and the size and characteristics of the affected areas.

The potential effects of the proposed rail line on floodplains would be avoided or minimized through design measures that comply with local county floodplain ordinances and codes. Any part of the proposed rail line within FEMA-mapped 100-year floodplains would be designed to meet the required floodplain development regulations.

4.1.1.3 Comparison of Alignments

Anticipated potential wetland and floodplain disturbance areas are presented in Table 4-1. To estimate potential project disturbance areas for wetlands and floodplains for each of the conceptual alignment alternatives, the identification and location of mapped FEMA flood hazard zones, the NWI, and Nevada's local state inventory DRI databases were overlaid with the permanent disturbance footprint for the conceptual designs for each rail alignment. In general, site preparation, grading, placement of fill, and other project construction activities that may disturb wetland and floodplain areas would be restricted to this corridor area. During future construction of a rail line, there may be other areas of temporary disturbance outside the corridor of permanent disturbance; however, the

locations of any temporary disturbance areas for the alignments is not known at this time and was not factored into this comparison of alignments.

Table 4-1
Wetland and Floodplain Disturbance by Alignment Segment

Alignment	Wetland Disturbance (acre)	Floodplain Disturbance (acre)
Boulder Segment		
Private Land Avoidance West	5.7	93.4
Private Land Avoidance East	5.7	108.5
Private Land Avoidance Rhoads	4.4	75.5
Solar Bypass West	6.1	114.3
Dunphy Road East	4.0	74.7
Dunphy Road West	5.0	74.4
Crescent Segment		
Private Land Avoidance	36.3	114.9
Crescent Valley Bypass East	9.1	67.0
Crescent Valley Bypass West	6.1	47.6
Frenchie Road Direct	15.0	69.5
Frenchie Road Switchback	15.9	96.3
Hot Springs Bypass	34.3	87.6
Spa Road	22.6	14.6
Trailblazer	22.7	78.6

As presented in Table 4-1 above, each alignment is anticipated to result in disturbance of wetland and floodplain areas. The DRI- and NWI-mapped wetland data was combined to quantify the disturbance of wetlands with the segments and their alignments. However, it is important to note both the NWI- and DRI-mapped wetland data includes the impact areas of streams, synonymous with the National Hydrography Dataset (NHD) mapped data for surface waters analyzed in Section 4.1.2 below. Additional wetland analysis including field surveys of wetland and stream boundaries and their extents would be necessary to verify the accuracy of the NWI and DRI wetland data.

4.1.1.3.1 Boulder Segment

The Boulder Creek Segment is located within the Boulder Valley and is generally located parallel to Boulder Creek. Each of the proposed Boulder alignments overlap with areas mapped as wetland by DRI and NWI and with FEMA-mapped flood hazard zones. The Dunphy Road East Alignment overlaps with the smallest combined mapped wetland areas (4.0 acres), and the Solar Bypass West Alignment would overlap with the largest combined mapped wetland areas (6.1 acres). The Dunphy

Road West Alignment overlaps with the least FEMA-mapped floodplains (74.4 acres), and the Solar Bypass West Alignment overlaps with the greatest FEMA-mapped floodplains (114.3 acres).

4.1.1.3.2 *Crescent Segment*

The Crescent Segment is located within the Crescent Valley. Each of the proposed Crescent alignments overlap with areas mapped as wetland by DRI and NWI and with FEMA-mapped flood hazard zones. The Crescent Valley Bypass West Alignment overlaps with the smallest combined mapped wetland areas (6.1 acres), and the Private Land Avoidance Alignment would overlap with the largest combined mapped wetland areas (36.3 acres). The Spa Road Alignment overlaps with the least FEMA-mapped floodplains (14.6 acres), and the Private Land Avoidance Alignment overlaps with the greatest FEMA-mapped floodplains (114.9 acres).

4.1.2 *Surface Waters*

4.1.2.1 *Baseline Conditions*

The project area is located within the Owyhee High Plateau and Humboldt Basin and Range areas, which are characteristically cooler and wetter than the neighboring major land resource areas of the Great Basin. The western boundary of the Owyhee High Plateau is marked by a gradual transition to the lower and warmer Humboldt Basin and Range area. Excluding the Owyhee, Bruneau, and Humboldt rivers, the supply of water from precipitation and streamflow is small, unreliable, and mostly used for crop irrigation (NRCS and USDA 2022). Streamflow depends largely on accumulated snow in late-season runoff from the mountains. Precipitation within the project area varies and the nearest updated precipitation and temperature data can be obtained from Elko Regional Airport (USW00024121). Based on long-term precipitation and temperature data from the Elko Regional Airport station, annual precipitation as rainfall is 9.5 inches; average precipitation as snowfall is 38.2 inches (water equivalent) (Midwestern Regional Climate Center 2024).

The project area is dominated by valleys, flats, and surface water draining systems. Surface water within the Boulder Segment generally flows south within and along Boulder Creek. However, in most years Boulder Creek lacks sufficient surface water to form a positive connection with the Humboldt River. Within the Crescent Segment, surface waters flow into the Crescent Valley between the Dry Hills and Shoshone Range, emptying into Coyote and Thomas Creeks. It should be noted that the USACE has previously determined that surface waters in the southern portion of Crescent Valley are not jurisdictional as they lack a significant nexus to traditionally navigable waters. Surface waters in this area subside into the playas or evaporate.

As described in Section 4.1.1, the discharge of dredged and fill material into WOTUS is regulated by the NDEP Bureau of Water Quality Planning, excluding waters of the United States which are regulated by USACE under authority of Section 404 of the CWA and Section 10 of the RHA. In

addition, compliance with Section 402 of the CWA, a National Pollutant Discharge Elimination System permit and associated Storm Water Pollution Prevention Plan may be required. A water quality certification under Section 401 of the CWA may also be required.

Under CWA Section 303(d), states, territories, and authorized Tribes are required to develop lists of impaired surface waters, which are those waters that are not attaining beneficial uses according to the established water quality standards. The Humboldt River is listed as the only Section 303(d) stream within the project area. Under Section 303(d) of the Federal CWA, States must report and manage Section 303(d) listed waters to resolve the current water quality impairments. Surface waters, including streams, reservoirs, irrigation channels, and lakes indicated by the NHD and the Section 303(d) streams list, are shown in Figures 20 and 21.

4.1.2.2 Potential Effects

Where possible, the rail alignments have been routed to avoid surface waters in the project area. The alignments would not intersect any lakes or reservoirs. The project design will integrate culverts and hydraulic factors into the rail bed construction to preserve existing surface water connections.

4.1.2.3 Comparison of Alignments

To determine the number of surface waters that may be affected by each of the rail alignments, USGS 3D National Hydrography Program data and Section 303(d) stream data were overlaid with the disturbance footprint for the conceptual designs for each rail alignment. In general, site preparation, grading and other project construction activities that may disturb surface waters would be restricted to this corridor area. The number of USGS 3D National Hydrography Program data and Section 303(d) stream crossings for each alignment is presented in Table 4-2. It is important to note that this number does not represent the number of streams affected, which may be much smaller because one stream can be crossed by an alignment more than one time.

Table 4-2
Stream Crossings by Alignment Segment

Alignment	Number of Stream Crossings
Boulder Segment	
Private Land Avoidance West	15
Private Land Avoidance East	13
Private Land Avoidance Rhoads	12
Solar Bypass West	16
Dunphy Road East	10
Dunphy Road West	12
Crescent Segment	
Private Land Avoidance	40
Crescent Valley Bypass East	29
Crescent Valley Bypass West	34
Frenchie Road Direct	42
Frenchie Road Switchback	41
Hot Springs Bypass	41
Spa Road	41
Trailblazer	48

Indicated in Table 4-2 above, each alignment would result in surface water crossings. Additionally, no alignments would cross a Section 303(d)-listed stream.

4.1.2.3.1 Boulder Segment

The Boulder Creek Segment is located within the Boulder Valley and generally travels parallel to Boulder Creek and its associated tributaries. The Dunphy Road East Alignment would have the fewest surface water crossings (10 crossings), whereas the Solar Bypass West Alignment would have the greatest number of surface water crossings (16 crossings). No alignment would cross a Section 303(d)-listed stream.

4.1.2.3.2 Crescent Segment

The Crescent Segment is located within the Crescent Valley, which includes Coyote Creek, Fire Creek, Indian Creek, Duff Creek, Little Cottonwood Creek, McConnel Canal, and Cottonwood Creek. The Crescent Valley Bypass East Alignment would have the fewest surface water crossings (29 crossings). The Trailblazer Alignment would have the greatest number of surface water crossings (48 crossings), because it would intersect Thomas Creek at multiple locations throughout the northeast portion of Crescent Valley. No alignment would cross a Section 303(d)-listed stream.

4.1.3 Terrestrial Species and Habitat

4.1.3.1 Baseline Conditions

Terrestrial species are defined as plants or wildlife that live on land. The project area is within Eureka and Lander Counties in northeastern Nevada, which is a part of the greater “Central Basin and Range” Level III Ecoregion (Bryce et al. 2003). Examples of vegetation in the low-lying portions of the Central Basin and Range Ecoregion that are also near the project area (approximately 20 miles) include dominant shrubs such as Great Basin sagebrush (*Artemisia tridentata*) and greasewood (*Sarcobatus vermiculatus*) and also include shadscale (*Atriplex confertifolia*), winterfat (*Krascheninnikovia lanata*), black sagebrush (*Artemisia nova*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), ephedra (*Ephedra* ssp.), rabbitbrush (*Chrysothamnus* ssp. and *Ericameria* ssp.), Indian ricegrass (*Achnatherum hymenoides*), and squirreltail (*Elymus elymoides*). Higher elevation mountain slopes are vegetated with many of the above shrub species but may also include forest species such as Utah juniper (*Juniperus osteosperma*), bitterbrush (*Purshia tridentata*), singleleaf pinyon (*Pinus monophylla*), and quaking aspen (*Populus tremuloides*) (Wilken et al 2011).

Vegetation communities within the region where the project area is located may provide habitat for a wide variety of terrestrial wildlife species, including large mammal species such as mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), bighorn sheep⁴ (*Ovis canadensis*), elk (*Cervus canadensis*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*); smaller terrestrial mammal species such as American badger (*Taxidea taxus*), American mink (*Neogale vison*), yellow-bellied marmot (*Marmota flaviventris*), muskrat (*Ondatra zibethicus*), long-tailed weasel (*Neogale frenata*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), bushy-tailed woodrat (*Neotoma cinerea*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), western harvest mouse (*Reithrodontomys megalotis*), western deer mouse (*Peromyscus sonoriensis*), dark kangaroo mouse (*Microdipodops megacephalus*), western jumping mouse (*Zapus princeps*), and montane vole (*Microtus montanus*); bats such as Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), and little brown bat (*Myotis lucifugus*); birds such as red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), great horned owl (*Bubo virginianus*), white pelican (*Pelecanus erythrorhynchos*), tundra swans (*Cygnus columbianus*), canvasback duck (*Aythya valisineria*) and ruddy duck (*Oxyura jamaicensis*), sandhill cranes (*Grus canadensis*), northern sage sparrow (*Artemisiospiza nevadensis*), and greater sage grouse (GSG; *Centrocercus urophasianus*); and reptiles such as western fence lizard (*Sceloporus occidentalis*), sagebrush lizard (*Sceloporus graciosus*), and western rattlesnake (*Crotalus oreganus*) (Wilken et al 2011; iNaturalist 2024; Cornell Lab of Ornithology 2024).

⁴ Bighorn sheep have been known to occupy the west side of Boulder Valley.

4.1.3.2 Potential Effects

Potential impacts on terrestrial species and their habitat could occur from both temporary construction activities and the permanent presence of project features. Each of the project alignments could result in potential permanent impacts on terrestrial species by conversion of associated vegetated habitat into railway, railway embankments, and ROWs (Ouédraogo et al. 2020). Potential construction impacts could occur from land clearing, excavation, grading, and fill placement activities that permanently remove, fill, or otherwise change existing upland terrestrial habitats. Terrestrial habitat could also be fragmented by construction and development of linear rail lines; however, the rail embankment would be unlikely to create a barrier to the movement of terrestrial wildlife. Additionally, construction and future operation of the rail lines could result in potential temporary or permanent displacement of wildlife species within the rail alignment corridors and could potentially cause mortality of less mobile species, such as smaller mammals and reptilian species (Lucas et al. 2017).

Each of the project alignments could result in potential impacts on terrestrial species by increasing noise levels during project construction and future operation of the railway. Large mammals and other highly mobile species, such as birds and bats, are likely to exhibit avoidance behavior by relocating to other areas farther from transient and intermittent disturbances (Lucas et al. 2017) or by adapting to or otherwise ignoring disturbances altogether (Rytwinski and Fahrig 2012). Train trip frequency has also been found to be positively correlated with an increasing number of train collisions (Kusta et al. 2014), but the complex interrelation between life history characteristics, behavioral traits, and collision vulnerability of the terrestrial species that may occur in the study area are not well studied. However, regardless of the rail alignment, the project would result in a significant decrease in truck traffic in the project area, which would be anticipated to decrease traffic-related impacts on the same species and their habitats from noise and collisions.

4.1.3.3 Comparison of Alignment

To compare potential project impacts of each of the alignment alternatives on terrestrial species and habitat, a composite habitat layer was created by combining all current Nevada Department of Wildlife (NDOW) spatial habitat map data occurring within the project area. To assess potential direct effects, the composite habitat layer was then overlaid with the disturbance footprint for the conceptual designs of each rail alignment. In general, site preparation, grading, and other project construction activities that may permanently remove or disturb terrestrial habitats would be restricted to this corridor area. Anticipated potential direct terrestrial habitat impacts areas for each alignment section are presented in Table 4-3. Terrestrial species that could utilize the NDOW habitats are listed in Section 4.1.3.1.

4.1.3.3.1 Boulder Segment

The Boulder Creek Segment is located within the Boulder Valley and is generally located parallel to Boulder Creek. Each of the proposed Boulder alignments overlap with NDOW grassland and

meadows, intermountain cold desert shrub, and sagebrush mapped habitat spatial data areas. The Private Land Avoidance West Alignment would overlap with the largest combined mapped NDOW habitat data areas (287.9 acres), and the Dunphy Road West Alignment would overlap with the smallest combined mapped NDOW habitat data areas (204.45 acres).

4.1.3.3.2 Crescent Segment

The Crescent Segment is located within the Crescent Valley. Each of the proposed Crescent alignments overlap with NDOW grassland and meadows, intermountain cold desert shrub, and sagebrush mapped habitat spatial data areas. The Trailblazer Alignment would overlap with the largest combined mapped NDOW habitat data areas (1,234.6 acres), and the Spa Road Alignment would overlap with the smallest largest combined mapped NDOW habitat data areas (377.5 acres). Additionally, the Trailblazer Alignment is the only alignment that overlaps with mapped NDOW cliffs and canyons habitat spatial data areas (5.1 acres), which may provide suitable bat roosting and bird nesting habitat.

Table 4-3
Terrestrial Species Habitat Disturbance by Alignment Section

Alignment	Permanent Habitat Disturbance by Type (acres)					
	Cliffs and Canyons	Grasslands and Meadows	Intermountain Cold Desert Shrub	Lower Montane Woodlands and Chaparral	Sagebrush	Total
Boulder Segment						
Private Land Avoidance West	0.0	80.6	75.5	0.0	131.7	287.9
Private Land Avoidance East	0.0	58.1	76.7	0.0	124.9	259.6
Private Land Avoidance Rhoads	0.0	47.0	71.7	0.0	88.2	206.9
Solar Bypass West	0.0	66.5	34.5	0.0	112.4	213.3
Dunphy Road East	0.0	46.0	53.6	0.0	106.9	206.5
Dunphy Road West	0.0	55.2	53.3	0.0	96.0	204.5
Crescent Segment						
Private Land Avoidance	0.0	118.2	199.4	0.0	79.7	397.2
Crescent Valley Bypass East	0.0	5.1	271.9	0.0	117.4	394.4
Crescent Valley Bypass West	0.0	16.6	223.5	0.0	153.1	393.2
Frenchie Road Direct	0.0	161.4	198.3	0.0	78.7	438.3
Frenchie Road Switchback	0.0	137.6	193.1	0.0	84.2	414.9
Hot Springs Bypass	0.0	131.4	182.5	0.0	76.6	390.5
Spa Road	0.0	116.3	169.1	0.0	92.0	377.5
Trailblazer	5.1	91.5	97.9	0.0	1,040.0	1,234.6

4.1.4 Aquatic Species and Habitat

4.1.4.1 Baseline Conditions

Aquatic species are defined as plants or wildlife that are reliant on water for all or part of their habitat needs. Within the project area, potential aquatic habitats are limited to areas having surface

water, such as streams, lakes or ponds, wetlands, or that are fed by springs or other groundwater sources. Examples of vegetation within riparian areas around aquatic resources include Nevada Fremont cottonwood (*Populus fremontii*), quaking aspen, willows (*Salix* spp.), greasewood, white sagebrush (*Artemisia ludoviciana*), serviceberry (*Amelanchier* spp.), milkweed (*Asclepias* spp.), cattail (*Typha* spp.), and grasses such as alkali sacaton (*Sporobolus airoides*), and scratch grass (*Muhlenbergia asperifolia*) (USDA 2024; iNaturalist 2024).

Aquatic and riparian vegetation communities within the project area provide habitat for a wide variety of wildlife species, including many of the terrestrial species listed in Section 4.1.3 but may also provide habitat necessary for aquatic species such as fish, including Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*), Lahontan redbreast (*Richardsonius egregius*), Tui chub (*Siphateles bicolor*), and mountain sucker (*Catostomus platyrhynchus*); amphibians such as Great Basin spadefoot (*Spea intermontana*) and western toad (*Anaxyrus boreas*); and invertebrates such as springsnails (*Pyrgulopsis* spp.) (iNaturalist 2024).

4.1.4.2 Potential Effects

Temporary construction activities and the presence of project features could result in potential short-term impacts on aquatic species and their habitat. Although no direct conversion of streams or rivers to railway infrastructure would occur, construction within wetlands and riparian areas would require land clearing, excavation, grading, and fill placement. Project construction near or over aquatic environments could also introduce temporary disturbances. These may include temporary noise impacts, potential sediment runoff, or short-term habitat disruptions during land clearing, excavation, grading, and fill placement. Waterway crossings would primarily utilize bridges and trestles to avoid direct impacts on aquatic habitat. If a culvert were used to cross a small waterbody instead of a bridge or trestle, some modification of the aquatic environment could occur, though connectivity and flow would be maintained, and aquatic habitat fragmentation would not occur. Additionally, temporary disturbances from construction activities and ongoing rail operations could result in displacement of some wildlife species within the corridor, with potential localized effects on less mobile species such as small mammals, reptiles, and amphibians. However, these impacts are unlikely to occur and would be avoided, minimized, or mitigated through project design, best management practices, and permit conditions.

Potential impacts on species and riparian habitat could occur from both temporary construction activities and the permanent presence of project features. Each of the project alignments could result in impacts on species by conversion of associated wetland or riparian vegetated habitat into railway, railway embankments, and ROWs. Potential construction impacts could occur from land clearing, excavation, grading, and fill placement activities that permanently remove, fill, or otherwise change existing wetland or riparian habitat. Wetland and riparian habitat could also be fragmented by construction and development of linear rail lines; however, the rail embankment would be unlikely to

create a barrier to the movement of wetland and riparian wildlife. Additionally, construction and future operation of the rail lines could result in displacement of wildlife species within the rail alignment corridors and could potentially cause mortality of less mobile species, such as smaller mammals, amphibians, and reptilian species (Lucas et al 2017).

4.1.4.3 Comparison of Alignments

No direct long-term aquatic habitat impacts on rivers or streams are anticipated to occur; however, each alignment would result in a number of stream crossings. To estimate potential impacts of each alignment alternative on riparian habitat, the disturbance footprint for the conceptual designs for each of the rail alignments was overlaid with U.S. Geological Survey (USGS) D3 3D National Hydrography Program riparian habitat and lake data. In general, site preparation, grading, and other project construction activities that may permanently remove or disturb riparian habitat would be restricted to this corridor area. Stream crossings and riparian areas overlapped by alignments are presented in Table 4-4.

Table 4-4
Aquatic and Riparian Habitat Disturbance by Alignment Section

Alignment	Aquatic Habitat Disturbance (No. of Waterway Crossings)	Riparian Habitat Disturbance Area (acres)
Boulder Segment		
Private Land Avoidance West	15	0.0
Private Land Avoidance East	13	0.0
Private Land Avoidance Rhoads	12	0.0
Solar Bypass West	16	0.0
Dunphy Road East	10	0.0
Dunphy Road West	12	0.2
Crescent Segment		
Private Land Avoidance	40	0.0
Crescent Valley Bypass East	29	0.0
Crescent Valley Bypass West	34	1.1
Frenchie Road Direct	42	0.0
Frenchie Road Switchback	41	0.0
Hot Springs Bypass	41	0.0
Spa Road	41	0.0
Trailblazer	48	5.0

4.1.4.3.1 Boulder Segment

Only the Dunphy Road West Alignment would overlap with any riparian habitat areas (0.2 acre). For a comparison of stream crossings, see Section 4.1.2.3.1 of this report.

4.1.4.3.2 Crescent Segment

The Trailblazer Alignment would overlap with the largest estimated riparian habitat areas (5.0 acres). The only other alignment that would overlap with riparian habitat is the Crescent Valley West Bypass (1.1 acres). For a comparison of stream crossings, see Section 4.1.2.3.2 of this report.

4.1.5 Threatened and Endangered Species

4.1.5.1 Baseline Conditions

Special status species include species that are protected federally under the Endangered Species Act (ESA) and by the State of Nevada (endangered, threatened, protected, or priority species).

Threatened and endangered species listed under ESA that overlap with the project area are identified using the U.S. Fish and Wildlife Service (USFWS) information for Planning and Consultation (iPaC) database (USFWS 2024) and species listed by the State of Nevada are identified under Nevada Administrative Code (NAC) 503.030 (protected, threatened, and sensitive mammals), NAC 503.050 (protected, threatened, and sensitive birds), NAC 503.065 (protected, endangered, and threatened fish), NAC 503.075 (amphibians), and NAC 503.080 (reptiles). The project area overlaps with the distribution and suitable habitat for Lahontan cutthroat trout, monarch butterfly (*Danaus plexippus*), and Suckley's cuckoo bumble bee (*Bombus suckleyi*), which are listed as threatened, proposed threatened, and proposed endangered under the ESA, respectively (USFWS 2024). In addition to federal ESA-listed species, the project area overlaps with habitat and distribution of several species protected by the State of Nevada. Table 4-5 summarizes special status species that may be present in the project area.

Table 4-5
Federal and State of Nevada Special Status Wildlife Species that May Occur in the Project Area

Common Name	Scientific Name	Federal Status	State Status
Mammals			
Dark kangaroo mouse	<i>Microdipodops megacephalus</i>	BLM-listed ¹	Protected ²
Pale kangaroo mouse	<i>Microdipodops pallidus</i>	BLM-listed	Protected
Pygmy rabbit	<i>Brachylagus idahoensis</i>	BLM-listed	SGCN
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	Not listed	Protected
Fringed bat	<i>Myotis thysanoides</i>	BLM-listed	Protected
Pallid bat	<i>Antrozous pallidus</i>	BLM-listed	Protected
Spotted bat	<i>Euderma maculatum</i>	BLM-listed	Threatened ³

Common Name	Scientific Name	Federal Status	State Status
Townsend's Big-eared bat	<i>Corynorhinus townsendii</i>	BLM-listed	Sensitive ⁴
Western mastiff bat	<i>Eumops perotis</i>	Not listed	Sensitive
Western red bat	<i>Lasiurus blossevillei</i>	BLM-listed	Sensitive
Birds⁵			
Northern goshawk	<i>Accipiter gentilis</i>	BLM-listed	Sensitive
Greater sage grouse	<i>Centrocercus urophasianus</i>	BLM-listed	Protected
Loggerhead shrike	<i>Lanius ludovicianus</i>	BLM-listed	Sensitive
Sage thrasher	<i>Oreoscoptes montanus</i>	BLM-listed	Sensitive
Brewer's sparrow	<i>Spizella breweri</i>	BLM-listed	Sensitive
Peregrine falcon	<i>Falco peregrinus</i>	BLM-listed	Endangered ⁶
Bald eagle	<i>Haliaeetus leucocephalus</i>	BLM-listed	Endangered
Fish			
Lahontan cutthroat trout	<i>Oncorhynchus clarkii henshawi</i>	Threatened, BLM-listed	Threatened
Amphibians			
Columbia spotted frog	<i>Rana luteiventris</i>	BLM-listed	Protected
Northern leopard frog	<i>Rana pipiens</i>	BLM-listed	Protected
Western toad	<i>Anaxyrus boreas</i>	BLM-listed	SGCN
Insects			
Monarch butterfly	<i>Danaus plexippus</i>	Proposed threatened, BLM-listed	Not listed
Suckley's cuckoo bumble bee	<i>Bombus suckleyi</i>	Proposed endangered	Not listed

Notes:

1. The project spans two BLM districts. Species are listed as special status in one of the two districts.
2. "Protected" means when a species or subspecies is classified as protected by the Nevada Board of Wildlife Commissioners pursuant to NAC 503.103.
3. "Threatened" is a designation under the ESA that means when a species or subspecies is likely to become an endangered species in the near future throughout all or a significant portion of its range .
4. "Sensitive" means when a species or subspecies is classified as sensitive by the Commission pursuant to NAC 503.104.
5. All species of wild birds are protected by the Migratory Bird Treaty Act, as amended, 16 *United States Code* §§ 703 et seq., and listed in 50 CFR § 10.13, unless such wild birds are migratory game or unprotected (house sparrow and European starling).
6. "Endangered" is a designation under the ESA that means when a species or subspecies is in danger of extinction throughout all or a significant portion of its range.

4.1.5.2 Potential Effects

Special status mammals that may occur in the project area include two species of kangaroo mouse (dark kangaroo mouse and pale kangaroo mouse) and seven species of bat (Brazilian free-tailed bat, fringed bat, pallid bat, spotted bat, Townsend's big-eared bat, western mastiff bat, and western red bat). None of the mammal species are federally listed under the ESA but are listed by the State of

Nevada as sensitive, protected, or threatened. Both species of mice are Bureau of Land Management (BLM) special status species, as are the pallid bat, spotted bat, Townsend's big-eared bat, and western red bat. Kangaroo mice inhabit dry desert areas with loose sand and gravel where they create burrows. Biological baseline surveys were conducted in the Boulder and Crescent valleys in 2021 and 2022. Suitable pygmy rabbit habitat exists within the project area, mostly near Cortez, but very few possible burrows were observed. No kangaroo mouse of either species or shrews were caught during trapping.

All bat species roost in caves, mines, trees, and along cliffs. The special status mammals may be affected by project activities through loss and fragmentation of suitable habitat, increased noise and disturbance during construction and operation, and potential mortalities associated with operation of trains through suitable habitat. Within the project area, there are no federal ESA-listed bird species; however, several species are State-listed as sensitive (northern goshawk, loggerhead shrike, sage thrasher, and Brewer's sparrow, among others), protected (GSG), or endangered (peregrine falcon and bald eagle) and may occur in the project area. These bird species are also BLM special status species. Extensive aerial (rotor-wing) raptor surveying was conducted throughout the Boulder and Crescent segment alignment areas by Stantec during the 2023 breeding season (Stantec 2023) and followed the protocol outlined by Pagel et al. (2010). The survey observations did not find nests for sensitive or endangered raptors such as northern goshawk, peregrine falcon, or bald eagle within close proximity to any of the alignment alternatives within the Boulder and Crescent segments. Species that prefer open grassland and sagebrush habitat, including loggerhead shrike, sage thrasher, Brewer's sparrow, and GSG, could be affected by construction and operation of the proposed project through loss of suitable habitat and disturbance to nesting sites if they were found to be located near the alignments.

Of the fish species potentially present within the project area, only the Lahontan cutthroat trout are listed on the federal ESA as threatened. This species is also a BLM special status species. Lahontan cutthroat trout distribution near the project area includes lakes and streams characterized by cool water, pools close to cover and velocity breaks, vegetated and stable stream banks, and rocky riffle habitat in Elko County.

There are no ESA-listed amphibians within the project area; however, the State-listed Columbia spotted frog, northern leopard frog, and western toad may be present within the project area. These species are also BLM special status species. The Columbia spotted frog occur in the Jarbidge, Independence, Ruby, and Toiyabe Mountains near perennial, clean lakes, ponds, streams, and marshes. The northern leopard frog is found in many types of habitats that have access to perennial waters, such as springs, streams, marshes, ponds, reservoirs, and lakes. During the nonbreeding season, they are found in grasslands, uplands, and shrublands. American bullfrog, an invasive species,

was the only amphibian observed during the baseline surveys. Western toad, although not observed in the project area during baseline surveys, is known to occur within large portions of the project area.

There are two insect species proposed for federal listing that may be present in the project area. The monarch butterfly was proposed for listing as a federally threatened species on December 12, 2024. The project area includes monarch butterfly summer breeding areas, and their potential presence is dependent on the presence of milkweed and flowering plants. The Suckley's cuckoo bumble bee was proposed for listing as a federally endangered species on December 16, 2024. There is still much unknown about the distribution of the Suckley's cuckoo bumble bee, but it has been found in various habitats including prairies, grasslands, meadows, agricultural fields, woodlands, and urban areas, many of which are present in the project area. Both the monarch butterfly and the Suckley's cuckoo bumble bee are BLM special status species. Although no special status butterflies were observed near the project area during the 2021 and 2022 baseline surveys, milkweed, the host plant of monarch butterfly, can occur in mesic areas throughout the project area.

4.1.5.3 Comparison of Alignments

The type and degree of sensitive species impact would vary within each of the rail segment project areas and would be influenced by factors such as the surveyed presence of species, distance from the proposed alignments to the nearest suitable habitat, and species life history characteristics and behaviors.

4.1.5.3.1 Boulder Segment

All Boulder Segment rail alignments directly overlap with areas mapped by NDOW as grasslands and meadows (Figure 23), which may provide suitable habitat for kangaroo mouse. None of the Boulder Segment rail alignments directly overlap with areas mapped as cliffs and canyons, which may provide suitable nesting habitat for birds and roosting habitat for bats, but areas along the northern portions of all alignments in this segment are within 1 mile of cliffs and canyons habitat.

All six Boulder Segment rail alignments include a northern terminus rail loop at the Goldstrike Mine, although proposed rail loop for the Private Land Avoidance Rhoads Alignment is located further to the northeast than the other alignments. The rail loop portion of the alignments is within 4 miles from a known, surveyed, and active GSG lek (ERM-West 2022). Per the BLM Disturbance Density Calculation Tool, the project-level disturbance area indicates projects could affect leks within a 4-mile radius. Sagebrush habitat is present along the northern portion of all Boulder Segment alignments and scattered throughout the southern end, which may provide suitable foraging habitat for GSG and other State-listed sensitive bird species (NDOW 2022).

There are no intermountain rivers or streams that overlap or cross alignment alternatives; however, there are several small seasonal and ephemeral streams within the project area (Figure 23). Due to the lack of springs or perennial flow in this portion of the project area, the presence of State-protected

fish or amphibian species is unlikely. There is no information regarding presence of milkweed, which would inform the potential impact to monarch butterfly; however, monarch butterfly and Suckley's cuckoo bumble bee are found in grasslands and meadows. All rail alignments overlap with grassland and meadow habitat in the center of the Boulder Segment (Figure 23). Additionally, at the northern extent of the Boulder Segment, the Private Land Avoidance West Alignment, Dunphy Road East Alignment, and Private Land Avoidance Rhoads Alignment overlap with grassland and meadow habitat (Figure 23) and may affect monarch butterfly and Suckley's cuckoo bumble bee.

4.1.5.3.2 Crescent Segment

Both the Crescent Bypass East and Crescent Bypass West alignments directly overlap with small areas mapped as grasslands and meadows in the northern portion of the alignment, which may provide suitable habitat for kangaroo mouse. The Trailblazer Alignment overlaps with cliff and canyon habitat and the alignment follows the base of the Cortez Mountains (Figure 22). Bats travel 6 to 18 miles from their roosting habitat to their feeding grounds each night. The Trailblazer Alignment stays within 1 to 4 miles of suitable bat roosting and bird nesting habitat within cliffs and canyons.

All alignments directly overlap with areas mapped as sagebrush (Figure 22), across suitable foraging habitat for GSG and other State-listed sensitive bird species. Per the BLM Disturbance Density Calculation Tool, the project-level disturbance area indicates projects could affect leks within a 4-mile radius. Six of the eight Crescent Segment alignments (Frenchie Road Direct, Frenchie Road Switchback, Hot Springs Bypass, Private Land Avoidance, Spa Road, and Trailblazer) share nearly identical paths in their southernmost portions, which bring them within 4 miles of a surveyed and active GSG lek (ERM-West 2022). The other two alignments (Crescent Valley Bypass West and Crescent Valley Bypass East) are within 4 miles of two leks—one documented as inactive and one that has not been recently surveyed.

No new bridge crossings will be built over the Humboldt River; therefore, there would not be any impact to Lahontan cutthroat trout or other fish and amphibian species State-listed as sensitive, protected, threatened, or endangered. There are additional intermountain streams crossings on the southern end of Frenchie Road Direct, Frenchie Road Switchback, Hot Springs Bypass East, Private Land Avoidance, Spa Road, and Trailblazer alignments (Figure 22). Other seasonal and ephemeral stream crossings occur along all alignments; however, due to the lack of springs or perennial flow in this portion of the project area, the presence of state protected fish or amphibian species is unlikely.

There is no information regarding presence of milkweed, which would inform the potential impact to monarch butterfly; however, monarch butterfly and Suckley's cuckoo bumble bee are found in grasslands and meadows. The northern portions of Frenchie Road Direct, Frenchie Road Switchback, Hot Springs Bypass, and Spa Road overlap with grasslands and meadows (Figure 22) and may affect monarch butterfly and Suckley's cuckoo bumble bee.

4.1.6 *Geology and Soils*

4.1.6.1 **Baseline Conditions**

The project location is within the arid to semi-arid Great Basin region, named for the basin and range geography prevalent in much of Nevada. Basin and range topography refers to the low basins at the valley floor and the mountain ranges that separate the valleys, often along fault boundaries. Basins within the project area are generally quaternary aged alluvium (commonly sandy soil) and playa or lacustrine deposits (commonly silty soil), whereas areas with greater topographic relief (ranges) are typically composed of rock. Range rock composition is generally Mesozoic or Cenozoic Era-aged metamorphic and volcanic rocks, although, within the project area, there are several areas with sedimentary and meta-sedimentary outcrops, as well as some older rocks dated into the Paleozoic Era (Ordovician Period) (Crafford 2007).

The rail alignments would primarily be located within basin areas, where terrain is generally more level; however, some alignments intersect the more mountainous range topography. The predominant soil types in the vicinity of the alignments are classified by Natural Resources Conservation Service as Aridisols (desert soils) and Entisols (shallow and/or shallow soils without clear layering); however, limited Mollisols (soils with high organic content) and Inceptisols (semi-arid weathered soils) (NRCS 2023) are common within stream drainage areas. Groundwater is generally prevalent in a range of depths in the Great Basin within basin-fill (soil) aquifers, although carbonate rock aquifers have been mapped in the vicinity of the project areas (Planert and Williams 1995).

Geologic hazard types present within the project area are generally limited to seismic-related hazards and landslides. Seismic hazards emanating from active fault contacts, which are numerous in the project area, include ground response or shaking resulting from locally or regionally occurring earthquakes, which may trigger lateral spreading, subsidence or displacement in areas proximal to the fault lines at which the earthquake has occurred, and/or seismically induced liquefaction in areas with susceptible soil types. Landslide hazards (such as debris flows, calving, or rock falls) are present in areas nearby to steeper slopes (>20 degrees) or in excavation and fill areas (such as slope-cuts). Landslide triggers may occur concurrently with earthwork or over a longer period of time as a result of weathering, precipitation, and erosion. Certain types of soils or characteristics of rocks may carry higher landslide risks and can vary within the project area, as can areas with recent wildfire activity; however, recently burned areas at risk for post-wildfire debris flows are uncommon in the project area. Seismic events (earthquakes) may also act as drivers in initiating landslides or rockfalls, and many alignments cross or are proximate to fault lines marked as active faults by the USGS (2022). The locations of historic landslides and potential landslide hazard areas (such as previously burned areas) may also increase potential for related impacts. Mapped slide or slide hazard locations do not generally intersect the alignments. Instead, landslide hazards are primarily attributed to earthwork,

such as over-steepened cut and fill slopes. A more detailed evaluation should be conducted for the selected alternative to understand the specific landslide and seismic hazard impacts.

4.1.6.2 Potential Effects

Each of the alignments considered will be affected by some combination of soil conditions and geologic factors. Earthwork required for alignment construction may require excavation and placement of materials for grade setting, embankment construction, or cutting and filling on slopes. Where geologic features or rock is encountered, blasting may be required to construct alignments. Imported crushed aggregate for fill or ballast materials will need to be sourced, generated, transported, and placed. Unsuitable soils, such as expansive soils, within an alignment may require over-excavation and haul-off prior to placement of imported aggregate material. Variations in the alignment grades, such as natural depressions, stream crossings, slope transects, or mounds, that occur along the alignment will require earthwork (cuts and fills), culverts or bridges (requiring construction of abutments), or other deep foundation elements, further adding to the amount of disturbed ground for each alignment. Furthermore, alignments that travel through steeper range areas, such as the Trailblazer Alignment in the Crescent Segment, could require tunnelling through varying types of rock units. Working in steep terrain will require additional considerations for landslides, rockfalls, and other excavation and construction work.

4.1.6.3 Comparison of Alignments

The anticipated impacts are based on the permanent disturbance footprint associated with the conceptual designs for each alignment. Although direct impacts from construction within the ROW are the primary method for the impact characterization, work performed within the ROW may impact areas outside of the ROW, such as large cut areas, which may increase landslide risks from slope areas adjacent to and/or outside of the ROW. Selected impacts for the Boulder and Crescent alignments are presented quantitatively in Table 4-6. The geotechnical report for the rail alignments (Terracon 2022) was used to plan grades for each alignment alternative and plan for the anticipated earthwork required for construction of each alignment. Cut and fill volumes correlate to earthwork required for each alignment, which can be attributed to overall, high-level impacts to the geography of each alignment. Cut and fill parameters are indicative of volumes of earthwork required to maintain individual alignment grades, additional potential haul-off of unsuitable materials, import of embankment and fill materials, and overall footprint of the alignment.

Table 4-6
Selected Impacts

Alignment	Total Earthwork (Cut+Fill cy)	Deepest Cut (feet)	Highest Fill (feet)	Grade Separations	Minor/Major Drainage Structures
Boulder Segment					
Private Land Avoidance West	4,916,400	89.5	36.6	0	25/1
Private Land Avoidance East	4,048,985	68.4	19.7	0	29/2
Private Land Avoidance Rhoads	2,371,023	16.3	22.4	0	39/2
Solar Bypass West	2,592,467	24.2	21.5	0	51/1
Dunphy Road East	2,557,473	24.2	21.5	0	30/1
Dunphy Road West	2,537,798	24.2	21.5	0	32/1
Crescent Segment					
Private Land Avoidance	3,830,240	21.9	10.6	0	175/12
Crescent Valley Bypass East	3,393,344	22.6	21	0	120/3
Crescent Valley Bypass West	4,582,656	45.6	11	0	83/1
Frenchie Road Direct	6,717,219	88.6	15.5	0	141/5
Frenchie Road Switchback	4,390,638	52.7	28.8	0	158/5
Hot Springs Bypass	2,934,692	30.5	22.5	0	125/8
Spa Road	3,906,605	79.1	41.8	0	134/10
Trailblazer	208,223,312	399	11.2	0	224/3

Grade separations and drainage structures listed per alignment are also indicative of overall impacts on soils and geology and are independent of each alignment. Grade separations, either as under- or overpasses to existing transportation infrastructure, may require tunnelling or bridges, such as large embankments and bridge abutments. Drainage crossings require additional earthwork fill volumes, imported embankment materials, and culverts or other drainage structures within existing natural drainage features (which also introduces increased erosion potential to each alignment), which all contribute to the overall impact of the alignment. Alignments requiring more grade separations, culverts, drainage structures, and larger cut and fill volumes would have greater potential impacts than alignments with fewer of these features. Existing geological hazards in the area were identified using data from the Nevada Bureau of Mines and Geology MyHazards Web Map (NBMG 2024). Existing geologic hazards considered for each alignment may be indicative of additional development impacts, where alignment structures or embankments will require mitigation for potential ground shake amplification, liquefaction, lateral spreading, subsidence, or landsliding. A rating of “no interaction” indicates that mapped or perceived geologic hazards were not observed to

interact with the ROW of the alignment. Geologic hazards may be identified at a later date during more detailed field analysis or exploration. The potential geologic hazards are presented in Table 4-7.

Table 4-7
Potential Geologic Interactions

Alignment	Type of Geologic Hazard Interaction
Boulder Segment	
Private Land Avoidance West	Fault crossing(s)
Private Land Avoidance East	Fault crossing(s)
Private Land Avoidance Rhoads	Fault crossing(s)
Solar Bypass West	No interactions
Dunphy Road East	Fault crossing(s)
Dunphy Road West	Fault crossing(s)
Crescent Segment	
Private Land Avoidance	Fault crossing(s)
Crescent Valley Bypass East	No interactions
Crescent Valley Bypass West	No interactions
Frenchie Road Direct	Fault crossing(s)
Frenchie Road Switchback	Fault crossing(s)
Hot Springs Bypass	Fault crossing(s)
Spa Road	Fault crossing(s)
Trailblazer	Fault crossing(s), landslide, rockfall

At a high level, the impact analysis for each alignment is driven by the quantitative combination of the volume of disturbance in the alignment with the additive factor of each alignment's interaction with potential geologic hazards.

4.1.6.3.1 Boulder Segment

Within the Boulder Segment, the Private Land Avoidance West Alignment would have the greatest amount of earthwork (4,916,400 cubic yards [cy]) and the Private Land Avoidance Rhoads Alignment would have the least (2,371,023 cy). The Solar Bypass West Alignment is the only alignment in the segment that would not interact with any mapped fault lines. Although this alignment does require more minor drainage structures than other alignments within the Boulder Segment, the reduction in the potential fault line interaction (subsidence, displacement) may reduce the overall environmental impacts.

4.1.6.3.2 Crescent Segment

On the Crescent Segment, the Valley Bypass East and West alignments are the only alignments that do not transect a mapped fault line. If other alignments that transect a mapped, active fault line

within the route are considered, a detailed characterization of the fault type and movement potential would be required to accurately determine the potential impact the feature would impose on the project. The Trailblazer Alignment would result in the greatest volume of earthwork (208,223,312 cy) and the Hot Springs Bypass would result in the least (2,934,692 cy).

4.2 Human Environment

4.2.1 *Transportation Systems*

4.2.1.1 Baseline Conditions

The existing railroads in the study are owned and operated by UPRR and generally extend east-west on the main line that spans Northern Nevada as part of an interstate system that links central California with Salt Lake City, Utah (UPRR 2024). The main transportation corridors for vehicle traffic in the study area include I-80, SR 278 and 306, and other minor statewide routes and rural roads, including the Old Victory Highway, Bush Street, Tomera Ranch Road, Rose-Ranch Beowawe Road, and Dean Dann Spa Road.

4.2.1.2 Potential Effects

Construction and operations of the proposed project would have a potential impact on the local transportation system, primarily at the road crossings during operations. Operations of the proposed rail project are not expected to create additional vehicular traffic and instead would be expected to reduce road congestion by eliminating the 480 truck trips per day between the mining site and the roasting facilities under existing conditions. Subsequently, with the elimination of truck trips, it is expected that there would be fewer traffic accidents in the region.

The project would result in multiple at-grade crossings amongst all segments. New at-grade road crossings for all alignments would be created and are summarized on Table 4-8. Any new at-grade crossings would be expected to cause delays for vehicular traffic when the train is using the crossing. The length of delay would vary depending on roadway traffic volume and train length and speed. The project is anticipated to result in one round-trip train per day (one loaded train and one unloaded train).

4.2.1.3 Comparison of Alignments

The planned number of new at-grade and separated-grade crossings for each alignment could affect traffic as a result of wait times at crossings during operations. Publicly available data from the Nevada Department of Transportation (NDOT 2024) and information developed by NGM was used to identify roads in the area. The number of crossings anticipated for the alignments in the Boulder and Crescent segments are presented in Table 4-8.

Railroad crossing safety signals would be installed at each at-grade crossing location. Railroad crossing safety signals include passive signs, which do not have moving parts or lights and are

generally used for roads with low volumes of vehicle traffic, or active signals, which are equipped with lights, gates, or bells and are used for roads with higher traffic levels. The type and placement of railroad crossing safety signals would vary and would be determined by the amount of vehicular traffic at the crossing and as recommended by the Federal Railroad Administration and Nevada Department of Transportation. Existing roads that would be affected by the proposed alignments and would be expected to require railroad crossing safety signals are summarized below.

Table 4-8
Summary of New At-Grade Crossing and New Grade-Separated Crossing of Proposed Alignments

Alignment	Number of New At-Grade Crossings	Number of New Grade-Separated Crossings
Boulder Segment		
Private Land Avoidance West	11	0
Private Land Avoidance East	11	0
Private Land Avoidance Rhoads	16	0
Solar Bypass West	4	0
Dunphy Road East	8	0
Dunphy Road West	6	0
Crescent Segment		
Private Land Avoidance	13	0
Crescent Valley Bypass East	24	0
Crescent Valley Bypass West	32	0
Frenchie Road Direct	17	0
Frenchie Road Switchback	15	0
Hot Springs Bypass	17	0
Spa Road	13	0
Trailblazer	22	0

4.2.1.3.1 Boulder Segment

None of the proposed alignments on the Boulder Segment are anticipated to result in new grade-separated crossings. Of all alignments on this segment, the Dunphy Road West Alignment would result in the fewest new at-grade crossings (four). Conversely, the Private Land Avoidance Rhoads Alignment would result in the most new at-grade crossings (16). The remaining alignments would require between 8 and 11 new at-grade crossings.

4.2.1.3.2 Crescent Segment

None of the proposed alignments on the Crescent Segment are anticipated to result in new grade-separated crossings. The Private Land Avoidance and the Spa Road alignments would require

the fewest new at-grade crossings (13). The Crescent Valley Bypass East Alignment would require the most new at-grade crossings (24).

4.2.2 *Noise and Vibration*

4.2.2.1 Baseline Conditions

Land in the region is primarily used for grazing, mining, and agriculture. The project area includes non-industrial and rural areas with low population density. The CDP of Crescent Valley is the most populated area near the project area, and there are other residences dispersedly distributed through the project area along the alignments. Existing human-generated sources of noise and vibration are the main transportation corridors, which include vehicle traffic on I-80, SR 306, and minor statewide routes, as well as from the existing UPRR. Other existing sources of noise include mining and agricultural activities near the rail alignments.

4.2.2.2 Potential Effects

The proposed rail project is expected to result in a temporary increase in noise and vibration during the construction of rail alignments and is expected to have a permanent increase in noise and vibration during operations, resulting from the noise generated by trains traveling along the rail line and the noise of train horns sounded at the location of at-grade road crossings. Generally, potential noise-sensitive receptors include residences, office buildings, resting places, hospitals, nursing homes, places of worship, libraries, schools, and day care centers. Sensitive receptors for vibration generally include masonry structures, vibration-sensitive equipment, and residential areas. For this analysis, sensitive noise and vibration receptors are limited to residential parcels because other potential sensitive receptors are not expected to be present within the screening distance for each alignment.

4.2.2.3 Comparison of Alignments

Geospatial analysis and publicly available data revealed that the study area includes non-industrial or rural areas with low population density, and it is primarily used for grazing, mining, and agriculture. A physical survey of the area necessary to confirm the presence of residential dwellings was not conducted. Rather, a desktop review of tax parcels using county parcel and tax assessor data was chosen as a proxy to identify potentially sensitive parcels (Eureka County 2024; Lander County 2024). A preliminary screening analysis was conducted to identify residential parcels within or intersecting 500 feet of the rail from the centerline for each alignment in the study area with a 1,000-foot total screening distance. The 1,000-foot screening distance represents a conservative estimate of nearby parcels that may contain sensitive noise and vibration receptors. Table 4-9 summarizes the number of residential parcels that are either within or intersecting a 500-foot screening zone around the proposed alignments. The specific number of individual receptors along any given alignment may differ from the number of residential parcels and would need to be verified through additional study.

Federal Railroad Administration regulations require trains to sound their horns when approaching a public at-grade crossing to warn motorists and pedestrians (49 CFR Part 222). Table 4-9 also identifies the number of at-grade crossings associated with each alignment where horn soundings would be expected. To identify at-grade crossings, publicly available data from the Nevada Department of Transportation (NDOT 2024) and information developed by NGM were used. The specific number of receptors that would experience impacts resulting from train horn noise would be verified through additional noise modelling.

Table 4-9
Residential Parcels Within 500 Feet of Alignments and At-Grade Crossings Required by Alignments

Segment – Alignment	Residential Parcels Within 500 Feet of Alignments	New At-Grade Crossings Where Train Horn Sounding Would Occur
Boulder Segment		
Private Land Avoidance West	0	11
Private Land Avoidance East	0	8
Private Land Avoidance Rhoads	0	16
Solar Bypass West	0	9
Dunphy Road East	0	8
Dunphy Road West	0	7
Crescent Segment		
Private Land Avoidance	2	12
Crescent Valley Bypass East	18	27
Crescent Valley Bypass West	55	19
Frenchie Road Direct	4	22
Frenchie Road Switchback	2	17
Hot Springs Bypass	4	13
Spa Road	6	14
Trailblazer	2	22

4.2.2.3.1 *Boulder Segment*

As summarized in Table 4-9, there are no residential parcels located within 500 feet of any of the proposed alignments on the Boulder Segment. The Private Land Avoidance Rhoads Alignment would result in the greatest number of new at-grade crossings (16) and the Dunphy Road West Alignment would result in the fewest (7).

4.2.2.3.2 Crescent Segment

On the Crescent Segment, the Private Land Avoidance Alignment, the Frenchie Road Switchback Alignment, and the Trailblazer Alignment would be located within 500 feet of the fewest residential parcels (two). The Crescent Valley Bypass West Alignment would be located within 500 feet of the greatest number of residential parcels (55) because of this alignment's proximity to the Crescent Valley CDP and other residential parcels located along State Route 306. The Crescent Valley Bypass East Alignment would result in the greatest number of new at-grade crossings (27) and the Private Land Avoidance Alignment would result in the fewest (12).

4.2.3 Energy

4.2.3.1 Baseline Conditions

Energy sources in the study area include energy commodities produced outside the study area and imported as electricity or liquid fuels. The study area has gas transmission pipelines and electricity transmission lines crossing and delivering energy to Elko, Eureka, and Landen Counties (PHMSA 2024).

Currently, ore transportation between the two mine sites and the processing facility is carried out by truck. Material transport by truck is known to contribute to energy consumption and results in higher emissions air pollutants and GHGs than rail transport, in terms of emissions per ton-mile.

4.2.3.2 Potential Effects

The proposed alignments can overlap with existing transmission lines, creating the potential for exposure, and crossing of overhead electricity lines and underground pipelines. It is expected that construction of the alignments would not disrupt the service provided by the existing overhead electricity lines. The potential for impacts on gas pipelines is greater during construction, which could require temporary relocation and service interruptions depending on the alignment's location and its impact footprint.

Construction of the project would require an increase in energy consumption to operate tools and equipment and to transport materials. As described in Section 4.1.6, Geology and Soils, earthwork will be required for alignment construction, which could require excavation and placement of materials for grade setting, drainage structures, blasting, embankment construction, or cutting and filling slopes. Fuel consumption is expected to temporarily increase during the operation of machinery performing these activities and from the transport of aggregate and other imported materials and tools. Although there would be short-term increases in energy consumption associated with construction of the track, the project would be expected to be more energy efficient in the near and long term.

During operations of the proposed rail project, gold ore from the Cortez Mine would be hauled to nearby processing facilities via train instead of hauling gold ore by truck, which is expected to result in one round-trip train per day (one loaded train and one unloaded train). Replacing current truck

operations with rail transport would reduce direct net operational fuel consumption because trains are generally more fuel efficient than trucks when measured by ton-miles per gallon (FRA 1991).

In general terms, energy consumption during operations of the proposed rail alignments includes locomotives fuel consumption and electricity for powering communications equipment and other rail-related equipment. Locomotive fuel consumption is directly related to track distance, trip frequency, and engine load. Because trip frequency would be the same for all alignments, alignment energy consumption can be ranked from least to highest according to the length and average engine load. Engine load is higher when trains are more heavily laden and when tracks change elevation and direction. Based on this, shorter, flatter, and more direct alignments would be expected to be more energy efficient, while longer, hilly, and winding routes would require more energy.

4.2.3.3 Comparison of Alignments

The primary driver of potential locomotive energy consumption is the length and terrain of each alignment, which affects the average engine load and results in variations of fuel consumption. Rail alignment alternatives were evaluated qualitatively based on length and terrain and are summarized in Table 4-10.

Potential impacts to energy services are quantitatively measured by the number of electricity transmission lines and gas transmission pipeline crossings. Gas pipeline crossings were identified using the Pipeline and Hazardous Materials Safety Administration public map viewer (PHMSA 2024) and survey information from NGM. Electrical transmission line crossings were identified through a review of aerial imagery. All alternatives would be expected to intersect with at least two electric transmission lines in all segments during construction and operations. Table 4-10 summarizes the number of gas pipelines and electrical transmission line crossings for each alternative. All alternatives would be expected to result in improvements to air quality and GHGs, to slightly varying degrees.

Table 4-10**Summary of Approximate Length and Transmission Line Crossings for Alignments**

Alignment	Locomotive Emissions		Electrical Transmission Line Crossings	Gas Pipeline Crossings
	Length (miles)	Terrain		
Boulder Segment				
Private Land Avoidance West	19.8	Very slight hill, 90° turn	4	1
Private Land Avoidance East	19.3	Slight hill, 90° turns	2	1
Private Land Avoidance Rhoads	20.8	Flat, 90° turns	2	1
Solar Bypass West	18.0	Flat, wider turns	3	1
Dunphy Road East	19.3	Flat, 90° turn	3	1
Dunphy Road West	19.3	Flat, 90° turn	3	1
Crescent Segment				
Private Land Avoidance	35.6	Flat, 100° turns	2	0
Crescent Valley Bypass East	33.9	Flat, 90° turns	2	0
Crescent Valley Bypass West	33.6	Slight hill, 90° turns	4	0
Frenchie Road Direct	36.6	Slight hill, 90° turns	2	0
Frenchie Road Switchback	36.8	Slight hill, <90° turns	2	0
Hot Springs Bypass	36.2	Flat, 90° turns	2	0
Spa Road	35.7	Flat, 100° turns	2	0
Trailblazer	39.0	Hills, wider turns	2	0

Energy consumption during construction-related activities for alignment in all segments would be expected to vary depending on the terrain conditions and the earthwork required. Additional considerations for terrain conditions and earthwork for alignments in each segment are further described in Section 4.1.6, Geology and Soils.

4.2.3.3.1 Boulder Segment

The Private Land Avoidance Rhoads Alignment is the longest alignment in this segment with an overall length of 20.8 miles. The Solar Bypass West Alignment is the shortest alignment in this segment, with an overall length of 18 miles. There is one gas pipeline that would be crossed by all alignments on the Boulder Segment, and there are low risks of utility service interruptions during construction or operations resulting from incidental crossings with electricity transmission lines. The Private Land Avoidance West Alignment would cross the most electrical transmission lines (four) and the Private Land Avoidance East Alignment and the Private Land Avoidance Rhoads Alignment would cross the fewest electrical transmission lines (two). During operations, it is expected that the Solar Bypass West Alignment would be the most energy efficient option because of its length and terrain,

as well as wider turns that could result in additional fuel savings from fewer speed variations needed during narrower turns (Laird and Mitchell 2004).

4.2.3.3.2 *Crescent Segment*

Alignments in the Crescent Segment range from 33.6 to 39.0 miles long. Depending on the alignment, the terrain varies from flat to hilly, with turns narrower than 90 degrees or wider than 100 degrees. There are no gas pipeline crossings on the Crescent Segment, and there are low risks of utility service interruptions during construction or operations resulting from incidental crossings with electricity transmission lines. During operations, the Trailblazer Alignment in the Crescent Segment would be expected to result in more energy consumption when compared to other alignments due to the length and uneven terrain of its trajectory, making it the least energy efficient option on the Crescent Segment. Alternatively, the Private Land Avoidance and the Crescent Valley Bypass West alignments would be expected to be the most energy efficient alignments during operations because of their combination of length, terrain, and turns. Other alternatives in this segment would be expected to result in marginally increased energy consumption when compared to the Private Land Avoidance and the Crescent Valley Bypass West alignments and are expected to result in less energy consumption when compared to the Trailblazer Alignment.

4.2.4 *Land Use, Recreation, and Visual Resources*

4.2.4.1 *Land Use and Ownership*

4.2.4.1.1 *Baseline Conditions*

Land in the region is primarily used for grazing, mining, and agriculture. The project area includes non-industrial and rural areas with low population density. The CDP of Crescent Valley is the most populated area within the study area, and there are other residences dispersedly distributed through the project area along the alignments. The project area includes a mix of private lands with multiple owners and public lands administered by the BLM Battle Mountain and Elko Districts. Based on geospatial analysis, there are no designated wilderness or conservation areas, Tribal-owned lands, or lands managed by the Bureau of Reclamation, the Forest Service, the Department of Defense, Department of Energy, or the Fish and Wildlife Services on or near the project area.

4.2.4.1.2 *Potential Effects*

The proposed alignments for each segment would result in temporary effects in privately owned and BLM-owned lands and would result in the permanent conversion of land uses within the project area footprint to a railroad to support project operations. Land conversion could require the acquisition of private parcels that are not owned by the applicant and would require the approval of a ROW authorization to build on public lands. The applicant will be responsible for administering their privately owned lands (including acquired lands) and the portions of their lands included in their ROW

authorization. A large percentage of the land in the study area has not been developed, and current land uses for developed parcels include residential, commercial, industrial, and agricultural. Therefore, the project would be expected to have temporary and permanent adverse effects in developed parcels within the project footprint and could influence development in adjacent parcels. Potential impacts on demographics and housing are explained in detail in Section 4.2.6, Socioeconomics.

4.2.4.1.3 Comparison of Alignments

The project area includes a mix of private lands with multiple owners and public lands administered by the BLM Battle Mountain and Elko Districts, and Table 4-11 summarizes the acreage of each type of land use for the parcels (or portions of parcels) that lie within the footprint of each alignment as determined using the BLM Surface Management Agency dataset (BLM 2023a)

Table 4-11
Total Area Land Uses within Alignment Footprints

Alignment	Total Privately Owned Lands (acres)	Total BLM-Owned Lands (acres)	Total (acres)
Boulder Segment			
Private Land Avoidance West	238	51	289
Private Land Avoidance East	223	36	259
Private Land Avoidance Rhoads	184	24	208
Solar Bypass West	183	35	218
Dunphy Road East	173	35	208
Dunphy Road West	171	35	206
Crescent Segment			
Private Land Avoidance	141	303	444
Crescent Valley Bypass East	145	236	381
Crescent Valley Bypass West	135	262	397
Frenchie Road Direct	186	266	452
Frenchie Road Switchback	142	327	469
Hot Springs Bypass	192	289	481
Spa Road	180	224	404
Trailblazer	163	1,106	1,269

4.2.4.1.4 Boulder Segment

Land on the Boulder Segment is primarily privately owned and managed. The vast majority of private land affected by alignments in the Boulder Segment is owned by NGM. The Private Land Avoidance West Alignment would result in the largest acreage of privately owned land affected (238 acres) and

the Dunphy Road West Alignment would result in the least amount of privately owned land affected (171 acres). The footprint for most alignments in the Boulder Segment would result in the conversion of 35 to 36 acres of public lands. The Private Land Avoidance West Alignment would affect the largest area of public land (51 acres), and the Private Land Avoidance Rhoads Alignment would affect the smallest area of public land (24 acres).

4.2.4.1.5 *Crescent Segment*

Alignments on the Crescent Segment have a larger footprint on public lands than on privately owned lands. The Crescent Valley Bypass West Alignment would have the least impact on privately owned lands (135 acres), and the Spa Road Alignment would have the least impact on public lands (224 acres). Although the different alignments have varying combinations of public and private land uses, the Hot Springs Bypass Alignment marginally has the most impacts on privately owned lands (192 acres), and the Trailblazer Alignment has a significantly larger footprint on public lands (1,106 acres) when compared to other alignments in this segment.

4.2.4.2 Recreation

4.2.4.2.1 *Baseline Conditions*

Land in the region includes dispersed recreation opportunities. Geospatial analysis revealed that there are no federal or state-designated parks and recreation areas or locally designated parks within the footprint for each alignment. South Fork State Recreation Area is the closest designated recreation area and is located approximately 35 miles from the Crescent Segment.

Public lands managed by the BLM generally provide recreational opportunities for outdoor activities. Examples of recreational opportunities in and around the project area include hiking, climbing, photography, sightseeing, and rock collecting (BLM 2023b). These activities generally occur in areas designated for recreation, privately owned lands, and lands open for public use. However, developed recreational opportunities are relatively sparse or non-existent around the project area, and there are no developed recreational facilities or BLM special planning designations within or in the proximity of surrounding the proposed alignments. Although BLM-managed public lands in the vicinity of the proposed project area are generally open for recreational use, mobility in these areas may be limited by adjacent privately owned lands or fencing in authorized mining areas to prevent the public from interfering with mining activities.

Trails are an important recreational and transportation resource in the study area. For this report, an officially recognized trail is defined as a trail located on a formally dedicated easement or on public land. The only officially recognized trail in the study area is the California National Historic Trail. The trail was designated in 1992 and extends to BLM-managed lands in California, Nevada, Oregon, Utah, and Wyoming. The segment of the trail that is in northern Nevada stretches across 700 miles of

BLM-managed land and offers auto-touring and educational programs. In addition, the BLM California Trail Interpretive Center was opened in 2012 along I-80 and over 30 miles away from the Crescent Segment alignments (BLM 2024).

Additionally, informal recreation on public lands also could occur throughout the study area but may not be included in currently available recreational databases. Informal recreation refers to activities that take place on public lands without a formal designation. An example of informal recreation activities is unofficial trails, which are defined as those trails that have no legal ROW instrument or recognition in trail plans.

4.2.4.2.2 Potential Effects

Officially recognized trails are the only formal recreational uses in the study area. Potential effects during construction include temporary closures of trail sections and detours for hikers while excavation, grading, or installation of rail lines take place. Other temporary impacts include exposure to noise, vibration, and visual disruptions to the trail route and scenery during construction activities. Potential long-term effects could include noise, vibration, and visual impacts from train operations when approaching or crossing the trail. Additionally, there could be permanent impacts on informal recreation from the acquisition of private lands and impacts on the portions of public lands that would be converted to rail. Although the portions of BLM lands that will be converted may not be primarily used for recreation, conversions and the ROW authorizations granted to the applicant could result in permanent disruptions on existing informal recreation activities could take place on these lands.

4.2.4.2.3 Comparison of Alignments

The comparison of alignments impacts focuses on existing trail crossings because officially recognized trails are the only formal recreational uses in the study area, and impacts on informal recreational uses are not currently available in recreational databases. Any crossings of trails would be at-grade crossings. The Boulder Segment alignments and the Crescent Segment alignments would not cross the California National Historic Trail or other officially recognized trails. A summary of trail crossings is summarized in Table 4-12.

Table 4-12
Summary of Trail Crossings

Alignment	Trail Crossings
Boulder Segment	
Private Land Avoidance West	0
Private Land Avoidance East	0
Private Land Avoidance Rhoads	0
Solar Bypass West	0
Dunphy Road East	0
Dunphy Road West	0
Crescent Segment	
Private Land Avoidance	0
Crescent Valley Bypass East	0
Crescent Valley Bypass West	0
Frenchie Road Direct	0
Frenchie Road Switchback	0
Hot Springs Bypass	0
Spa Road	0
Trailblazer	0

4.2.4.3 Visual Resources

4.2.4.3.1 Baseline Conditions

Visual resources include all objects and features that are visible on a landscape and that add or detract from aesthetic or scenic quality. Generally, the project area is within the arid to semi-arid Great Basin region and has a basin and range geography that contributes to the visual landscape. The rail alignments would primarily be located within basin areas, where terrain is generally more level; however, some alignments are near the more mountainous range topography.

Overall, the region has a rural character with a few dispersed small towns. Past and present activities within the areas of analysis have resulted in existing changes and permanent impacts to the viewshed. These include the existing utilities lines, infrastructure, livestock grazing, the UPRR, roads, and mining and exploration activities.

4.2.4.3.2 Potential Effects

Visual receptors in the project area may include residents, motorists, and recreationists within the viewshed of the proposed alignments in all three segments.

Generally, effects on visual resources for residents and recreationists are anticipated to intensify during the construction period with the introduction of vehicles to transport construction personnel, equipment, and materials and from additional sources of lighting used during construction activities. However, these effects are expected to be temporary.

Permanent visual effects would result from the introduction of rail lines, which are expected to add minor changes to the baseline conditions. During operations of the proposed rail project, train crossings would be expected to result in temporary effects experienced by the visual receptors. This would be expected to occur approximately two times per day, and the extent and duration of impacts would depend on the size of the train that would be crossing.

4.2.4.3.3 *Comparison of Alignments*

The comparison of the potential effects on visual receptors for each alignment used in this report is based on the proximity of each alignment to residential units. Residential parcels within a 500-foot radius were used as proxy in this analysis because they suggest the potential presence of visual receptors and are summarized in Table 4-13. Methods used to estimate the number of residential parcels are described in Section 4.2.2.3 of this report.

Table 4-13
Summary of the Number of Residential Parcels Within or Intersecting a 500-Foot Screening Zone of Proposed Alignments and Terrain

Alignment	Residential Parcels
Boulder Segment	
Private Land Avoidance West	0
Private Land Avoidance East	0
Private Land Avoidance Rhoads	0
Solar Bypass West	0
Dunphy Road East	0
Dunphy Road West	0
Crescent Segment	
Private Land Avoidance	2
Crescent Valley Bypass East	18
Crescent Valley Bypass West	55
Frenchie Road Direct	4
Frenchie Road Switchback	2
Hot Springs Bypass	4
Spa Road	6
Trailblazer	2

4.2.4.3.4 Boulder Segment

Alignments on the Boulder Segment would not be expected to cross within 500 feet of residential parcels.

4.2.4.3.5 Crescent Segment

On the Crescent Segment, the Trailblazer Alignment, the Private Land Avoidance Alignment, the Frenchie Road Switchback Alignment, and the Trailblazer Alignment would cross within 500 feet of the fewest residential parcels (2), and the Crescent Valley Bypass West Alignments would cross within 500 feet of the most residential parcels (55) because of this alignment's proximity to the Crescent Valley CDP and other residential parcels located along State Route 306.

4.2.5 Cultural and Tribal Resources

4.2.5.1 Baseline Conditions

The project area contains numerous cultural resources. The term "cultural resources" refers to the broad range of resources that represent or convey the heritage of a people or place or help tell the story of a region's past. A cultural resource can be considered any building, structure, object, site, landscape, or district associated with human manipulation of the environment. These resources are often valued by a particular group of people (monetarily, aesthetically, or religiously) and can be historic in character or date to the prehistoric past (i.e., prior to written records).

Three categories of cultural resources are discussed in this section: archaeological resources, historic resources, and culturally significant properties. Archaeological resources encompass features and deposits located on or below the ground surface that are evidence of prior human occupation or use in a particular area. Historic resources include elements of the built environment, such as buildings or structures, or human-made objects or landscapes. Finally, culturally significant properties are sites or locations considered culturally important to the history of a group or people, or where culturally important events or practices are known to have occurred.

4.2.5.2 Potential Effects

Effects on cultural resources occur when an undertaking directly or indirectly alters any characteristic of a resource that is listed in or eligible for inclusion in the National Register of Historic Places (NRHP). Potential adverse or negative effects are those that would diminish those characteristics that qualify a cultural resource as NRHP eligible. These could include direct effects resulting from construction or operational impacts, or they might also be reasonably foreseeable effects that could occur later in time, be farther removed in distance, or be cumulative.

Examples of adverse effects on cultural resources include, but are not limited to, the following:

- Physical destruction of or damage to all or part of the resource

- Alteration of the resource, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access that is not consistent with the U.S. Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR 68) and applicable guidelines
- Removal of the resource from its historical location
- Changing the character of the resource's use or of physical features within the resource's setting that contribute to its historical significance
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the resource's significant historical features
- Neglect of a resource, which causes its deterioration, except where such neglect and deterioration are recognized qualities of a resource of religious and cultural significance to an Indian Tribe or Native Hawaiian organization
- Transfer, lease, or sale of resources out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historical significance.

4.2.5.3 Comparison of Alternatives

A Class III cultural resources inventory was completed for portions of the project area in January 2022 and March 2023 by Summit Envirosolutions, Inc., for NGM (McQueen 2023; McQueen and Lafayette 2022). However, much of the project area, including proposed alignments, has not been studied, and no comprehensive cultural resources data exist for these areas. The 2022/2023 Class III cultural resources inventory studied a preferred railway route only and did not consider other alignments. The inventory identified a total of 233 resources in its study area, including 49 previously recorded archaeological sites, 86 newly recorded archaeological sites, 94 resources within previously surveyed areas, and at least four built environment resources. Six of the identified archaeological sites were found eligible for listing in the NRHP; one required further testing, and 128 sites were recommended or previously determined not eligible for the NRHP. Similar results would be expected from any additional cultural resources inventories conducted for the project for any of the proposed alignments.

Although the alignments might differ geographically, the environmental background, prehistoric/historical contexts, and expectations presented in the 2022/2023 Class III inventory reports would likely be the same or similar for each alternative, as would the potential to identify new or previously recorded cultural resources. It is also expected that the study areas for each alignment would be defined consistent with the 2022 Class III inventory, unless determined otherwise through consultation with the State Historic Preservation Office, Tribal governments, and other interested parties.

The project area has not been thoroughly surveyed, and it is likely that cultural resources—archaeological sites, historic resources, and culturally significant properties—exist in the project area that have not yet been identified. At present, the project's potential to affect cultural resources would

be considered the same for each alignment. Additional cultural resources inventories, including field investigations, of the alignments would be necessary for further analysis of the alignments; this effort would need to be conducted in consultation with the State Historic Preservation Office, Tribal governments, and other interested parties, pursuant to Section 106 of the National Historic Preservation Act (36 CFR 800).

4.2.6 Socioeconomics

4.2.6.1 Baseline Conditions

4.2.6.1.1 Demographics

The study area for this analysis is defined as the alignments and a half-mile buffer around each alignment. Demographic information for the census tracts intersecting the study area is described below and in Table 4-14. The demographic makeup of the state is also provided for reference.

Approximately 5,000 people live within the census tracts that intersect the study area, and there are approximately 2,692 households. Between 2010 and 2020, the populations of Census Tract 1 (Eureka County) remained approximately the same, indicating little to no population growth in the project area.⁵ The mean median household income within the census tracts intersecting the study area is \$86,339. Minority and low-income populations are further discussed in Section 4.2.6.4 and are presented in Table 4-14.

Table 4-14
Demographic Information

Geographic Area	Alignments that Intersect the Census Tract	Total Population	Total Households
Nevada	N/A	3,104,817	1,163,671
Census Tract 3.02, Lander County	Crescent Valley Bypass East, Central Valley Bypass West, Frenchie Road Direct, Frenchie Road Switchback	3,404	1,281
Census Tract 1, Eureka County	Private Land Avoidance East, Dunphy Road East, Dunphy Road West, Solar Bypass West, Trailblazer, Frenchie Road Switchback, Frenchie Road Direct, Hot Springs Bypass, Spa Road, Crescent Valley Bypass East, Crescent Valley Bypass West	1,622	570

Note:
Source: ACS 2022

⁵ Census Tract 3.02 in Lander County was created following the 2010 Decennial Census.

4.2.6.1.2 Housing

There are approximately 2,482 housing units in the census tracts that intersect the study area. Approximately 1,850 of these are occupied, 631 are vacant, and 53 are used for seasonal and recreational use. Table 4-15 provides a summary of housing units by census tract.

Table 4-15
Housing Information

Geographic Area	Segments that Intersect the Census Tract	Total Housing Units	Total Occupied	Total Vacant	Total Seasonal and Recreational Use
Census Tract 3.02, Lander County	Crescent	1,485	1,281	204	5
Census Tract 1, Eureka County	Crescent and Boulder	997	570	427	48

Note:

Sources: ACS 2022; U.S. Census Bureau 2020

4.2.6.1.3 Economics

Major sectors of the economy in Eureka and Lander Counties include mining, agriculture, and the military. Employment and income data for each county is summarized in Table 4-16. Gold mining specifically is a major component of the regional economy. Around three quarters of the nation's gold production is in northeastern Nevada, and NGM is responsible for approximately 75% of the nation's gold production. Regional offices of global gold producing or mining infrastructure companies such as Barrick Gold Corporation, Newmont Mining, and Caterpillar can be found in Elko County (NNRDA 2024). The combined gross regional product of the extraction industry in these three counties surpasses two and a half billion dollars (Lightcast 2024a, 2024b, 2024c).

Table 4-16
Employment Information

Geographic Area	Total Population	Civilian Labor Force	Unemployment Rate	Median Household Income
Nevada	3,104,817	1,566,279	7.00%	\$71,646
Lander County	5,728	2,643	11.7%	\$92,388
Eureka County	1,622	579	0.0%	\$73,929

Note:

Source: ACS 2022

4.2.6.2 Potential Effects

Examples of impacts on demographics and housing could include the following:

- Inducing population growth or decline
- Inducing the need for new housing or displacing existing housing
- Reducing or increasing incomes or affecting businesses
- Substantially altering employment opportunities and patterns

Construction and operation of the proposed project is not expected to induce population growth or decline, regardless of which alignments are chosen. Construction activities may result in a short-term influx of construction workers, but this would be negligible and would not impact the demographic makeup, employment opportunities, or housing of the study area.

The objective of the project is to support operations at the NGM's mining facilities. Because NGM is an important part of the local economy, the project would provide a local economic benefit. Construction of the project would temporarily increase construction jobs. In the long term, the project objectives of alleviating road congestion, road accidents, GHG emissions, environmental concerns, and truck driver shortages could provide secondary benefits to the local economy.

4.2.6.3 Comparison of Alignments

For the comparison, the disturbance footprint for each alignment was overlaid with BLM Surface Management Agency data (BLM 2023a). None of the alignments under evaluation are expected to displace housing units. None of the alignments would bisect neighborhoods or subdivisions. All alignments would result in the conversion of some amount of private property to rail line. However, the majority of private property that would be converted is owned by NGM; thus, these impacts would not be considered a socioeconomic impact on the wider community. A summary of private property conversion is provided in Table 4-17 and described below.

Table 4-17
Summary of Private Property Conversion

Alignment	Private Property Converted (acres)
Boulder Segment	
Private Land Avoidance West	238
Private Land Avoidance East	223
Private Land Avoidance Rhoads	184
Solar Bypass West	183
Dunphy Road East	173
Dunphy Road West	171
Crescent Segment	
Private Land Avoidance	141
Crescent Valley Bypass East	145
Crescent Valley Bypass West	135
Frenchie Road Direct	186
Frenchie Road Switchback	142
Hot Springs Bypass	192
Spa Road	180
Trailblazer	163

Note:

Private property conversion is inclusive of property owned by NGM.

The areas of conversion of private property were determined based on where grading would occur. All of the alternatives are expected to result in some conversion of private property.

4.2.6.3.1 Boulder Segment

The Boulder Segment's Private Land Avoidance West Alignment would result in the most private property conversion in the segment (238 acres). The Dunphy Road West Alignment would result in the least conversion in the Boulder Segment (171 acres). However, the vast majority of private land affected by alignments in this segment is owned by NGM.

4.2.6.3.2 Crescent Segment

In the Crescent Segment, the Hot Springs Bypass Alignment would result in the greatest conversion of private property (192 acres). Most of the private land affected by the Hot Spring Bypass Alignment is owned by NGM. The Crescent Valley Bypass West Alignment would result in the least conversion (135 acres). However, nearly all private land affected by the Crescent Valley Bypass West Alignment is not owned by NGM. As noted above, private property conversion on land owned by NGM would not be considered a socioeconomic impact.

4.2.7 Air Quality and Greenhouse Gases

4.2.7.1 Baseline Conditions

Air quality is described as the concentration of pollutants in the atmosphere near ground level. This is regulated under the Clean Air Act, which has established NAAQS for several criteria air pollutants (CAPs). As of July 2024, USEPA lists all counties encompassing the project area, Eureka and Lander Counties in northeastern Nevada, as being in attainment with the NAAQS (Green Book 2024), indicating that ambient air pollutant concentrations in these counties are at levels in keeping with the protection of human health and well-being.

Currently, ore transportation between the two mine sites and the two processing facilities is carried out by truck. Material transport by truck is known to result in higher emissions of CAPs and GHGs than rail transport, in terms of emissions per ton-mile.

Current truck hauling operations from the Cortez facility to Gold Quarry results in GHG emissions of 26,741 tons carbon dioxide equivalent (CO₂e) per year and 35,057 tons CO₂e per year for transport to Goldstrike (Air Sciences 2022a).

4.2.7.2 Potential Effects

Replacing current truck operations with rail transport would reduce direct operational GHG emissions by 78%, from 61,798 to 13,820 tons CO₂e per year (Air Sciences 2022b). A similar reduction in CAP emissions would be expected due to the increased efficiency in moving cargo via rail.

Although there would be short-term GHG and CAP emissions increases associated with construction of the track, the project would be expected to benefit air quality and GHG emissions in the near and long term.

In general terms, the aspects of the rail alignment that would be expected to impact air quality and GHGs relate to the amount of fuel consumed by locomotives traversing the lines and increased emissions from on-road vehicles delayed by at-grade crossings.

For locomotive fuel consumption, the three factors to consider are track distance, trip frequency, and engine load. If trip frequency is similar across all alignment alternatives, then alignment alternatives can be ranked from least impact to highest impact according to the length and average engine load. Engine load is higher when trains are more heavily laden and when tracks change elevation and direction. Based on this, shorter, flatter, and more direct alignments would be expected to impact air quality and GHGs the least, and longer, hilly, and winding routes would impact them more, relatively.

When considering at-grade crossings and the impact on traffic, the length and frequency of train crossings as well as the average number of vehicles per minute at a given crossing are the factors to

consider. Crossing heavily trafficked sections of public highways at-grade results in more vehicle idling than infrequently traveled private roads.

4.2.7.3 Comparison of Alignments

Rail alignment alternatives were evaluated qualitatively based on length, terrain, and road crossings. Each alternative's impacts from locomotive emissions and vehicle idling emissions depend on these factors. This qualitative assessment is shown in Table 4-18. Overall, only minimal differences in air quality and GHG impacts would be expected between the various rail alignments within each segment. All alternatives would be expected to result in improvements to air quality and GHGs, to slightly varying degrees.

Table 4-18
Emissions-Related Assessment of Rail Alignments by Segment

Alignment	Locomotive Emissions		On-Road Vehicle Idling Emissions
	Length (miles)	Terrain	Crossings
Boulder Segment			
Private Land Avoidance West	19.8	Very slight hill, 90° turn	Private: 8; Public: 3
Private Land Avoidance East	19.3	Slight hill, 90° turns	Private: 9; Public: 2
Private Land Avoidance Rhoads	20.8	Flat, 90° turns	Private: 16; Public: 0
Solar Bypass West	18.0	Flat, wider turns	Private: 3; Public: 1
Dunphy Road East	19.3	Flat, 90° turn	Private: 6; Public: 2
Dunphy Road West	19.3	Flat, 90° turn	Private: 3; Public: 3
Crescent Segment			
Private Land Avoidance	35.6	Flat, 100° turns	Private: 9; Public: 4
Crescent Valley Bypass East	33.9	Flat, 90° turns	Private: 12; Public: 12
Crescent Valley Bypass West	33.6	Slight hill, 90° turns	Private: 8; Public: 24
Frenchie Road Direct	36.6	Slight hill, 90° turns	Private: 9; Public: 8
Frenchie Road Switchback	36.8	Slight hill, <90° turns	Private: 9; Public: 6
Hot Springs Bypass	36.2	Flat, 90° turns	Private: 9; Public: 8
Spa Road	35.7	Flat, 100° turns	Private: 9; Public: 4
Trailblazer	39.0	Hills, wider turns	Private: 8; Public: 7

5 Evaluation

Following a detailed comparative analysis of environmental, engineering, and land ownership considerations, NGM has identified the Private Land Avoidance Alignment as the preferred alternative for the Crescent Segment and the Private Land Avoidance Rhoads Alignment as the preferred alternative for the Boulder Segment. These selections are based on their ability to meet critical design and performance objectives while minimizing potential impacts on environmental resources and private lands not owned by NGM.

The Private Land Avoidance Alignment in the Crescent Segment offers a clear advantage over the other alternatives by substantially avoiding privately owned lands not already controlled by NGM. It would have the second lowest amount of privately owned lands affected after the Crescent Valley Bypass Alignment; however, all private land on the Private Land Avoidance Alignment is owned by NGM. This reduces potential complications related to land acquisition, permitting, and public opposition. The alignment meets all required engineering and operational design criteria and provides a direct, constructible route to the Cortez Mine. Although this alignment intersects more mapped wetlands and floodplains than some shorter alternatives, such as the Crescent Valley Bypass alignments, these differences are not significant when viewed in the broader context of project impacts. For example, several alignments with slightly lower wetland impacts—such as the Hot Springs Bypass and Frenchie Road Direct alignments—would result in greater disturbances to riparian habitat, greater private property conversion, more stream crossings, or proximity to sensitive resources such as active GSG leks and residential parcels. In contrast, the Private Land Avoidance Alignment is located within 500 feet of only two residential parcels—tied for the fewest of all Crescent alternatives—and avoids the densely populated Crescent Valley CDP entirely. It would also have the fewest at-grade crossings of any of the alignments in the Crescent Segment.

Similarly, the Private Land Avoidance Rhoads Alignment in the Boulder Segment demonstrates a strong overall benefit by fulfilling technical requirements for grade, curvature, and rail operations while minimizing impacts on wetlands, floodplains, habitats, and public roads. This alignment requires less earthwork than other alignments in this segment. Importantly, the Private Land Avoidance Rhoads Alignment avoids all mapped riparian habitat, would have the second lowest impact on wetlands and stream crossings, and has fewer utility line crossings than several other alignments. Of the other Boulder Segment alignments, only the Dunphy Road East Alignment would have a marginally lower impact on wetland impacts and both Dunphy Road alignments would have slightly lower impacts on floodplains, but the differences are not significant. These alignments would also cross up to three public roads and bisect the existing solar energy facility near the TS Power Plant and offer no other significant environmental advantage.

Taken together, the preferred alignments for both segments represent the most responsible and practical options. They reduce the need for acquisition of third-party private land, meet rigorous engineering standards, and offer a balanced environmental profile without introducing new or greater adverse impacts when compared to other alternatives. These alignments best align with NGM's project goals of delivering a safe, efficient, and environmentally sustainable rail solution.

6 References

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Figures













































