U.S. Department of the Interior
Bureau of Land Management

Rhyolite Ridge Lithium-Boron Project

Draft Environmental Impact Statement

DOI-BLM-NV-B020-2021-0020-EIS

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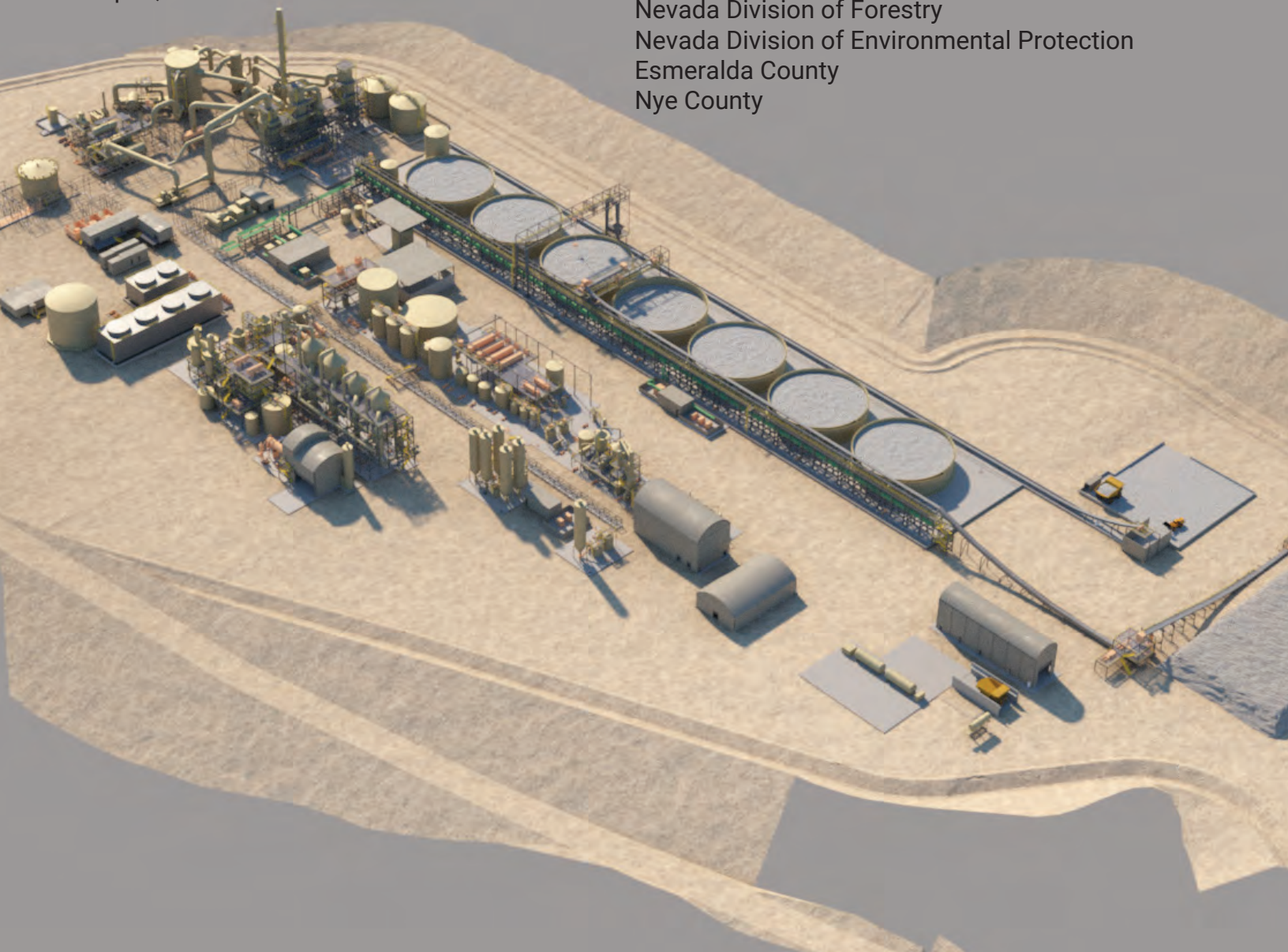
Bureau of Land Management
Battle Mountain District Office
Tonopah Field Office
1553 South Main Street
Tonopah, Nevada 89049

Cooperating Agencies:
United States Department of Energy
United States Environmental Protection Agency
United States Fish and Wildlife Service
Ecological and Migratory Bird Programs
Nevada Department of Wildlife
Nevada Division of Forestry
Nevada Division of Environmental Protection
Esmeralda County
Nye County



It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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List of Acronyms and Abbreviations

°F	Degrees Fahrenheit
µg/m^3	Micrograms Per Cubic Meter
AADT	Annual Average Daily Traffic
ACEPM	Applicant-Committed Environmental Protection Measure
AML	Appropriate Management Level
AMSL	Above Mean Sea Level
ANFO	Ammonium Nitrate Fuel Oil

AO	Authorized Officer
APE	Area of Potential Effects
ATV	All-Terrain Vehicle
AUM	Animal Unit Month
BBCS	Bird and Bat Conservation Strategy
BLM	Bureau of Land Management
BMP	Best Management Practice
BSSG	Bi-State Sage-Grouse
CEQ	Council on Environmental Quality
CESA	Cumulative Effects Study Area
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
ECP	Eagle Conservation Plan
EIS	Environmental Impact Statement
EPFZ	Emigrant Peak Fault Zone
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ET	Evapotranspiration
FLPMA	Federal Land Policy Management Act
FLVFZ	Fish Lake Valley Fault Zone
FPPC	Final Plan for Permanent Closure
GHG	Greenhouse Gas
GIS	Geographic Information System
gpm	Gallons Per Minute
H_2S	Hydrogen Sulfide
H_2SO_4	Sulfuric Acid
HA	Hydrographic Area
HAP	Hazardous Air Pollutant
HMA	Herd Management Area
HPTP	Historic Properties Treatment Plan
I-80	Interstate 80
Ioneer	Ioneer Rhyolite Ridge LLC
KOP	Key Observation Point
km	Kilometer
kV	Kilovolt
LWC	Lands With Wilderness Characteristics
MCF	McAfee Canyon Fault
mg/L	Milligrams Per Liter
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	Miles Per Hour
MSHA	Mine Safety and Health Administration
Mt	Million Tons
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966

NO_2	Nitrogen Dioxide
NOAEL	No Adverse Effect Level
NOx	Nitrogen Oxide
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NVAAQS	Nevada Ambient Air Quality Standards
NWI	National Wetland Inventory
OHV	Off-Highway Vehicle
OPA	Operational Project Area
OSF	Overburden Storage Facility
PAG	Potentially Acid-Generating
PAPE	Physical Area of Potential Effects
Plan	Plan of Operations
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Microns in Diameter
PM_{10}	Particulate Matter Less Than 10 Microns in Diameter
PMU	Population Management Unit
ppb	Parts Per Billion
Project	Rhyolite Ridge Lithium-Boron Project
RFFA	Reasonably Foreseeable Future Action
RMA	Resource Management Area
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
RV	Recreational Vehicle
SER	Supplemental Environmental Report
SHPO	State Historic Preservation Office
SIR	Supplemental Information Report
SO_2	Sulfur Dioxide
SOSF	Spent Ore Storage Facility
SR	State Route
TDS	Total Dissolved Solids
TFO	Tonopah Field Office
tpy	Tons Per Year
U.S.	United States
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
VRM	Visual Resource Management
VWP	Vibrating Wire Piezometer
WPCP	Water Pollution Control Permit
WSA	Wilderness Study Area
ZoA	Zones of Analysis

Executive Summary

Ioneer Rhyolite Ridge LLC (Ioneer) submitted the Plan of Operations (Plan) (NVNV106205338 [NVN 098058]) and Nevada Reclamation Permit Application for the Rhyolite Ridge Lithium-Boron Project (Project) to the Tonopah Field Office (TFO) of the Battle Mountain District Bureau of Land Management (BLM) (Ioneer 2022). The Project is located in the Silver Peak Range in Esmeralda County, Nevada. The BLM's surface management regulations at 43 Code of Federal Regulations (CFR) 3809 require that the BLM fulfill its obligation under the National Environmental Policy Act of 1969 (NEPA) by analyzing and disclosing the potential environmental impacts of the BLM's approval of the Project Plan. The BLM determined the level of analysis necessary for the Plan was an Environmental Impact Statement (EIS). The BLM TFO is serving as the lead federal agency for preparing the EIS in compliance with NEPA.

Proposed Action

Ioneer is proposing the construction, operation, reclamation, and closure of a surface quarry from which lithium and boron ore would be extracted using conventional quarrying techniques and associated facilities as Alternative A – Proposed Action (Proposed Action). The proposed Plan boundary would include 7,166 acres and consist of two components: the 6,369-acre Operational Project Area (OPA) and the 797-acre Access Road and Infrastructure Corridor. The Access Road and Infrastructure Corridor would include a portion of State Route (SR) 264 within the existing right-of-way (ROW) and the access road between SR 264 in the Fish Lake Valley and the OPA including the existing Hot Ditch Road and Cave Springs Road. Within the Plan boundary, there are approximately 7,137 acres of land administered by the BLM and approximately 29 acres of private land. The private land is located within the ROW corridor along SR 264.

The proposed life of the Project is approximately 23 years and includes the construction phase of approximately four years (Years 1 through 4), the quarrying phase of approximately 17 years (Years 1 through 17), the processing phase of 13 years (Years 4 through 17), and the reclamation and closure phase of 6 years (Years 18 through 23). Monitoring would continue, as necessary. The Proposed Action facilities include: quarry; processing facility; overburden storage facilities (OSFs); spent ore storage facility (SOSF); contact water ponds; batch plant, haul road, service roads; dewatering pipeline; stockpiles; explosives storage area; sewage system; public road realignment; communication towers and all-terrain vehicle trails; proposed monitoring locations and access; proposed water supply testing and facilities including pipelines; and resource exploration drilling and dewatering wells. The Proposed Action would create an additional 2,306 acres of surface disturbance on public land administered by the BLM and private land.

Alternatives

Alternatives Eliminated from Detailed Analysis

There were 57 additional alternatives related to quarry footprint, quarry backfill/infill, facilities placement, ore conveyance, sulfuric acid plan design, leaching, power supply and infrastructure, aggregate sourcing, haulage and traffic control, access road, water use, and mine law. These alternatives were either dismissed from detailed analysis as they were considered to either be not environmentally reasonable, not economically feasible, not technically practical, or a combination of these rationales, or portions of these alternatives were incorporated into either the Proposed Action or North and South OSF Alternative. Additional details regarding the alternatives considered but dismissed, as well as the rationale for dismissal, is provided in the Project Alternatives Supplemental Information Report for the Rhyolite Ridge Lithium-Boron Project (BLM 2024a).

North and South Overburden Storage Facility Alternative

Alternative B – The North and South OSF Alternative (North and South OSF Alternative) would be similar to the Proposed Action; however, the facility layout has been modified to reduce the footprint within the Tiehm's buckwheat (*Eriogonum tiehmii*) designated critical habitat (Ioneer 2023a). Placement of overburden material would occur in the North OSF, Quarry Infill OSF, and the additional South OSF. The West OSF and associated infrastructure would not be constructed under the North and South OSF

Alternative (Ioneer 2023a). Total surface disturbance under the North and South OSF Alternative would be approximately 2,271 acres, which would be approximately 35 acres less than the Proposed Action.

The capacities of the North OSF and the Quarry Infill OSF would be the same as the Proposed Action; however, the South OSF would be constructed to accommodate the remaining material. The design of the South OSF would be consistent with the OSF designs included in the Proposed Action including the average slope of 3H:1V. The haulage distance between the quarry and the South OSF would be similar to the distance between the West OSF and the quarry as configured in the Proposed Action. Additional differences include a higher output steam turbine generator (40 megawatts instead of the 35 megawatts for the Proposed Action), and reconfiguration of the quarry to minimize impacts, to the extent practicable, in Tiehm's buckwheat designated critical habitat while maintaining slope stability required during operations and addressing long-term slope stability needs for Tiehm's buckwheat subpopulations. Additional Applicant Proposed Conservation Measures and pollinator habitat reclamation would be conducted as described in the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b).

No Action Alternative

Under Alternative C – No Action Alternative (No Action Alternative), the Project would not be approved. The existing 15 acres of exploration disturbance (i.e., drill sites, monitoring sites, and access roads), under relinquished Notices (NVN-97202 and NVN-97262), has occurred on public lands administered by the BLM and would be reclaimed. No additional surface disturbance would occur.

Resource Impacts

Air Quality and Climate Change

Proposed Action: Total Hazardous Air Pollutant emissions would be 0.81 tons per year (tpy) for up to 17 years, and less emissions for six years of reclamation. PM, PM_{10}, and $PM_{2.5}$ emissions would be 2,899.97, 1,277.86, and 227.92 tpy, respectively, for up to 17 years, and less emissions for six years of reclamation. Nitrogen oxide, carbon monoxide, sulfur dioxide, volatile organic compound, hydrogen sulfide, and sulfuric acid emissions would be 156.69, 130.84, 82.42, 7.92, 2.84, and 24.41 tpy, respectively, for up to 17 years and less emissions for six years of reclamation. On-site greenhouse gas (GHG) emissions would be 471,589 tpy of direct and 24,429 tpy of indirect. Off-site GHG emissions would be 5,447.20 tons carbon dioxide equivalent for up to 17 years, and less emissions for six years of reclamation. Mercury emissions of 4.7×10^{-4} tpy for up to 17 years, and less emissions for six years of reclamation. There would be a maximum 8-hour impact of 0.69 parts per billion for ozone.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: Minor amounts of emissions from 15 acres of reclamation on existing disturbance.

Cultural Resources

Proposed Action: Up to 12 cultural resource sites would potentially be impacted by surface disturbance, with four additional cultural resource sites within 100 feet of disturbance. Up to 29 cultural resource sites would potentially be impacted by auditory, vibrational, and/or visual impacts. Sites would be avoided to the extent possible or mitigated.

North and South OSF Alternative: Impacts would be the same as the Proposed Action except 19 cultural resource sites would potentially be impacted by surface disturbance.

No Action Alternative: There would be no impacts to cultural resources beyond what is already occurring.

Environmental Justice

Proposed Action: Impacts to environmental justice populations of concern may include air quality, visual, noise, water, traffic, hazardous material transportation, and social and economic values. Impact could occur for up to 23 years.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: No disproportionate effects to an environmental justice population are anticipated.

Geology and Minerals

Proposed Action: There would be up to 2,306 acres of new surface disturbance of which 383 would be permanent. There would be permanent removal of 25 million tons (Mt) of lithium-boron ore from the quarry. Approximately 406 Mt of overburden would be removed, impacting future utilization of bedrock and/or unconsolidated mineral resources located under approximately 1,322 acres associated with the OSFs and SOSF Final slope configuration would result in a post-closure Factor of Safety close to or greater than 2.0, and 1.72 with the quarry lake. There is no anticipated significant damage to facilities for the life of the Project from faulting, and no subsidence is predicted to occur. About 80 percent of the overburden is classified as non-potentially acid generating and presents a low risk of acid rock drainage.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except there would be up to 2,271 acres of new surface disturbance of which 214 would be permanent. About 406 Mt of overburden would be removed, impacting future utilization of bedrock and/or unconsolidated mineral resources located under approximately 1,304 acres associated with the OSFs and SOSF.

No Action Alternative: Reclamation would occur on 15 acres of existing disturbance.

Hazardous Materials and Solid Waste

Proposed Action: There would be a diesel fuel release probability of 760 in 1,000 miles and 174.8 for each 230-mile transportation route from Las Vegas to the OPA and Reno to the OPA. There would be a corrosion inhibitor 3DT129 release probability of 30.5 in 1,000 miles and 7.0 for each 230-mile transportation route. There would be a liquid phosphate release probability of 25 in 1,000 miles and 5.8 for each 230-mile transportation route. Up to two loads of solid waste would be produced and shipped off site annually for up to 17 years.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: There would be limited potential for accidental spills or releases of hazardous materials during reclamation of 15 acres of existing surface disturbance.

Land Use and Realty

Proposed Action: Cave Springs Road (NVN 62084) and Argentite Canyon Road (N 54404) ROWs would be impacted from realignment to avoid Project features. Coordination with holders of ROWs, geothermal leases, and mining claims off Hot Ditch Road and in the OPA would be required for access. There would be up to 2,306 acres of new surface disturbance, of which 383 would be permanent. Approximately 559 acres of Tiehm's buckwheat designated critical habitat would be fenced with locked gates, with approximately 51 acres of Tiehm's buckwheat subpopulations fenced within.

North and South OSF Alternative: Impacts would be the same as the Proposed Action, except there would be up to 2,271 acres of new surface disturbance of which 214 would be permanent. Approximately 714 acres of Tiehm's buckwheat designated critical habitat would be fenced with locked gates.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Livestock Grazing

Proposed Action: There would be disturbance of 140 acres (83 that provide livestock forage) of the Red Spring Allotment, 2,145 acres (1,726 that provide livestock forage) of the Silver Peak Allotment, and 21 acres (none that provide livestock forage) of the Fish Lake Valley Allotment. This disturbance would result in impacts to four animal unit months (AUMs) in Red Spring Allotment, 72 AUMs in Silver Peak Allotment (15 of which would be permanent), and no impacts to AUMs in the Fish Lake Valley Allotment. Fencing of 559 acres (469 that provide livestock forage) of Tiehm's buckwheat designated critical habitat would impact an additional 20 AUMs in the Silver Peak Allotment. This could result in up to $9,639 in annual economic impacts from reduction of 96 BLM-permitted AUMs for up to 23 years. There could be potential impacts to livestock water sources at 32 surface water sites if sourced from the aquifer proposed for dewatering.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except there would be disturbance of 140 acres (83 that provide livestock forage) of the Red Spring Allotment, 2,110 acres (1,804 that provide livestock forage) of the Silver Peak Allotment, and 21 acres (none that provide livestock forage) of the Fish Lake Valley Allotment. This would result in impacts to four AUMs in Red Spring Allotment, 75 AUMs in Silver Peak Allotment (eight of which would be permanent), and no impacts to AUMs in the Fish Lake Valley Allotment. Fencing of 714 acres (587 that provide livestock forage) of Tiehm's buckwheat designated critical habitat would impact an additional 24 AUMs in the Silver Peak Allotment. This could result in up to $10,342 in annual economic impacts from reduction of 103 BLM-permitted AUMs for up to 23 years.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance. There would be no additional impacts to livestock grazing other than what is already occurring.

Native American Traditional Values

Proposed Action: Three areas of concern have been identified and would be avoided by the proposed layout through Project design. Vegetation communities and wildlife species important to Native American Traditional Values may be impacted. There could be impacts to water supply at 32 surface water sites (including Cave Spring) if sourced from the aquifer proposed for dewatering.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: No additional impacts to Native American Traditional Values would occur, and 15 acres of existing disturbance would be reclaimed.

Recreation

Proposed Action: There would be a total of 2,306 acres of surface disturbance of which 383 would be permanent. Up to 559 acres of designated critical habitat (including 51 acres of subpopulations) would be fenced from some recreational uses (e.g., off-highway vehicle [OHV] use). Hunting would be restricted from areas of surface disturbance or security fencing. There would be disturbance to 869 acres (58 permanent) of semi-primitive motorized recreational areas. There would be disturbance to 1,975 acres (383 permanent) of OHV use restricted land, including 944 acres (80 permanent) limited to existing roads and trails and closed to competitive events and 1,030 acres (286 permanent) limited to existing roads and trails. There would be disturbance to 331 acres (16 permanent) of non-restricted areas. Regarding Lands with Wilderness Characteristics (LWCs) and Wilderness Study Areas (WSAs), there would be surface disturbance to 426 acres (32 permanent) of LWC328 and 1,356 acres (224 permanent) of LWC338. The LWCs would still meet the 5,000 roadless acre criteria for the LWC designation. Some Project components would be visible from some areas of the Silver Peak WSA. There would likely be an increased human presence and demand for recreation resources and opportunities from an increased population in the area. There would also be increased noise, traffic congestion, fugitive dust and emissions from vehicle traffic, and lighting from vehicles and operation from additional recreationalists.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except there would be a total of 2,271 acres of surface disturbance (214 acres would be permanent). Up to 714

acres of Tiehm's buckwheat designated critical habitat would be fenced from some recreational uses (e.g., OHV use). There would be disturbance to 1,910 acres of OHV use restricted land including, 1,084 acres (154 permanent) limited to existing roads and trails and 826 acres (51 permanent) limited to existing roads and trails and closed to competitive events. There would be surface disturbance to 532 acres (28 permanent) of LWC328 and 1,158 acres (117 permanent) of LWC338. Some Project components would be visible from some areas of the Silver Peak WSA.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Social and Economic Values

Proposed Action: There would be a construction workforce of 500 people for four years, plus 113 indirect and induced jobs, and there would be a quarrying and processing workforce of 350 people for 14 years, plus 79 indirect and induced jobs. Additional employment would result in an annual calendar year direct labor income of $54,141,401 and annual calendar year indirect and induced labor income of $2,619,995 for construction, and annual calendar year direct labor income of $125,142,545 and annual calendar year indirect and induced labor income of $18,709,469 for quarrying and processing. The total estimated annual calendar year direct value added would be $102,788,237, and total annual calendar year indirect and induced value added would be $10,028,255 from construction. The total estimated annual calendar year direct value added would be $71,951,766, and total annual calendar year indirect and induced value added would be $7,019,778 from quarrying and processing. Total tax generation would be $25,069,752 annual calendar year (direct, indirect, and induced), including $11,819,628 annual calendar year in federal taxes, $4,183,588 in state taxes, $5,911,690 annual calendar year in county-level taxes, and $3,154,846 annual calendar year in sub-county special district taxes during construction. Total tax generation would be $17,548,826 annual calendar year (direct, indirect, and induced), including $8,273,740 annual calendar year in federal taxes, $2,928,511 annual calendar year in state taxes, $4,138,183 annual calendar year in county-level taxes, and $2,208,392 annual calendar year in sub-county special district taxes during quarrying and processing. There would be potential for increased property tax to Esmeralda County. Housing demand during construction would be 328 units during construction and 230 units during quarrying and processing. There would be an increased need for improvements/modifications to the public utilities infrastructure, and additional requirements for law enforcement, fire protection, and emergency medical services. There would be an increased demand for healthcare services and practitioners, as well as grocery stores, retail stores, and other convenience and commodity needs. Increased school enrollment in Dyer, Silver Peak, Tonopah, Hawthorne, and Bishop would be approximately 140 additional students during construction and 98 additional students during quarrying and processing, likely spread throughout these communities. Additional disturbance, employment, and traffic generation may impact social values and cultural landscapes in the nearby communities. The communities could expect to see increased use of facilities and public lands. Water rights secured or leased from current agricultural water users in the Fish Lake Valley could reduce the level of agriculture in the area. There could be impacts after closure including housing market and economic declines.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: There would be no additional taxes or economic activity gained.

Soil Resources

Proposed Action: There would be up to 2,306 acres of new surface disturbance of which 383 would be permanent. There could be potential impacts to biological soil crusts if present.

North and South OSF Alternative: Impacts would be the same as the Proposed Action except there would be up to 2,271 acres of new surface disturbance of which 214 would be permanent.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Threatened and Endangered Species

Proposed Action: For Bi-State Sage-grouse (BSSG) (*Centrocercus urophasianus*), there would be up to 1,064 acres (279 permanent) of potential habitat, and no disturbance to mapped habitat or proposed critical habitat. BSSG could potentially avoid the area from increased noise and human presence. Water sources could potentially be impacted if used by BSSG and if sourced from the aquifer proposed for dewatering. For monarch butterfly (*Danaus plexippus*), there would be up to 2,306 acres (383 permanent) of new surface disturbance of potential habitat that may support milkweed and nectar sources. Access road travel, construction activities, and operation could result in vehicle strikes or crushing of BSSG and monarch butterflies resulting in fatality. For Tiehm's buckwheat, there would be up to 354 acres (97 permanent) of surface disturbance to designated critical habitat. Up to 559 acres of designated critical habitat would be fenced, which includes the 51 acres of fenced subpopulations. There would be no direct disturbance to individuals or within the eight Tiehm's buckwheat subpopulations. Pollinator communities could be impacted by up to 2,306 acres of new surface disturbance of which 383 would be permanent. Surface disturbance could change overland flow patterns potentially affecting pollinator species communities or Tiehm's buckwheat designated critical habitat. Fugitive dust could impact Tiehm's buckwheat, Tiehm's buckwheat designated critical habitat, and pollinator species communities from reduced photosynthesis and decreased water-use efficiency.

North and South OSF Alternative: Impacts would be the same as the Proposed Action except for BSSG, there would be surface disturbance of up to 782 acres (135 permanent) of potential habitat. For monarch butterfly, there would be up to 2,271 acres (214 permanent) of new surface disturbance of potential habitat that may support milkweed and nectar sources. For Tiehm's buckwheat, there would be 197 acres (45 permanent) of designated critical habitat disturbed. Up to 714 acres of designated critical habitat would be fenced. Up to 2,271 acres of new surface disturbance of which 214 would be permanent. Impacts to pollinator communities if present. There would be less overland flow altercation in designated critical habitat and potentially less impacts from fugitive dust due to less disturbance proposed in designated critical habitat.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance. There would be no impacts to Tiehm's buckwheat or its designated critical habitat beyond what is already occurring.

Transportation and Access

Proposed Action: Approximately 4.7-miles of Cave Springs Road and 0.9-mile of Argentite Canyon Road would be realigned to avoid Project facilities. The realigned Cave Springs Road would have three new crossings with Project roads. There would be an additional estimated 186 to 248 vehicle passes per day during construction, an additional 230 to 288 vehicle passes per day during operations, and an additional 40 vehicle passes per day during closure on the access road. Traffic control systems on Cave Springs Road would temporarily stop public traffic at two autonomous haul road intersections to the processing facility and North OSF causing delays. A pilot car would guide the public through the OPA.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except there would be 1.2 miles of Argentite Canyon Road realigned and two new crossings with Project roads.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Vegetation Resources

Proposed Action: There would be up to 2,306 acres (383 permanent) of new surface disturbance of vegetation communities and ecological communities. Disturbance during construction, operation, and reclamation results in increased potential for establishment and spread of noxious species. There would be potential impacts to sagebrush cholla (*Opuntia pulchella*) and Tecopa birdbeak (*Cordylanthus tecopensis*) from fugitive dust or sedimentation. Because the extent of Mojave fishhook cactus (*Sclerocactus polyancistrus*) in the area is known, it could be impacted by disturbance. Plant species of ethnobotanical importance could be impacted by surface disturbance as well as fugitive dust.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except there would be up to 2,271 acres (214 permanent) of new surface disturbance of vegetation communities and ecological communities. One sagebrush cholla would be impacted by disturbance from the South OSF unless relocated. There would be 35 acres less surface disturbance, reducing the area where noxious weeds could become established, as well as reducing the total potential impacts to plant species of ethnobotanical importance.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance. Noxious and invasive weed species could establish if not managed properly.

Visual Resources

Proposed Action: From Key Observation Points (KOPs) 1, 2, and 4, there would be no conflict with the Visual Resource Management (VRM) Class IV objectives. From KOP 3, there would be no conflict with the VRM Class III objectives. Visible portions from the Silver Peak WSA (VRM Class I) are not anticipated to change the overall quality of views. Nighttime lighting could cause an urban sky glow over the OPA. The brightness of the lights and darkness of the nearly black background would create a strong contrast, and thus make the lights visible.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Water Resources

Proposed Action: There would be groundwater drawdown of up to 300 feet near the quarry, followed subsequently by groundwater recovery over a period of approximately 60 years. A 113-acre (surface size) quarry lake would form post-quarrying and after groundwater recovery. Nevada Division of Environmental Protection Profile III reference values in the quarry lake would be in exceedance for arsenic from 50 to 200 years post-closure, boron from five to 200 years post-closure, fluoride from five to 200 years post-closure, and molybdenum from five to 200 years post-closure. An ecological risk assessment indicated a low probability that risks to wildlife would occur based on the predicted water quality for the post-quarrying quarry lake. Impacts to 32 surface water sites are not anticipated because they are thought to be perched. If the springs are sourced from upwelling groundwater on the upgradient side of a low permeability fault zone, decreased amounts of spring flow may occur. A total of 2,306 acres of surface disturbance may cause erosion and sedimentation during construction and operation. Four surface water stock rights within the predicted 10-foot drawdown contour associated with the maximal drawdown prediction for the Proposed Action (SP-01, SP-03, SP-06, and SP-07), one surface stock water right, one groundwater stock right, and nine groundwater irrigation rights could be impacted by groundwater drawdown. There are no impacts predicted to groundwater quality because evaporation of the quarry lake would cause it to be a terminal sink.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action except a 110-acre (surface size) quarry lake would form, and 2,271 acres of surface disturbance may cause erosion and sedimentation during construction and operation.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Wetland and Riparian Resources

Proposed Action: There would be direct disturbance to up to 0.16 acre of wetlands within the Access Road and Infrastructure Corridor where the Fish Lake Valley Hot Springs cross the access road and 54.04 acres of riverine, 0.40 acres of freshwater emergent wetland, and 0.02 acres of freshwater pond National Wetland Inventory (NWI)-mapped wetlands. The riparian area near Chiatovich Creek could be impacted from the water supply pipeline.

North and South OSF Alternative: Impacts would be the same as the Proposed Action except there would be surface disturbance to 54.87 acres of riverine NWI mapped wetlands.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Wildlife Resources

Proposed Action: There could be impacts to water sources used by various wildlife species. Up to 32 surface water sites could have reduced or removed flow if sourced from the aquifer proposed for dewatering. One guzzler would be relocated away from Project features. Additionally, a quarry lake would form with a predicted low probability of risk to wildlife. Human presence and noise could cause wildlife avoidance and displacement in the area. Vehicles, vertical facilities, and lights may cause collisions, and there could be increased competition between wildlife species for available resources. Access road travel, construction activities, and operation could result in vehicle strikes or crushing of wildlife and/or burrows resulting in fatality. There would be removal of 2,306 acres (383 permanent) of avian nesting and foraging habitat and insect species, mammal species, and reptile/amphibian species habitat. There would be surface disturbance to 2,136 acres (383 permanent) of year-round mule deer (*Odocoileus hemionus*) habitat, 2,129 acres (383 permanent) of year-round desert bighorn sheep (*Ovis canadensis nelsoni*) habitat, 2,209 acres (381 permanent) of Brewer's sparrow (*Spizella breweri*) habitat, 1,065 acres (281 permanent) of pinyon jay (*Gymnorhinus cyanocephalus*) habitat, one acre of permanent disturbance to black-throated gray warbler (*Setophaga nigrescens*) habitat, and 2,306 acres (383 permanent) of potential habitat for Cassin's finch (*Haemorhous cassinii*), common nighthawk (*Chordeiles minor*), loggerhead shrike (*Lanius ludovicianus*), ferruginous hawk (*Buteo regalis*), and western burrowing owl (*Athene cunicularia*) habitat. Two golden eagle nesting territories are within one mile of proposed surface disturbance and/or two miles of quarry blasting. There would be removal of 2,306 acres (383 permanent) of potential golden eagle foraging habitat. There would be surface disturbance to 988 acres (96 permanent) of suitable soils for Botta's pocket gopher (*Thomomys bottae*) and desert kangaroo rat (*Dipodomys deserti*), and 1,039 acres (104 permanent) of suitable habitat for pale kangaroo mouse (*Microdipodops pallidus*). There would be surface disturbance to eight acres of potential habitat for California toad (*Anaxyrus boreas halophilus*) and western toad (*Anaxyrus boreas*), and potential impacts to habitat from sedimentation and fugitive dust. Potential impacts to water supply at 32 surface water sites (including Cave Spring) if sourced from the aquifer proposed for dewatering could impact Wong's springsnail (*Pyrgulopsis wongi*) and its associated habitat. Fish Lake Valley tui chub (*Siphateles bicolor* ssp. 4) and Fish Lake Valley pyrg (*Pyrgulopsis ruinosa*) habitat could be indirectly impacted from sedimentation and fugitive dust from use of the access road. There would be disturbance to three acres (one permanent) of cliff and canyon habitat and one acre (permanent) of pinyon-juniper habitat potentially used by bat species. The creation of a quarry lake may attract foraging bats, and the quarry walls could potentially provide bat roosting habitat. One adit would be removed from construction of the haul road.

North and South OSF Alternative: Impacts would be the same as described for the Proposed Action, except there would be removal of 2,271 acres (214 permanent) of avian nesting and foraging habitat and insect species, mammal species, and reptile/amphibian species habitat. There would be surface disturbance to 2,100 acres (214 permanent) of year-round mule deer habitat, 2,093 acres (214 permanent) of year-round desert bighorn sheep habitat, 2,019 acres (206 permanent) of Brewer's sparrow habitat, 902 acres (143 permanent) of pinyon jay habitat, 120 acres (eight permanent) of black-throated gray warbler habitat, and 2,271 aces (214 permanent) of potential habitat for Cassin's finch, common nighthawk, loggerhead shrike, ferruginous hawk, and western burrowing owl habitat. There would be removal of 2,271 acres (214 permanent) of potential golden eagle foraging habitat. There would be surface disturbance to 1,051 acres (99 permanent) of suitable soils for Botta's pocket gopher and desert kangaroo rat, and 1,113 acres (62 permanent) of suitable habitat for pale kangaroo mouse. There would be disturbance to nine acres (less than one permanent) of cliff and canyon habitat and 120 acres (eight permanent) of pinyon-juniper habitat used by bat species.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

Wild Horses and Burros

Proposed Action: Disturbance to 2,286 acres (383 permanent) of the Silver Peak Herd Management Area (HMA); however, the appropriate management level for the Silver Peak HMA is zero. Up to 559 acres of Tiehm's buckwheat designated critical habitat would be fenced, which includes the 51 acres of fenced subpopulations. There would be Increased traffic on the access road that could lead to fatalities or injuries to wild horses or burros from collisions. Effects from human disturbance and noise could reduce the areas in the HMA utilized by wild horses and burros, causing increased use in other portions of the HMA.

North and South OSF Alternative: There would be disturbance to 2,171 acres (214 permanent) in the Silver Peak HMA, and 714 acres of Tiehm's buckwheat designated critical habitat fenced.

No Action Alternative: Reclamation would be completed on 15 acres of existing disturbance.

1.0 Introduction

1.1 Introduction and General Information

Ioneer Rhyolite Ridge LLC (Ioneer) submitted the Plan of Operations (Plan) (NVN 098058) and Nevada Reclamation Permit Application for the Rhyolite Ridge Lithium-Boron Project (Project) to the Tonopah Field Office (TFO) of the Battle Mountain District Bureau of Land Management (BLM) in May 2020. Following review by the BLM, revised Plans were submitted in July 2020, August 2020, November 2021, January 2022, and July 2022 (Ioneer 2022). The Plan was accepted by the BLM in August 2020 and subsequently in August 2022. The Plan was submitted to comply with Title 43 Code of Federal Regulations (CFR), subpart 3809 (43 CFR 3809.401 et seq., as amended), State of Nevada regulations governing the reclamation of mined lands (Nevada Administrative Code [NAC] 519A.010-635). The 43 CFR 3809 regulations require that the BLM fulfill its obligation under the National Environmental Policy Act of 1969 (NEPA) by analyzing and disclosing the potential environmental impacts of the Project. In compliance with the NEPA, the BLM, is preparing an Environmental Impact Statement (EIS) to address potential effects from the development of the Project. The BLM TFO is serving as the lead federal agency for preparing this EIS.

The Project is located approximately 40 air miles southwest of Tonopah and 13 air miles northeast of Dyer (**Figure 1-1**) and includes the construction, operation, and closure of a new lithium-boron project. Note all figures referenced in this document are included in **Appendix A**. The Plan boundary encompasses approximately 7,166 acres, which consists of the 6,369-acre Operational Project Area (OPA) and the 797-acre Access Road and Infrastructure Corridor. There are approximately 7,137 acres of land administered by the BLM and approximately 29 acres of private land within the Plan boundary. Ioneer controls 299 lode mining claims and 310 mill sites within the Plan boundary (WestLand 2024).

The legal description of the Plan boundary is as follows: The OPA is in all or portions of Sections 19-23 and 26-35, Township 1 South, Range 37 East (T1S, R37E); and Sections 2-4 and 9-11, T2S, R37E, Mount Diablo Base and Meridian. The proposed Access Road and Infrastructure Corridor is in all or portions of Sections 13, 21-24, 28, and 33, T1S, R35E; Sections 4, 9, 16, 21, and 28, T2S, R35E; Sections 9, 10, 14-19, and 23-24, T1S, R36E; and Section 19, T1S, R37E, Mount Diablo Base and Meridian.

The United States (U.S.) Department of Energy, U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS) Ecological Branch and Migratory Bird Program, Nevada Department of Wildlife (NDOW), Nevada Division of Forestry (NDF), Department of Conservation and Natural Resources Sagebrush Ecosystem Technical Team, Esmeralda County, and Nye County are serving as cooperating agencies for the preparation and review of the EIS.

1.2 Purpose of and Need for the Action

The BLM's purpose is to respond to Ioneer's proposal as described in the Plan and to analyze the environmental effects associated with the proponent's Proposed Action and alternatives to the Proposed Action, consider reasonable alternatives, and develop and consider mitigation, when necessary, to lessen effects to environmental resources.

The BLM's need for the action is established by the BLM's responsibilities under Section 302 of the Federal Land Policy Management Act (FLPMA) and the BLM Surface Management Regulations at 43 CFR 3809, to respond to a request for a Plan for the applicant to exercise their rights under the General Mining Law of 1872 and to prevent unnecessary or undue degradation of public lands as a result of the actions taken to prospect, explore, assess, develop, and process locatable mineral resources on public lands.

1.3 Decision to be Made

The BLM's decision relative to this EIS will consider the following: 1) approval of the Plan to authorize the proposed activities without modifications or additional mitigation measures; 2) approval of the Plan with additional mitigation measures that the BLM deems necessary to prevent unnecessary or undue degradation of public lands; 3) approval of the Plan with one of the alternatives analyzed in the EIS; or 4)

denial of the Plan and associated activities if the BLM determines that the proposal does not comply with 43 CFR 3809 and 43 CFR 3715 regulations.

1.4 Conformance and Permits

The Proposed Action and alternatives shall be consistent with federal agency laws, regulations, plans, and policies, including: NEPA; Council on Environmental Quality (CEQ) Regulations (40 CFR parts 1500-1508); Department of the Interior NEPA Regulations (40 CFR part 46); BLM NEPA Handbook H-1790-1 (BLM 2008); FLPMA; Mining and Mineral Policy Act of 1970; Endangered Species Act (ESA) of 1973; Surface Management Regulations (43 CFR 3809); Use and Occupancy under the Mining Laws (43 CFR 3715); and BLM Manual Handbooks for Reclamation Standards (H-3042-1), Surface Management (H-3809-1), and Surface Management Bond Processing (H-3809-2). Public involvement for the Project, as required by 36 CFR 800.2(d)(3) would be fulfilled through the public scoping and comment periods for the NEPA analysis, as well as on-going government-to-government consultation with applicable Tribes.

1.4.1 Other Project Permits

Implementation of the Proposed Action would require authorizations from other federal, state, and local agencies with jurisdiction over certain aspects of the Project. The list of permits and authorizations that may be necessary for the Project are included in **Appendix B**. Ioneer is responsible for acquiring necessary permits and authorizations.

1.4.2 Land Use Plan Conformance

The Project is located on public lands within the administrative boundaries of the BLM Battle Mountain District, TFO (**Figure 1-1**). The Project would be in conformance with the Tonopah Resource Management Plan (RMP) (BLM 1997), the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (BLM 2015), the Land Use Plan Amendment for the Nevada and California Greater Sage-Grouse Bi-State Distinct Population Segment in the Carson City District and Tonopah Field Office (BLM 2016), NAC 519A.010, and Esmeralda County Public Lands Policy Plan (Esmeralda County 2013).

1.4.2.1 Tonopah Resource Management Plan

Public lands located within the BLM TFO boundaries are managed under the guidance of the Tonopah RMP, as amended, and Record of Decision (ROD). The Tonopah RMP ROD includes the following objective for locatable minerals (BLM 1997):

- To provide opportunity for exploration and development of locatable minerals such as gold, silver, copper, lead, zinc, molybdenum, etc., consistent with the preservation of fragile and unique resources in areas identified as open to the operation of the mining laws.

Standard operating procedures for locatable minerals include:

- BLM provides for mineral entry, exploration, location, and operations pursuant to the mining laws in a manner that 1) will not unduly hinder the mineral activities, and 2) assures that these activities are conducted in a manner which will prevent undue or unnecessary degradation of the public land.

- The Authorized Officer (AO) may require modifications of Plans of Operations to meet the requirements of the regulations and to prevent undue or unnecessary degradation of public land.

- Plans of Operations cannot be approved until Section 106 of the National Historic Preservation Act (NHPA), and Section 7 of the ESA, and the National Environmental Policy Act have been complied with.

- Reclamation of disturbed areas to meet BLM standards is required for all levels of activity: Casual Use, Notice, or Plan of Operations.

1.4.2.2 County Plans

The Project is within the jurisdictional boundaries of Esmeralda County. It is the responsibility of Ioneer to work with the county to demonstrate compliance with county plans and development code requirements. It is the responsibility of the counties to determine if the Proposed Action is in compliance with their master plan policies and development codes. Per CEQ regulations (40 CFR 1506.2(d)), the EIS shall discuss any inconsistency a project may have with any approved state, tribal, or local plan. While the EIS shall discuss any inconsistencies, NEPA does not require reconciliation (CEQ 2020).

Esmeralda County

The Esmeralda County Master Plan was formally adopted in 2011 (Esmeralda County 2011) and includes a Public Lands Policy Plan (Esmeralda County 2013) which provides the county's perspective on public lands policies and actions.

The Esmeralda County Public Lands Policy Plan emphasizes the county's support for, and dependence on, mineral resources development (Esmeralda County 2013). Specifically, the plan policy statement for mineral resources includes:

- Policy 7-1: Encourage the careful development and production of Esmeralda County's metal, mineral, and geothermal resources while recognizing the need to protect the environment and ecologic resources. Esmeralda County recommends Federal and State agencies take into consideration the potential economic or social impact of any proposed land management changes or natural resource related plans to the minerals industry, and on the citizens. Any economic impacts to the mineral industry directly impacts County tax revenues and County supported programs, such as the Esmeralda County School District. Therefore, Federal and State agency plans or management recommendations shall include a minerals and industry economic, social, and environmental impact description.

- Policy 7-3: Support State and Federal policies that encourage both large and small-scale mining and geothermal operations. Regulatory requirements, e.g., documentation, permitting, should be minimized and expedited in order to maintain the principles of the existing mining and leasing laws, including the Mining Law of 1872.

- Policy 7-5: Federal land management and state agencies should continue to enforce existing reclamation standards to ensure there is no undue degradation of the federally administered lands.

- Policy 7-6: Geothermal, mine, and exploration sites reclamation standards should be consistent with the best possible post site use for each specific area. Specific reclamation standards should be developed for each property rather than using broad based generic standards.

1.5 Issues and Comments

Issues identified during public scoping and internal scoping were documented in the Project scoping report (BLM 2023a). The issues relevant to the NEPA analysis are identified in **Table 1-1** with reference to the section where this issue is discussed in the Draft EIS.

Table 1-1 Issues Identified

Issues Identified During Scoping	Addressed
Air Quality	
How would air pollutants (including hazardous air pollutants [HAPs] and particulate matter [PM]) from on-site and off-site Project operations impact air, soil, and water resources?	Section 4.1
How would emissions be controlled, evaluated, and mitigated?	Sections 2.1.13 and 4.1
What would the Project's contribution be to carbon dioxide (CO_2) and other greenhouse gases (GHG)?	Section 4.1
How would emissions and dust impact Tiehm's buckwheat (*Eriogonum tiehmii*)?	Section 4.12

Issues Identified During Scoping	Addressed
Alternatives	
What are the environmental impacts of each alternative and why were some alternatives not evaluated in detail?	Section 2.4, **Appendix C**
What is the Environmentally Preferred Alternative and has BLM considered the No-Action Alternative?	Sections 2.3 and 2.5
Climate Change	
How would the Proposed Action and alternatives contribute to or be affected by climate change?	Section 4.1
Cumulative Effects	
How would cumulative effects be analyzed in the EIS?	Section 4.20
Cultural Resources	
How would the Proposed Action and alternatives impact the cultural resource sites identified within the analysis area? How would impacts to these sites be avoided, or mitigated?	Section 4.2
Environmental Justice	
How would the Proposed Action and alternatives disproportionately and adversely impact environmental justice populations in and connected to area?	Section 4.3
Environmental Protection Measures	
Would proposed applicant-committed environmental protection measures (ACEPMs) reduce Project-related impacts?	Sections 2.1.13 and 4.0
Are the proposed ACEPMs feasible and why were some not incorporated into the Project?	Sections 2.1.13 and 2.4
Geochemistry	
How would the Project impact surface water and groundwater quality from potentially acid generating (PAG) waste rock? How would these impacts be monitored for and mitigated?	Sections 4.16 and 4.21
Geotechnical Design and Stability	
Would the proposed quarry be stable? How would natural events affect the stability of the quarry?	Section 4.4
Hazardous Materials and Waste	
What is the potential for contamination of surface water and groundwater?	Section 4.5
Which controls and containment systems would be in place to collect leaks, contain spills, and handle/store hazardous waste?	Section 4.5
How would accidental releases be handled?	Section 4.5
Land Use	
How does the Project comply with applicable land use designations, the local Master Plan, and FLPMA?	Sections 1.4 and 4.6
Livestock Grazing	
How would the Project impact permitted Animal Unit Months and livestock access to grazing allotments?	Section 4.7
Mitigation	
What mitigation measures are necessary during quarrying, closure and post-closure, and which ones are the proponent, the BLM, or other agencies responsible for?	Section 4.21
What mitigation measures are required to minimize criteria air pollutant emissions, impacts to special status species, Tiehm's buckwheat, archaeological sites, and traditional cultural properties from the Project?	Section 4.21
How is long-term monitoring and management enforced?	Section 4.21
Native American Traditional Values and Consultation	
How would the Proposed Action and alternatives affect important tribal sacred or religious sites, settings, or other important tribal values or resources?	Section 4.8
Noise	
How would noise from the Project affect wildlife and other noise sensitive resources?	Sections 4.3, 4.9, and 4.18
Reclamation	
Is the reclamation plan sufficient?	Sections 2.1.11, 4.21

Issues Identified During Scoping	Addressed
Is the financial assurance and bonding sufficient?	Plan of Operations
What are the BLM and State regulators reclamation bonding requirements and how are funds ensured for the completion of reclamation and closure activities?	Plan of Operations
Recreation	
What impact would the Project have on recreation?	Section 4.9
Social and Economic Values	
How would the Proposed Action and alternatives affect local and regional social and economic conditions through jobs, tax revenues, and local and regional spending?	Section 4.10
How would the Proposed Action and alternatives affect demand on local and regional resources and services (e.g., housing, roads, health care, law enforcement)?	Section 4.10
How would the Proposed Action and alternatives affect the quality of life and non-market values of local and regional populations?	Section 4.10
Soil Resources	
What impact would the Project have on soils?	Section 4.11
Threatened and Endangered Species	
How would the Proposed Action and alternatives impact Tiehm's buckwheat?	Section 4.12
How would the Proposed Action and alternatives impact bi-state sage-grouse (BSSG) (*Centrocercus urophasianus*)?	Section 4.12
Transportation and Access	
How would the Proposed Action and alternatives impact existing highway infrastructure, local and regional traffic volumes, traffic patterns, and public access?	Section 4.13
Vegetation	
How would the Proposed Action and alternatives affect vegetation and vegetation communities through direct removal and from loss of surface water resources?	Section 4.14
How would the Proposed Action and alternatives affect special status plant species?	Section 4.14
Visual Resources	
How would the Proposed Action and alternatives affect visual resources in the Project area?	Section 4.15
Water Resources	
How would the Proposed Action and alternatives affect groundwater in Fish Lake Valley?	Section 4.16
What baseline data, monitoring and mitigation measures, and protocols and procedures would be used for monitoring throughout all phases of the Project?	Section 4.16
How would current drainage patterns across the Project area change under each alternative?	Section 4.16
How would any water contaminated from PAG waste rock or spills be captured or treated?	Section 4.16
How would the Project impact water-dependent wildlife, ecosystems, and local communities?	Section 4.16
What mitigation is required for surface water and groundwater quality?	Section 4.21
Wetlands and Riparian Areas	
How would the Proposed Action and alternatives affect wetlands, drainages, and riparian areas?	Section 4.17
Wildlife and Special Status Species	
How would the Proposed Action and alternatives affect raptors, including golden eagles (*Aquila chrysaetos*)?	Section 4.18
How would the Proposed Action and alternatives affect big game use in and movement through the Project vicinity?	Section 4.18
How would the Proposed Action and alternatives affect the availability and quality of habitat for terrestrial game and non-game species?	Section 4.18
How would impacts to surface water features impact terrestrial and aquatic wildlife?	Section 4.18
What mitigation is required to minimize impacts to wildlife including special status species?	Section 4.21
Wild Horses and Burros	
How would the Proposed Action and alternatives affect wild horses and burros?	Section 4.19

2.0 Alternatives

2.1 Proposed Action

Ioneer is proposing to construct, operate, and close a new lithium-boron project in the Silver Peak Range in Esmeralda County, Nevada. The description of the Proposed Action is summarized from the Plan (Ioneer 2022) and the *Project Alternatives Supplemental Information Report for the Rhyolite Ridge Lithium-Boron Project* (SIR) (BLM 2024a), unless otherwise specified. The life of the Project is approximately 23 years and includes the construction phase of approximately four years (Years 1 through 4), the quarrying phase of approximately 17 years (Years 1 through 17), the processing phase of 13 years (Years 4 through 17), and the reclamation and closure phase of six years (Years 18 through 23). Monitoring would continue, as necessary. Project facilities include a quarry; processing facility; West, North, and Quarry Infill overburden storage facilities (OSFs); spent ore storage facility (SOSF); contact water ponds; haul roads, service roads, and dewatering pipeline; stockpiles; explosives storage area; sewage system; batch plant; public road realignment; communication towers and all-terrain vehicle (ATV) trails; proposed monitoring locations and access; proposed water supply testing and facilities; and resource exploration drilling and dewatering wells.

The approximately 7,166-acre Plan boundary would consist of two components: the 6,369-acre OPA and the 797-acre Access Road and Infrastructure Corridor (**Figure 2-1**). There would be approximately 7,137 acres of land administered by the BLM and approximately 29 acres of private land within the Plan boundary. The Proposed Action would create an additional 2,306 acres of surface disturbance on public land administered by the BLM and private land. This includes approximately 35 acres of exploration disturbance in the OPA, 30 acres of disturbance for dewatering facilities in the OPA, and 20 acres of disturbance for water supply facilities in the Plan boundary. The 35 acres of proposed exploration disturbance in the OPA includes approximately three acres of existing authorized exploration-related disturbance conducted previously under Notices NVN-097202 and NVN-097262. The location of Project components are illustrated on **Figure 2-2**, and proposed surface disturbance by facility type is provided in **Table 2-1**.

Table 2-1 Proposed Action Surface Disturbance

Project Component	Area (acres)[1]	Comments
Quarry	201.5	Includes fence and water storage tanks. The total quarry would be 473.7 acres; however, 272.2 acres above the quarry rim would be occupied by the Quarry Infill OSF resulting in 201.5 acres of quarry.
Quarry Berm	19.1	200-foot-wide berm between the Quarry and the wash.
Processing Facility	82.6	Includes contact water pond, minimum 20-foot disturbance buffer, and diversion channels.
West, North, and Quarry Infill OSFs	947.3	Includes contact water pond, minimum 20-foot disturbance buffer, and diversion channels.
SOSF	373.9	Includes underdrain pond, minimum 20-foot disturbance buffer, and diversion channels.
Ponds	11.9	Includes the North and West OSFs contact water ponds, drainage, and access.
Haul Roads and Service Roads	101.7	Includes all haul roads and service roads with 20-foot disturbance buffer. Includes buckwheat exclusion area road reroute of 1,327 feet with a 10-foot disturbance buffer.
Stockpiles	30.0	Includes growth media stockpiles with minimum 20-foot disturbance buffer.
Explosives Storage Area	2.6	Includes explosive storage and area access road including 20-foot disturbance buffer.
Septic Leach Fields	10.0	Includes primary and reserve leach field for septic sewage management.
Communication Towers and ATV Trails	3.0	Includes Towers 3 and 4, and 40-foot disturbance buffer for access to monitoring locations. Towers 1, 2, and 5 would occur on surface disturbance footprints of other facilities.
Proposed Monitoring Locations and Access	3.8	Includes five proposed monitoring wells (0.5 acres each) and associated access routes with 40-foot disturbance buffer.

Project Component	Area (acres)[1]	Comments
Project Area Exploration	35	Includes phased exploration activities (access routes, drill sites with sumps), including approximately three acres of existing disturbance not within the Proposed Action footprint. No new exploration disturbance would occur in Tiehm's buckwheat designated critical habitat.
Water Supply Facilities	20	Includes access routes, wells, power, and pipelines to bring water from agricultural wells in Fish Lake Valley.
Dewatering Facilities	30	Includes access routes, drill sites with sumps, wells, power, and pipelines, and would not occur in Tiehm's buckwheat designated critical habitat.
Cave Springs Road Realignment (within OPA)	46.8	Includes 28-foot road width plus 60-foot disturbance buffer for existing and realigned segments within the OPA.
Argentite Canyon Road Realignment	1.6	Includes a 15-foot road width.
Buckwheat Exclusion Area Fence	1.5	Includes five-foot disturbance width, for 51 acres of Tiehm's buckwheat subpopulations fenced, referred to as the Buckwheat Exclusion Area.
Buckwheat Critical Habitat Fence	9.8	Includes 30-foot disturbance width, for 559 acres of designated critical habitat fenced. The 51 acres of Tiehm's buckwheat subpopulation fencing would occur within this area.
Yards	80.8	Includes general surface disturbance that does not require grading.
Fencing	0.0	All fencing, unless described for Tiehm's buckwheat, is located on other facility footprints, thus 0.0 acres of disturbance assumed.
Cave Springs Wash Berm	37.1	Includes a 100-foot disturbance buffer.
Diversion Ditches	60	includes a 60-foot disturbance buffer.
Access Road and Infrastructure (within the Access Road and Infrastructure Corridor)	192.7	Maximum of 100-foot disturbance buffer along the access road for 67,531 feet and 50-foot disturbance buffer along State Route (SR) 264 for 32,842 feet.
Batch Plant	3.2	To be used during construction.
Proposed Action Disturbance	**2,306**	Includes Proposed Action and existing disturbance.

[1] All areas include a minimum 20-foot disturbance width around the feature unless otherwise specified.

2.1.1 Quarry

A quarry (**Figure 2-3**) would be developed using conventional open pit quarrying methods to extract overburden and ore. The final configuration of quarry wall slopes would be within the 201.5-acre footprint, which includes a quarry adjustment zone developed to account for final adjustments of the quarry footprint for stability. The quarry would be excavated using 30-foot-high benches, except along those portions of the western wall of the quarry that have lower geotechnical stability. In these areas, a combination of quarrying on 10-foot high benches and the use of ground anchors would be used. In addition, at the end of quarrying, an additional backfill would be placed against the west quarry wall from the quarry floor to a height of at least 10 feet vertically above the ground anchors as a buttress to ensure long-term stability of the west quarry wall (Ioneer 2022). Geotechnical recommendations would be continually advanced and refined as more data are collected and actual excavation observations become available (EnviroMINE 2019).

The quarry would be developed using open cast quarrying methods that use heavy equipment (backhoe excavators/loaders/dozers/autonomous haul trucks) to remove overburden to the OSFs. Explosives would be used to fragment the rock to allow removal of overburden as well as the ore zone. Explosives would be stored on site in a secured fenced facility. There would be minimal blasting at the surface as no blasting would be required within the alluvium and/or lithium clay units. Following blasting, excavators would be used to extract the ore and overburden.

Development of the quarry is scheduled to be completed within approximately 17 years from initiation and would result in the quarrying of approximately 25 million tons (Mt) of lithium-boron ore and 406 Mt of overburden (including 23 Mt of lithium-rich clay).

2.1.2 Overburden Storage Facilities

The OSFs would be constructed within the valley west of the quarry (West OSF), the valley to the north of the quarry and the Cave Springs wash (North OSF), and in the southern and western portions of the quarry (Quarry Infill OSF) (**Figures 2-4** and **2-5**). The West OSF would contain a maximum of 120.7 Mt of overburden at a maximum overall height of 1,030 feet above existing ground surface. The North OSF would contain a maximum of 77 Mt of overburden at a maximum overall height of 700 feet above existing ground surface. The Quarry Infill OSF would contain a maximum of 208.3 Mt of overburden at a maximum overall height of 1,600 feet from the quarry floor. The OSFs would be constructed with 20-foot lifts separated by benches of sufficient width to maintain stacked inter-bench side slopes (between reclamation benches) of 3H:1V (Horizontal:Vertical).

The OSFs would be unlined facilities with underdrain systems consisting of foundation drainage collection piping and an inlet basin. Runoff from the facilities would be directed to and collected at lined contact water ponds. The OSF contact water ponds would be located downgradient of the facilities to capture runoff and seepage. Monitoring wells would be placed downgradient of the OSFs to assess groundwater quality.

Material placed on the OSFs would be predominantly non-PAG. The limited PAG material anticipated to be encountered and placed on the OSFs would be mixed with non-PAG material, which would result in net neutralization of the material. The OSFs would be managed according to the Overburden Management Plan (Piteau 2022a, 2023a, 2024a).

Lithium-rich clay would be extracted during quarrying and placed within the interior of the OSFs. Due to high clay content and the low shear strength at saturation, this material would be set back from the face of the OSFs and contained within certain elevations to control stability of the OSFs. This material could be utilized as a soil amendment for the SOSF cover system or other facilities.

2.1.3 Processing Facility

The processing facility would be located in the northwest portion of the OPA (**Figure 2-6**) and would include buildings, process machinery, bulk petroleum storage tanks, bulk solids storage facilities, process reagents, and parking areas. All fluids associated with the processing plant would be contained and managed as a closed system by use of concrete slabs, lined surfaces, directed runoff, or curbing. Fencing would be installed around the perimeter of the processing facility and adjacent contact water pond.

2.1.3.1 Processing

Approximately 2.8 Mt per year of ore is anticipated to be processed from ore extracted from the quarry through a series of components located at the processing facility. The processing facility would produce approximately 26,800 tons per year (tpy) of lithium carbonate and 219,000 tons per year of boric acid. The amount of material processed would be limited by availability of acid for leaching. The mineral processing circuit at the processing facility would include the following major components: ore crushing and vat leaching facilities; evaporation and crystallization circuits; production drying and packaging; and sulfuric acid plant, steam turbine, and generator.

2.1.3.2 Ore Crushing and Leaching

Ore would be trucked from the quarry to the processing facility and placed in one of two temporary stockpiles, a high-boron stockpile or a low-boron stockpile, prior to processing. From these stockpiles, front-end loaders would be used to blend and feed ore into the ore feed bin. After crushing, the ore would be conveyed directly to the leaching vats (i.e., large tanks). The base of the spent ore stockpile would be underlain by a concrete slab that would be graded toward a fluid collection/retrieval system, designed to store direct precipitation from the 100-year, 24-hour storm event. The fluid collection/retrieval system would include a collection of drainage collection pipes embedded within a drainage medium (overliner), overlaying an integrated textured 80-mil high density polyethylene geomembrane liner. The liner would be placed upon a prepared subgrade consisting of compacted, moisture-conditioned, regraded alluvium. Collected fluids would feed back into the process circuit.

Seven steel leaching vats with acid-resistant lining would contain the crushed ore at various stages of the leach process. Crushed ore would be conveyed by a vat tripper to a vat loading shuttle conveyor into the appropriate vat, each containing a variable leach solution, leached for a specified time, washed, and then removed with a clam shell reclaimer for discharge to a dump hopper and conveyor that feeds a spent ore stockpile. From there, the spent ore is loaded into haul trucks for transport to the SOSF. In total, the leach cycle within the vats would be seven days including 48 hours of ore loading, solution flooding, and neutralization, and 72 hours of leaching. The last 48 hours of the seven-day cycle would include washing, unloading, draining, inspection, and stacking. Mineral extraction would utilize sulfuric acid produced on site to leach the lithium and boron from the quarried ore material. Lime and soda ash would also be used in the processing facility to obtain the final products of boric acid and lithium carbonate.

Reagents for ore processing would be stored within secondary containment in the processing facility. Two secondary containment areas would be present at the sulfuric acid plant. The strong acid containment area, at which the product storage tanks containing sulfuric acid are stored, would be sufficient to hold 100 percent of the capacity of the largest equipment plus 10 percent of the aggregate capacity of the tanks located in the containment area plus containment of a 25-year, 24-hour storm event. The other area of the sulfuric acid plant requiring secondary containment is the diesel tank area. Capacity at that area would be sufficient to hold 110 percent of the largest tank and volume of the 25-year, 24-hour storm event. Individual component leak detection systems would be visually inspected and installed and monitored as appropriate to protect against inadvertent releases of ore residuum and process solutions.

Beyond the chemicals used in the processing circuit, the primary chemical and reagent needs are associated with potable water treatment, blasting, and potentially dust suppression (if acceptable chemical options are identified and approved by Nevada Department of Transportation [NDOT] and BLM).

2.1.3.3 Sulfuric Acid Plant

All sulfuric acid required would be produced on site at the sulfuric acid plant. Liquid or solid sulfur would be delivered to the site and be processed with water to produce sulfuric acid. Sulfuric acid would be used for processing ore through a seven-day leach cycle. Heat produced during the production of sulfuric acid would be used during ore processing, as well as to power the steam turbine generator. Steam generated during the sulfuric acid production process would pass through a steam turbine generator to produce 35 megawatts of power, enough to power the facility and allow it to operate independently from the electrical grid. Under normal conditions, the steam turbine generator would have minimal fuel needs; in the event of lost power, a backup diesel generator and diesel boiler would be used to power the steam turbine's mechanical parts. A portion of the high-pressure steam generated would also be reduced in pressure and used in the process for drying, evaporation, crystallization, and heating.

2.1.4 Spent Ore Storage Facility

The SOSF, located in the southwest portion of the OPA (**Figure 2-7**), would store byproducts from the leaching and mineral extraction process, including spent ore, sulfate salts, and neutralization filter cake. The byproducts would be hauled by truck from the processing facility to the SOSF, which would provide permanent storage of approximately 60 Mt of composite material. The SOSF would be constructed in multiple phases, with each phase being developed to store approximately 12 Mt of composite material.

The SOSF would be built on a prepared subgrade and geomembrane liner, with a maximum stacking height of approximately 250 feet, and would have an overall slope of 3H:1V. Leached spent ore material would be used to construct the structural outer shell of the SOSF, encapsulating a mixture of composite materials in the interior (spent ore, sulfate salts, and precipitation filter cake). A perimeter road would provide light vehicle access around the SOSF.

Draindown from the composite material would be collected in the drainage system at the base of the SOSF then gravity fed to the underdrain pond. The underdrain solution collection system includes a drainage medium consisting of a sand and gravel mixture (referred to as an overliner) with a network of perforated piping. Water from the pond would be pumped to a geomembrane-lined water truck fill stand on a platform along the pond crest, for transport to the processing facility for use as makeup water.

2.1.5 Contact Water Ponds

Four lined contact water ponds would be constructed to collect contact water resulting from precipitation and run-on entering facilities; these would be located at the West and North OSFs, the processing facility, and the SOSF. Two additional ponds would be constructed at the SOSF as the facility is expanded. All ponds would be fenced for security and to prevent wildlife and/or livestock access. The ponds would include avian exclusion measures in accordance with the Industrial Artificial Pond Permits and would be monitored and reclaimed at closure.

2.1.6 Ancillary Facilities

2.1.6.1 Power Supply

Power during construction would be supplied by diesel-powered generators, which would meet approved emissions guidelines and permit requirements. Once construction is complete, power would be supplied by heat and steam created by a steam turbine generator at the sulfuric acid plant. The acid plant would contain a steam turbine generator, a water-cooled condenser, condenser transfer pumps, condensate booster pumps, steam bypass stations, and a let-down station. A backup diesel generator and diesel boiler would be used to power the steam turbine's mechanical parts in the event of acid plant outage.

2.1.6.2 Explosives Storage Area

Blasting would be performed during daylight hours; the exact schedule would be determined based on operational needs and under strict safety procedures as required by Mine Safety and Health Administration (MSHA), state, and federal authorities. Explosive agents would be purchased, transported, handled, stored, and used in accordance with federal provisions by the Department of Homeland Security and others. The primary explosive used would be ammonium nitrate fuel oil (ANFO), or ammonium nitrate prill in pellet form, which would be loaded into the explosives truck and transported to the blast site. At the blast site the ANFO would be mixed in the truck.

The explosives storage area would be fenced and secure. Ammonium nitrate prill would be stored in a silo. Boosters and detonators would be stored in separate storage magazines. Explosives would be handled by a licensed contractor and stored on site in compliance with Department of Homeland Security, MSHA, and other regulations. Federal, state, and county roads/highways would be used to transport explosives. All shippers would be licensed by NDOT and other appropriate agencies.

2.1.6.3 Water Supply Wellfield and Pipeline, Dewatering Wells, Sumps, and Tanks

Three existing test wells would be converted to dewatering wells, and an additional network of dewatering wells is also anticipated to be installed adjacent to or near the quarry to provide water during the construction phase of the Project. Activities associated with dewatering would include access routes, drill sites with sumps, dewatering wells, pipelines, and powerlines or generators. Water from dewatering wells and sumps at the quarry would be stored in one or more tanks around the quarry perimeter. The dewatering system would be used to provide water during construction. In addition, dewatering water would be pumped from the storage tank(s) into water trucks and used for dust suppression, as well as for other activities during operations (WestLand 2023a).

During quarrying and processing, water from quarry dewatering wells would be supplemented with water from new or existing wells on private land in Fish Lake Valley. Up to 2,500 gallons per minute (gpm) would be pumped from these wells. Agricultural use of an equivalent number of wells and associated pumping that are currently used for agriculture, plus the Nevada Division of Water Resources (NDWR) adjustment to account for the conversion from agricultural use to mining and milling use, would be suspended during Project operations. Thus, on an annual basis the Project groundwater pumping in Fish Lake Valley would be equal to the agricultural pumping, including the NDWR adjustment. The wells in Fish Lake Valley would pump water to an adjacent booster station. The pipeline facilities and a booster station would be located on private land and connect with the pipeline adjacent to SR 264. An additional booster station would be located adjacent to the access road, within the Access Road and Infrastructure Corridor, to supply water to the OPA. Power for the additional booster station would be supplied from the Project power generation and delivered via above-ground powerlines within the Access Road and Infrastructure Corridor (WestLand 2023a).

2.1.6.4 Communication Towers

Five line-of-sight communication towers (Communication Towers 1 through 5) would be distributed through the OPA to provide combined cellular, broadband internet, and radio service to Project personnel and contract employees throughout operations. The towers would be 30 to 40 feet high and would supply broadband internet and radio; a single tower (Communication Tower 3) would also provide cellular service to the Project as well as to the public. Ioneer may co-own this tower with a major cellular service provider. Commercial use would require submittal and approval of a right-of-way (ROW) application. The communication towers would utilize a combination of battery and solar power. Towers would be accessed by existing and/or proposed service roads, or by utility vehicle along proposed overland ATV trails.

2.1.6.5 Facilities and Site Security

Administrative facilities at the processing facility would include offices for security and reception, administrative staff, a first aid station, and a meeting/training room. A guard house near the main facility entrance would control the entrance to the processing facility. Various levels of security control would be implemented across the OPA, depending on the sensitivity of the equipment or processes being protected. Security measures around the processing facility would include limiting access to only authorized persons and implementing cameras, alarms, and other measures.

An on-site ambulance and trained first aid responder would be available to respond to fire and medical emergencies at the site 24 hours per day, seven days per week. An Emergency Medical Technician would be staffed on site during day shift at the medical clinic near the administration building (Ioneer 2022). Phones would be used for emergency communication and radios would be used as back-up. If an injury requires medivac, the Sheriff Deputy, local emergency services, or dispatcher would request an air ambulance service from Las Vegas and return to Las Vegas for medical treatment. A helipad would be located west of the processing facility parking lot.

2.1.6.6 Truck Maintenance Facilities

Equipment maintenance and storage would be in designated areas and would include considerations for spill prevention. The truck maintenance shop would be supported on a reinforced concrete slab, with the center aisle section designed to support trucks weighing up to 200 tons. Any release of oil would be contained within the building. The truck wash bay would be located within an open area adjacent to the truck maintenance shop, with a reinforced concrete slab on grade designed to support a 200-ton class truck. The slab on grade would slope to a sump connected to a concrete settling pit. Truck wash water, and likely also dust suppression water, would be supplied by a tank located by the truck wash bay. The tire change facility would be an open area, in line with the truck wash bay. The surface of the area would be covered with hardstand and concrete.

2.1.6.7 Autonomous Haul Truck Calibration Sites

Autonomous haul trucks would be used at the Project and require calibration sites to ensure that the trucks operate within design specifications. Two different areas are required to complete the calibration. The first is a 500-foot by 424-foot area. The second area is 2,600 feet long and 200 feet wide. The calibration sites would be located in one of four different areas depending on the state of Project development at any given point. The locations for the sites would be within the three OSF and quarry footprints.

2.1.6.8 Borrow Material

Aggregate material would be required during the construction phase of the Project. Material may be sourced from development of the quarry or from stripping and grading of surficial aggregate from other Project facilities (namely the processing facility and SOSF). Private off-site commercial quarry sources may also be utilized. Portable crushers and screens may be used to meet design specifications, depending on parent material type. Crushing and/or sorting facilities would be temporary, in use during construction, and would be located within the footprints of other Project facilities.

2.1.6.9 Laydown Yards

Laydown yards would be constructed to accommodate off-loading of supplies and equipment needed to support Project construction as well as over-sized items. These yards would be located within and adjacent to the designated footprints for other facilities. The primary laydown yard would be located at the SOSF.

2.1.6.10 Fencing

Fencing would be used to protect facilities, exclude livestock and wildlife, and prevent trespassing. Fence specifications would be determined in consultation with BLM and NDOW. Individual Project components would be fenced separately along the outer clear and grub line, including the quarry, processing facility, explosives storage area, and various facility ponds. Gates or cattle guards may be installed along roadways within the OPA, as needed to exclude public access to Project facilities and maintain existing access to public areas. All fencing would be monitored on a regular basis and repairs made as needed. Fencing proposed for the protection of Tiehm's buckwheat is discussed in Section 2.1.13.1.

2.1.6.11 Cave Spring Wash Berm

A berm would be constructed of on-site materials on the south side of the Cave Springs wash between the haul road and the Cave Springs Road to control erosion during flood events in the wash. The east end of the berm would connect with the quarry berm and extend west to the western edge of the OPA. The berm would generally be 60 feet wide and 10 feet high.

2.1.6.12 Sewage Management

Sewage waste would originate as effluent from restroom facilities, lunch facilities, and offices. Sewage may be managed through either a package sewage plant or a septic system. If applicable, effluent would be routinely monitored to verify the treatment systems are functioning as designed and meet applicable environmental design criteria and treated liquid effluent may be recycled back into the process or used for dust control on the roads. Conceptual leach field locations (primary and reserve) have been proposed to allow for the possibility of a septic system.

2.1.7 Work Force and Schedule

Approximately 400 to 500 workers, including both Ioneer staff and contracted personnel, would be needed during the approximately four-year construction period. Approximately six 10-hour construction shifts are anticipated per week. Staff-level hiring would begin with salaried personnel to support Project development, followed by hourly personnel. Up to approximately 350 workers would be needed during quarrying and processing, staggered in shifts. Personnel would include skilled workers and several management staff. Operations would be continuous, 365 days per year, 24 hours per day. In addition, a limited number of contractors would be on site to complete specified activities, such as exploration and water well drilling, and other tasks. Ioneer would work with the local communities to develop temporary and long-term housing accommodations for the construction and quarrying and processing phases. Ioneer is reviewing various housing options on private land, including use of recreational vehicle parks, local hotels, and home rentals.

2.1.8 Transportation and Access

2.1.8.1 Plan Boundary Access

Within the OPA, haul roads and service roads would be constructed between the major Project facilities. A portion of Cave Springs Road would be realigned to provide separated, safe public access through the Plan boundary (**Figure 2-8**). Ioneer and Esmeralda County have a road improvement and maintenance Memorandum of Understanding (MOU) that would be implemented (Esmeralda County and Ioneer 2023).

2.1.8.2 On-Site Access

Project-related traffic entering and exiting the OPA would include vehicular traffic, semi-trucks providing material and supplies, and vehicles transporting employees. The initial traffic would include equipment for early construction and site grading, as well as construction equipment and materials for the batch plant.

The two primary types of roads constructed in the OPA would be service roads and haul roads. Service roads would be constructed to move equipment and supplies between the various Project components and to provide for light vehicle traffic. Service roads would be approximately 20 feet wide plus shoulders, sufficient to safely pass. Haul roads would allow haul trucks to transport ore, overburden, and spent ore between the quarry, processing facility, OSFs, and SOSF, with enough space to allow for safe passage of two 150-ton haul trucks with safety berms and surface water runoff control systems. Additionally, ancillary roads would be constructed to reach monitoring wells and planned resource exploration sites, as needed, within the OPA. These roads would be for occasional use and would be signed and closed when not in use. Overland ATV trails would be used to access communication towers and environmental monitoring sites.

2.1.8.3 Cave Springs Road Realignment

Cave Springs Road (aka Cave Springs Road-Coyote Summit) is a public road currently maintained by Esmeralda County that bisects the OPA. Approximately 4.7-miles of the road would be realigned within the OPA. It is assumed that the rerouted road within the OPA would be transferred to Esmeralda County at closure, presumably by way of an amendment to Esmeralda County's existing ROW grant with BLM. This segment of the Cave Springs Road would be designed and maintained similar to the existing route; 28 feet wide with associated ditches and berms.

Traffic control systems would be installed to maintain the safety of the public and Project employees. These would include establishment of strictly enforced speed limits, installation of a rail-road type crossing guard at the intersection of the haul road and Cave Springs Road near the processing facility and the intersection of the haul road and the North OSF, and installation of stop signs at the intersection of Cave Springs Road and the service road to the explosives storage area from the quarry.

2.1.8.4 Argentite Canyon Road Realignment

Argentite Canyon Road is a public road currently maintained by Esmeralda County that intersects the Cave Springs Road and provides access through the southern portion of the OPA. This public road would require a localized approximately 0.9-mile realignment around the quarry.

2.1.8.5 Material Transport

Boron and lithium products would be packaged in palletized one-ton super sacks and loaded into box trucks or sea containers to be transported off site by licensed contract carriers. Approximately 115 round-trips per day would be made by trucks bringing needed materials and supplies to the site and transporting product from the site. It is anticipated the trucks transporting these goods would range in size from single- to double-axle tractor trailers and would operate every day, to the extent possible.

2.1.9 Resource Exploration

Up to 35 acres of phased surface disturbance to support additional exploration, resource definition, and geotechnical drilling would occur within the Plan boundary in the vicinity of the quarry, but outside of Tiehm's buckwheat designated critical habitat. Ioneer is responsible for approximately three acres of existing surface disturbance from previous exploration activities in the OPA outside of the planned facility footprints (an additional 12 acres would be within the proposed surface disturbance). This existing surface disturbance would be incorporated into the Plan under the 35 acres of permitted acreage for phased activities described above and covered under the bond established for the Project. Exploration activities may consist of reverse circulation and core drilling from constructed drill sites with single or double sumps, constructed roads, overland travel routes, bulk sampling, geotechnical auger holes, and geological test pits. The exact location of these proposed surface disturbances would be determined as exploration activities progress.

2.1.10 Water Management

2.1.10.1 Water Usage and Water Supply

An operational site-wide water balance has been developed to achieve the Project's goals of recycling water and achieving zero discharge. It is anticipated that water needs would be approximately 2,500 gpm, the majority of which would be used for processing and cooling, with lesser amounts required for potable needs and dust suppression. Water derived from dewatering wells, water collected from in-quarry sumps,

contact water (as available), and supplemental groundwater resources (supply wells and associated pipelines) within the OPA would be utilized to support the water demands associated with the Project.

During construction, water required for construction needs (such as concrete) and for dust suppression would be sourced from existing test wells within the footprint of the quarry and stored in tanks located within the quarry footprint, as well as the contact water pond at the processing facility. During quarrying and processing, the Project's water supply would be from new or existing wells on private land in Fish Lake Valley, which would be pumped from two new booster stations with one located on private land and one within the Access Road and Infrastructure Corridor. Booster stations would assist with pumping water to the OPA via a pipeline adjacent to SR 264 and the access road to the processing facility in the OPA.

Ioneer has acquired or leased all necessary water rights, for which the points of use and/or diversion would be transferred to the appropriate locations within the Plan boundary. As part of the water rights acquisition, an equivalent amount of agricultural pumping would cease, resulting in the Project having no "net change" in the amount of groundwater pumped in Fish Lake Valley (WestLand 2023a).

2.1.10.2 Stormwater

Within the OPA, the main drainage for the area is an ephemeral unnamed stream which extends northwest from Cave Spring and the Silver Peak Range. This stream parallels Cave Springs Road and runs centrally through the OPA (referred to as Cave Springs wash), collecting water from surrounding ephemeral drainages before terminating in Fish Lake Valley.

Project stormwater infrastructure would include diversions and sediment control structures constructed to direct stormwater away from (around and downgradient of) Project facilities (**Figure 2-9**). A Stormwater Management Plan (NewFields 2022a) has been prepared for the Project to provide an overview of site conditions, facilities, potential on-site impact sources to natural drainages from stormwater, and best management practices (BMPs) that would reduce potential impacts from erosion and sedimentation. Appropriate downgradient stormwater and sediment control features would be installed at the onset of construction and throughout the construction process in accordance with the Stormwater Management Plan. Surface water diversion channels would border the Project components to capture surface runoff from the surrounding natural topography. Non-contact water would be diverted around the quarry, OSFs, SOSF, and processing facility and directed toward the natural drainages. Temporary sediment control structures would be installed as part of the incremental development of the OSFs and would be sized for a100-year, 24-hour storm event.

Stormwater management measures would include the reduction of contact between stormwater and industrial quarrying activities (including disturbed unvegetated ground), erosion and sediment controls, structural controls, fugitive dust control, and non-structural controls such as good housekeeping, inspections, training, and maintenance.

Water from precipitation entering the quarry would be intercepted by in-pit sumps and dewatering wells. Dewatering wells would be installed around the periphery of the quarry to intercept the majority of water before it flows into the quarry. Any deep groundwater or surface water that occurs along the haul roads or in the bottom of the quarry would be intercepted by intermediate sumps. Dewatering water and stormwater collected in contact water ponds would be used as makeup water in the process circuit and may also be used for dust suppression within the quarry or on Project roads (Ioneer 2022). The groundwater quantity impacts report prepared for the Project expects dewatering rates to range from about 60 gpm to a maximum annual average of 650 gpm in year 2033 (Piteau 2023b).

2.1.10.3 Potable and Fire Suppression Water System

Potable and fire suppression water would be derived from on-site groundwater sources and stored in a process/fire water tank in the processing facility. The upper section of the water tank would be available for process water supply and potable use; water from this tank would be piped to various areas of the processing facility, as needed. The lower section of the water tank would be reserved for fire water. The fire water distribution system would include a dedicated water storage tank and pump. Fire hydrants, sprinkler systems, hose stations, and extinguishers would be located strategically throughout the facilities.

Fire water would be pumped to a fire pump skid to provide fire water throughout the site using buried distribution piping to surface fire hydrants.

Per Nevada Division of Environmental Protection (NDEP) Bureau of Safe Drinking Water regulations, a potable water treatment facility and public water system would be constructed to supply potable water to workers and for other Project needs during operations. During construction, bottled water would be provided for all potable needs.

2.1.11 Reclamation

Reclamation of disturbed areas resulting from activities outlined in the Plan would be completed in accordance with the BLM and NDEP regulations. Procedures and standards to ensure that operators prevent unnecessary or undue degradation and reclaim disturbed lands are established under 43 CFR Subpart 3809. The sections below provide a summary of closure and reclamation activities for the Proposed Action. Additional detailed information regarding the proposed reclamation is in the Plan (Ioneer 2022) and the SIR (BLM 2024a). As proposed, Ioneer is committed to reclaiming all Project-related infrastructure and roads created in the Plan boundary with the exception of those features listed in **Table 2-2** under NAC 519A.250. Post-reclamation topography is shown on **Figure 2-10**.

Table 2-2 Proposed Action Facilities Permanent, Post Reclamation Features

Feature	Permanent Post Reclamation Feature Acres
Argentite Cayon Road Realignment	1.6
Cave Springs Road Realignment (within OPA)	46.8
Cave Springs Wash Berm	37.1
Communication Towers and ATV Trails	2.5
Evapotranspiration (ET) Cell	3
Diversion Channels	60
Quarry, Quarry Infill, and Quarry Lake	230.9
Unmaintained ATV Trails	0.5
Exclusion Area Road Reroute	0.3
Total	**382.7**

Post-closure, Communication Tower 3 may remain and continue to provide cellular service under other ownership. This use would require a ROW. Existing unmaintained and county-maintained roads, including the realigned portions of the Cave Springs Road and Argentite Canyon Road, would remain. As determined appropriate by the BLM and Esmeralda County, any roads on public lands suitable for public access or providing public access consistent with pre-operational conditions would not be reclaimed at closure.

A quarry lake would form in the quarry at an elevation of 5,650 feet above mean sea level (AMSL) and would be approximately 113 surface acres. The majority of recovery of the groundwater table is predicted to occur within approximately 60 years (Piteau 2023b). A safety berm would remain in place around the perimeter of the quarry and warning signs would be constructed prior to decommissioning of the quarry fence at the end of operations. A single quarry access point would remain to allow for periodic quarry lake monitoring, with a gate installed to restrict access and prevent public entry. An overland ATV trail from the public road to the quarry would remain for monitoring of water in the quarry by Project personnel as long as is required. The ATV trail to the quarry would be bermed and signed for safety and to prevent public access. A diversion feature would continue to re-direct stormwater run-on from upgradient of the quarry into natural drainages, to the extent practical. Stormwater diversions would be designed to withstand a 500-year, 24-hour storm event (Ioneer 2022).

Concurrent reclamation would be completed as areas become available and when reclamation is practical and safe. Final reclamation would occur over a minimum of six years of phased reclamation after Project facilities are closed, or until the reclamation of the site or component has been accepted by the BLM and NDEP. Additional environmental monitoring (including the quarry lake) is expected to extend beyond the

date of revegetation release, as guided by final closure plans. Perimeter fencing around reclaimed Project features would remain to preclude livestock and wildlife access until successful revegetation; at that time fences would be removed.

All buildings, concrete slabs and footers, and other ancillary features would be buried or removed from the processing facility. Disturbed areas would be recontoured. Sloped features, such as the OSFs and SOSF would be graded to smooth benches but would remain as landforms on the landscape. The regraded surface of the SOSF would be covered with an ET cover system composed of on-site alluvium. Monitoring and production wells would be abandoned and reclaimed as required by the general provision for underground water and wells (NAC 534). In accordance with Nevada Revised Statutes (NRS) 534.425 through 428, drill holes would be immediately plugged after data collection is complete.

All reclaimed surfaces would be revegetated. Prior to seeding, disturbance areas would be recontoured, surfaces would be ripped or scarified (where conditions warrant), and growth media would be distributed. Seed mixes would be approved by the BLM, and seed mixtures may be modified per BLM approval based on limited species availability, poor initial performance, new plant material releases, or advances in reclamation technology. All seed would be certified, properly labeled, and would meet the requirements of the Federal Seed Act and the seed and noxious weed laws of Nevada.

As outlined in the Tiehm's Buckwheat Protection Plan (Ioneer 2022), certain areas of the OSFs growth media cover would be constructed to resemble the geochemical and physical characteristics of the occupied Tiehm's buckwheat designated critical habitat. These areas would be used for propagation of Tiehm's buckwheat.

Slope stability monitoring would include visual inspections of the OSFs, SOSF, and quarry slopes. Quarry maintenance and stability monitoring would occur as long as needed, and to the minimal degree required to maintain safe access to the quarry lake for water monitoring activities during the period of responsibility for quarry lake monitoring.

Water quality and elevation monitoring of the anticipated quarry lake would continue as long as required by the BLM and NDEP (anticipated to be until the quarry lake has reached approximately 90 to 95 percent of its anticipated filling depth), and in accordance with monitoring parameters documented within the Water Pollution Control Permit (WPCP). As specified in the Final Plan for Permanent Closure (FPPC), selected quarry dewatering wells may be converted into vibrating wire piezometers (VWPs) for water level confirmation and reporting as needed.

Water remaining within the OSF contact water ponds and SOSF underdrain pond would be monitored for water quality until ponds are dry and/or chemical constituents of the fluid fall below regulatory or background limits, as agreed upon in the FPPC. At that time, all pond liners would be removed or perforated, and all ponds would be removed and/or regraded and revegetated, along with all processing plant facilities. Post-quarrying groundwater and surface water quality would be monitored according to the requirements established by NDEP and BLM, upon approval of the FPPC, with the goal of demonstrating non-degradation of groundwater quality.

2.1.12 Hazardous Materials

Hazardous materials would be transported, stored, and used in accordance with federal, state, and local regulations. Employees would be trained in the proper transportation, use, and disposal of hazardous materials. Hazardous wastes would be collected and trucked to an off-site licensed disposal facility in accordance with all federal and state regulations. Explosives are discussed under Section 2.1.8.2.

2.1.13 Applicant-Committed Environmental Protection Measures

Ioneer has committed to the following ACEPMs for the Proposed Action. ACEPMs are prepared by the proponent and included as part of the Proposed Action. These measures are outlined by resource below.

2.1.13.1 Tiehm's Buckwheat

The USFWS Reno Fish and Wildlife Office received a petition to list Tiehm's buckwheat under the ESA as an endangered or threatened species and to concurrently designate critical habitat on October 7, 2019. On June 4, 2021, the USFWS announced its 12-month finding on a petition to list Tiehm's buckwheat as an endangered or threatened species under the ESA. The USFWS determined that the petitioned action to list Tiehm's buckwheat was warranted. On October 7, 2021, the USFWS issued a proposed rule to list Tiehm's buckwheat as endangered under the ESA. In addition, on February 3, 2022, the USFWS issued a proposed rule for Tiehm's buckwheat critical habitat, which encompasses a 500-meter area around the subpopulations. On December 16, 2022, the USFWS published a final rule listing Tiehm's buckwheat as an endangered species and designating 910 acres of critical habitat (USFWS 2022a).

The NDF received a petition to add Tiehm's buckwheat to the State list of fully protected species of native flora in NAC 527.010, also on October 7, 2019. The NDF is currently in the process of reviewing the species for listing under their state regulations. Eight subpopulations of Tiehm's buckwheat were mapped and extensively studied within the OPA (EM Strategies 2020a). None of Ioneer's exploration activities have disturbed any of these subpopulations. Extensive surveys have been performed both within and outside of the OPA. The total number of plants was estimated to be approximately 44,000 in 2019. Many plants were killed or damaged by herbivores in 2020. The most recent population census was conducted from May 25 to June 7, 2023, and a total of 24,916 plants were counted (WestLand 2023b). Collectively, the subpopulations occupy approximately 10 acres (EM Strategies 2020a).

Ioneer has been engaged with the BLM and the USFWS regarding the protection of Tiehm's buckwheat and measures to ensure the long-term viability of the species. As a result of these discussions the Tiehm's Buckwheat Protection Plan (Ioneer 2022) was developed. Information regarding the plant and the means Ioneer would protect the plant, include: establishing disturbance buffers around the subpopulations; installing fencing around known populations as soon as a continuous proponent presence is on site; implementing a propagation and transplant program for plants at new locations; and constructing growth media area on the reclaimed OSF that reflects the geochemical and physical characteristics of the occupied Tiehm's buckwheat designated critical habitat. Specifics of these measures are provided in the Tiehm's Buckwheat Protection Plan, which has been developed by Ioneer to conserve and expand the species (Ioneer 2022). The size and shape of the buffer areas were developed based on the specific topographic characteristics at each subpopulation and designed to avoid direct effects to the subpopulations from the Project. It should be noted that these ACEPMs for Tiehm's buckwheat are designed to only address potential threats to the species for Project-related activities. In addition, all activities including quarrying have been designed to avoid any surface disturbance within the Buckwheat Exclusion Area, and thus the subpopulations. The Buckwheat Exclusion Area would be fenced.

The extent of Tiehm's buckwheat designated critical habitat would be fenced, approximately 7.98 linear miles around approximately 559 acres, except where site topography makes fence construction impracticable or unsafe. There would be locked gates included in the fencing (BLM 2024b).

2.1.13.2 Air Quality

Ioneer's products (lithium and boron) would be produced using an energy-neutral process with minimal CO_2 emissions from electricity that leverages innovative technologies, resulting in a plant with low emissions of GHGs and minimal HAPs. Air Quality operating permits have been obtained from NDEP Bureau of Air Pollution Control prior to Project construction. Air quality protection would include control of stationary source emissions and fugitive dust control per Bureau of Air Pollution Control regulations.

Appropriate emission control equipment would be installed at point (stationary) sources and operated in accordance with the construction and operating air permits. Where required, pollution control devices installed by equipment manufacturers would control combustion emissions. Pollution control equipment would be installed, operated, and maintained in good working order to minimize emissions.

Fugitive dust would be controlled on roadways and other areas of disturbance with water or NDEP/BLM-approved dust suppressants, where appropriate. Fugitive emissions at the crusher and material drop points would be minimized through application of water sprays or other dust control measures as per accepted industry practice and permit stipulation. Disturbed areas would be seeded with an interim seed mix developed in conjunction with the BLM to minimize fugitive dust emissions from exposed, unvegetated surfaces.

Ioneer would use BMPs to operate the ultra-low emission sulfuric acid plan (including low emissions for sulfur dioxide [SO_2], nitrogen oxides [NO_x], and sulfuric acid [H_2SO_4]).

These measures would include the use of Tier 4 equipment, controlling emissions of HAPs, minimizing impacts to the ambient air quality, and ensuring compliance with applicable standards.

2.1.13.3 Cultural Resources

A Class III cultural resource survey was performed within and near the OPA. The types and locations of cultural resources within this area have been documented and would be avoided, where possible, during all phases of Project implementation. In the event impacts to potentially eligible or unevaluated cultural resources are unavoidable, Ioneer would undertake actions in accordance with the Memorandum of Agreement (MOA) between the BLM, Nevada State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation, which is currently in preparation. For eligible cultural resources that cannot be avoided by the Project, Ioneer is working with the BLM and SHPO to develop a Historic Properties Treatment Plan (HPTP) for data recovery, archaeological and architectural documentation, and report preparation that would be based on the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (NPS 1983).

If an unevaluated site cannot be avoided, additional information would be gathered to evaluate the site for inclusion on the National Register of Historic Places (NRHP). If the site does not meet eligibility criteria as defined by the *National Register Criteria for Evaluation* (NPS 1990), no further cultural work would be performed. If the site meets the NRHP eligibility criteria, it would be included in the above-mentioned HPTP.

If previously unknown cultural resources, or human remains, funerary objects, or items of cultural patrimony, are encountered on BLM-administered land during Project construction or implementation, procedures spelled out in the Discovery Plan, HPTP, and/or MOA would be followed. Project activities would not recommence in these areas until a Notice to Proceed is issued by the BLM consistent with these documents. The BLM AO would be notified, in accordance with Section VI.B.1. of the *State Protocol Agreement between the Bureau of Land Management, Nevada and the Nevada State Historic Preservation Officer for Implementing the National Historic Preservation Act* (Revised December 22, 2014) (BLM and SHPO 2014).

The location of the find would not be publicly disclosed, and the remains would be secured and preserved in place. Ioneer or its contractors would also immediately notify the Esmeralda County Sheriff of the discovery. Any discovered Native American human remains, funerary objects, or items of cultural patrimony found on federal land would be handled in accordance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA). Non-Native American human remains would be handled in accordance with Nevada state law. An evaluation of the resource would determine any subsequent actions to be taken. Project activities would not recommence in the isolated area until a Notice to Proceed is issued by the BLM.

Ioneer would inform all field personnel of their responsibilities to protect cultural resources and report inadvertent discoveries. This includes training employees and contractors not to engage in the illegal collection of historic and prehistoric materials, avoidance procedures and avoidance buffer zones to cultural resources, and off-road travel procedures. Ioneer would also inform all field personnel of various regulations and penalties in place to protect these resources, including the Archaeological Resources Protection Act of 1979 and NAGPRA (Public Law 101-601).

2.1.13.4 Vibration Monitoring at Cultural Sites

Predicted indirect effects on cultural resources from blasting and equipment use were quantified as part of the Class III Cultural Resources evaluation to identify any potential resources that may be indirectly affected as a result of vibration caused by Project activities. An HPTP would be developed for eligible or unevaluated cultural resources deemed adversely impacted by the Project. Should vibration monitoring be deemed necessary by the BLM and SHPO, Ioneer would perform monitoring at the appropriate sites identified in the HPTP. If monitoring indicates that adverse impacts not initially anticipated in the HPTP have occurred at these sites, additional mitigation may be required. Mitigation options may include, but are not limited to, the implementation of a data recovery program that could include detailed site documentation, surface collection, and/or excavation and analysis to gather a representative sample of surface and subsurface cultural deposits capable of addressing identified research questions.

2.1.13.5 Paleontological Resources

Ioneer would not knowingly disturb, alter, injure, or destroy any scientifically important paleontological deposits. In the event that previously undiscovered paleontological resources are encountered, work in the areas would cease and they would be left intact and brought to the attention of the BLM. If significant paleontological resources are encountered, avoidance, recordation, and/or data recovery may be required, as determined by the BLM.

2.1.13.6 Erosion and Sediment Control

Erosion and sediment control would be accomplished through the application of BMPs to limit erosion and reduce sediment from precipitation or snowmelt runoff. Surface water would be managed using surface stabilization measures, runoff and run-on control and conveyance systems, and sediment traps and barriers. These practices are detailed in the Project's Stormwater Management Plan (Ioneer 2022).

Following construction, areas such as cut-and-fill embankments and growth media stockpiles would be seeded with an interim seed mix developed in conjunction with the BLM to stabilize material, reduce erosion and minimize the establishment of undesirable weeds, and sediment controls would be applied to limit wind and water erosion. Concurrent reclamation would be implemented, to the extent possible, to accelerate stabilization of disturbed areas. All sediment and erosion control measures would be inspected regularly, with any needed repairs performed or additional BMPs implemented.

2.1.13.7 Water Resources

The Project is located in the Fish Lake Valley Hydrographic Basin (10-117) which is considered endorheic and does not contribute to traditionally navigable waters. No perennial streams are present in the OPA.

There is an avoidance area around Cave Spring where no surface-disturbing activities would occur.

The Project's water needs would be derived first from dewatering wells located near the quarry and then from new or existing wells in the Fish Lake Valley. In general, there are few domestic water users in the Fish Lake Valley, with agricultural operations currently holding the majority of groundwater rights within the basin. All necessary water rights have been secured or leased by Ioneer and would be transferred to the appropriate points of diversion and places of use. If impacts to surface water are observed and found to be related to Project activities, such impacts would be addressed.

Process components would be designed, constructed, and operated in accordance with NAC 445A. Water would be recycled to the maximum extent practicable to conserve water resources. Stormwater management would ensure that clean water and contact water are not intermingled. Stormwater monitoring would be completed according to the Stormwater Management Plan (Ioneer 2022) to ensure that all surface water controls are stable and well maintained.

2.1.13.8 Geology and Minerals

A Quarry Lake Evaluation Report, Geochemical Characterization Report, and Overburden Management Plan (Ioneer 2022) have been prepared in accordance with BLM and NDEP guidance, in addition to a

Geology and Minerals Baseline Technical Report for the Operational Project Area and vicinity (NewFields 2019a). The Geochemical Characterization Report describes the potential for acid rock drainage, metals and metalloids leaching, and salinity generation from overburden, ore, and process residual materials as well as the potential for mobilization of deleterious constituents.

The Quarry Lake Evaluation Report describes the anticipated geochemical and hydrogeological characteristics of a predicted post-closure quarry lake. The Overburden Management Plan includes recommendations, from an environmental geochemistry standpoint, for overburden handling, overburden placement, and OSF design. Objectives of the Overburden Management Plan include: minimizing leaching of metals and metalloids; minimizing sulfide oxidation and development of localized acidic conditions; limiting seepage through overburden materials; and facilitating closure of the OSFs.

2.1.13.9 Materials and Waste Management

The Project may result in the use and generation of hazardous and non-hazardous waste materials. The management of regulated solid and hazardous wastes that are not Bevill Amendment exempt waste (e.g., fossil fuel combustion waste; waste from the extraction, beneficiation, and processing of ores and minerals [including phosphate rock and overburden from uranium ore mining]; and cement kiln dust) or associated with process components would be managed according to BMPs and requirements of regulatory permits. Efforts to find markets for other leached materials would continue during operations as a means to reduce waste quantities. Spill contingency and emergency response measures are included in the Emergency Response and Spill Contingency Plan (Ioneer 2022).

2.1.13.10 Hazardous Materials

Hazardous materials would be transported, stored, and used in accordance with federal, state, and local regulations, including regulations identified in Standards Applicable to Generators of Hazardous Waste (40 CFR 262). Management of hazardous materials associated with the Project would comply with all inventory and reporting requirements. If any hazardous waste is generated on site, it would be properly disposed of at a licensed facility. Transportation and handling of hazardous materials would be conducted by licensed carriers and properly trained workers. Employees would be trained in the proper transportation, use, and disposal of hazardous materials.

Blasting components, including ammonium nitrate, would be stored away from other Project facilities and a minimum of 700 feet from Cave Springs Road in compliance with MSHA, state, and federal requirements. Boosters and detonators would be stored at a separate location nearby.

All liquid petroleum products and reagents used in the process would be stored in above-ground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in a given containment area, as per NAC 445A.436.

2.1.13.11 Sanitary and Solid Waste Disposal

Employee training plans would address appropriate disposal practices, to include education on which wastes may be placed in a landfill, as well as management of regulated substances. Non-hazardous solid wastes would be disposed of off site in a licensed facility. Used solvent, liquids drained from aerosol cans, accumulations of mercury fluorescent lights, and used antifreeze may be regulated under Resource Conservation and Recovery Act and would be managed accordingly. Ioneer anticipates that the facility would fall in the “conditionally exempt small quantity generator” category. Domestic wastewater would be routed, treated, and disposed of appropriately.

2.1.13.12 Petroleum-Contaminated Soils

Petroleum-contaminated soils resulting from spills or leaks of hydrocarbons would be addressed immediately and removed from the spill site and stored in appropriate secondary containment areas in accordance with NDEP guidelines. Ioneer would excavate and transport any petroleum-contaminated soil to a licensed off-site disposal facility.

2.1.13.13 Growth Media and Soil Salvage

Suitable growth media/cover material would be salvaged and stockpiled during Project development. Growth media stockpiles would be located such that they would not be disturbed by Project development. The surfaces of the stockpiles would be contoured with slopes at 3H:1V to reduce erosion. To minimize wind and water erosion, growth media stockpiles would be seeded with an interim seed mix developed in conjunction with the BLM to stabilize material, reduce erosion and minimize the establishment of undesirable weeds. Surface water would be diverted around stockpiles as needed to prevent erosion from stormwater runoff. BMPs such as silt fences or staked weed-free straw bales would be applied as necessary to limit wind and water erosion.

2.1.13.14 Monitoring Plan and Other Plans

Baseline monitoring and characterization were completed at the onset of this Project. These findings would be utilized as a basis for assessing potential impacts to air, water, and biological resources that may result from the Project. The Monitoring Plan (Ioneer 2022) and other commitments (leak detection, fluid management, etc.) to be included in the WPCP would serve as a basis for monitoring activities. These plans may be updated as the Project progresses to accommodate changes in conditions and ensure ongoing protection of the environmental integrity of resources on site.

Ioneer is working on a Community Development Plan with Esmeralda County.

2.1.13.15 Wildlife and Avian Protection

Ioneer is committed to protecting wildlife and avian species and their supporting habitat as much as possible. The following ACEPMs would be implemented by Ioneer to reduce or preclude risks to raptors, birds, bats, grazing animals, and other species that may interact with Project activities or facilities.

- The open adit adjacent to the Project haul road may be closed in coordination with NDOW and BLM.
- Operators would be trained to monitor the OPA for the presence of larger wildlife such as deer, antelope, and sheep. Mortality information would be collected and reported, as necessary.
- Ioneer would establish wildlife protection policies that prohibit feeding or harassment of wildlife within the OPA boundary.
- Following Project construction, areas of disturbed land no longer required for operations would be reclaimed as required by the BLM to promote the reestablishment of native plant and wildlife habitat.

Ioneer has developed a draft Bird and Bat Conservation Strategy (BBCS) that includes measures to reduce impacts to birds and bats (WestLand 2023c). The BBCS includes, but is not limited to, the following:

- Land clearing or other surface disturbance associated with the Project would be conducted outside of the avian breeding season, whenever feasible, to avoid potential destruction of active nests or young birds in the area. When surface disturbance must occur during the avian breeding season (March 1 through July 31), a BLM-qualified biologist would survey the area prior to land clearing activities in accordance with current BLM protocols. Survey results would be submitted to BLM before surface disturbance occurs.
- Primary pond liners would consist of 80-mil high-density polyethylene single-sided textured geomembrane with the textured side up to facilitate wildlife egress.
- Avian exclusion measures (e.g., bird balls, netting, BirdXPellers) would be used where required. Ioneer employees would check the avian exclusion measures and the fencing around all ponds at least once per 12-hour shift or as specified in the permit. Ponds would be monitored and reclaimed at closure.

- The interior side slopes of the processing facility contact water pond are designed at 3H:1V with the exterior cut fill slopes designed at 2H:1V to ensure that there are no shallow 'mud-flat' areas that could allow birds to wade, forage, and rest along the shore.

- Ioneer would maintain a record of all mortalities (birds and bats) associated with permitted facilities.

- During all phases of the Project, all food, waste, and other trash would be placed in containers with lids or covers that can be closed to discourage scavenging by wildlife.

- Speed limits would be posted at 35 miles per hour (mph) on haul roads, 45 mph on access roads, and 25 mph on all other roads in the OPA.

- Powerlines would be designed to provide sufficient separation between phases and grounds to reduce the risk of electrocution for raptors, birds, and bats.

- The processing facility, the quarry, explosive storage area, and contact water ponds would be fenced to specifications outlined in the BLM Handbook 1741-1, as applicable. All fences would include double swing gates to allow for human access. Ioneer would also coordinate with NDOW on fencing specifications. Avian and wildlife protection measures would be in compliance with Industrial Artificial Pond Permit measures.

- Blasting would be performed during daylight hours.

2.1.13.16 Noxious Weeds and Invasive Non-native Species

Ioneer has developed a Noxious and Invasive Weed Management Plan (Ioneer 2022) for the Project. Prevention, detection, containment, and removal would be priority strategies for weed control. Weeds on site would be physically removed or treated with approved herbicides by certified applicators. Weed treatment activities within the Tiehm's buckwheat avoidance area and the subpopulations would be limited. Monitoring would include creation of an occurrence and treatment database including geographic locations of sites. The results from annual monitoring and treatment would be reported to the BLM and shall serve as the basis for updating the plan and developing ongoing annual treatment programs.

2.1.13.17 Public Safety and Accessibility

Public safety would be maintained throughout the life of the Project by excluding unauthorized access to sensitive Project facilities through installation of fencing and security features (including cameras and personnel) as well as installation of traffic-control measures. The latter would include establishment of speed limits (to be strictly enforced) for Project-related traffic on public and haul roads, installation of a rail-road type crossing guard (plus stop signs) at the intersection of the haul road and Cave Springs Road near the processing plant, and installation of stop signs at the intersection of Cave Springs Road and the service road to the explosives storage area from the quarry area (Ioneer 2022). These measures would also provide for continued accessibility of the public to and through the OPA. All equipment and facilities associated with the Project would be maintained in a safe and orderly manner as another measure to provide for the safety of the public. In addition, all activities would be conducted in conformance with applicable federal and state health and safety requirements; site visitors would be properly instructed in site safety procedures prior to admittance.

2.1.13.18 Transportation and Access

Ioneer's Transportation and Access Plan (Ioneer 2022) outlines safe procedures and mandatory practices for Project-related personnel travel and material transport to and from the Project. The plan includes description of how safe public access would continue to be accommodated through the Project area, in coordination with Esmeralda County and other existing road users. In addition, Ioneer realizes that certain road engineering upgrades and maintenance activities must be implemented to safely accommodate the increased traffic that would result from Project activities. Accordingly, an Access Road Improvement and Maintenance Plan (Ioneer 2022) has been produced. Together, the Transportation and Access Plan (Ioneer

2022) and the Access Road Improvement and Maintenance Plan (Ioneer 2022) outline the various commitments Ioneer has made related to road improvement, management, and maintenance.

2.1.13.19 Visual Resources and Night Skies

A Visual Resources Technical Report was prepared to characterize existing conditions associated with visual aspects in and around the Project Area (NewFields 2022b). Ioneer would seek to minimize the visual impact of activities and structures to viewers along publicly accessible roadways, public use areas, and within the Wilderness Study Area in consideration of guidance included in Appendix 3 of BLM's Visual Resource Contrast Rating Manual 8431 (BLM 1986). Dark sky lighting best practices would also minimize the effects of lighting on wildlife that may be present in the area, including bats. Several examples of measures Ioneer intends to implement include:

- Careful placement and blending of stored materials to minimize contrast;
- Selection of building sites and new roads such that they would be hidden from view behind topographical features, where possible; and
- Consultation with BLM on choice of colors of machinery, fencing, and powerlines; lighting design and color; and design, color, and surface texture treatments for the processing plant structures.

To minimize the effects from lighting, Ioneer would utilize hooded stationary lights and lighting plants. Lighting would be directed onto the pertinent site only and away from adjacent areas not in use, with safety and proper lighting of the active work areas being a priority.

2.1.13.20 Fire Protection and Emergency Response

The Emergency Response and Spill Contingency Plan (Ioneer 2022) details procedures for responding to emergency incidents including fire, accidents, and spills. Fire protection equipment would be secured and a fire protection plan would be established for the Project in accordance with National Fire Codes for Fire Protection and State Fire Marshal. The Project would operate in conformance with all applicable MSHA and Occupational Safety and Health Administration safety regulations (30 CFR 1-199).

Smoking would only be permitted in designated areas that are free of flammable materials and only if allowed by state law or federal regulations. Ioneer would immediately contact the appropriate dispatch or coordination center in the event of a fire and report all wildland fires to BLM and other relevant agencies. Project vehicles would be equipped with radios and/or cellular telephones for fire preparedness and prevention, suppression operations, and emergency response purposes. Crew vehicles and equipment would also be supplied with an emergency communication list that would include emergency contact information for administering agencies.

2.2 North and South OSF Alternative

The North and South OSF Alternative would be similar to the Proposed Action; however, locations of facilities would be relocated to minimize impacts to Tiehm's buckwheat designated critical habitat (**Figure 2-11**). Placement of overburden material would occur in the North OSF, Quarry Infill OSF, and the additional South OSF. The West OSF and associated infrastructure would not be constructed under the North and South OSF Alternative (Ioneer 2023a). Total new surface disturbance associated with the North and South OSF Alternative would be approximately 2,271 acres (**Table 2-3**), which would be approximately 35 acres less than the Proposed Action.

The capacities of the North OSF and the Quarry Infill OSF would be the same as the Proposed Action; however, the South OSF would be constructed to accommodate the remaining material. The design of the South OSF would be consistent with the OSF designs included in the Proposed Action including the average slope of 3H:1V. The haul distance between the quarry and the South OSF would be similar to the distance between the West OSF and the quarry as configured in the Proposed Action. Additional differences proposed for the North and South OSF Alternative include a higher output steam turbine generator (40 megawatts instead of the 35 megawatts included in the Proposed Action) and reconfiguration of the quarry

to minimize impacts, to the extent practicable, in designated critical habitat while maintaining slope stability required during operations and addressing long-term slope stability needs for Tiehm's buckwheat. The extent of Tiehm's buckwheat designated critical habitat would be fenced, approximately 8.09 linear miles around approximately 714 acres, except where site topography makes fence construction impracticable or unsafe (BLM 2024b). There would be locked gates included in the fencing (BLM 2024b). Pollinator habitat reclamation would occur as described in the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b), which is specific to the North and South OSF Alternative. Up to 30 acres of conceptual surface disturbance would occur within the Plan boundary, but outside of Tiehm's buckwheat designated critical habitat. All other details and appendices included in the Plan would apply to the North and South OSF Alternative.

Table 2-3 North and South OSF Alternative Surface Disturbance

Project Component	Area (acres)[1]	Comments
Quarry	201.5	Includes fence and water storage tanks.
Quarry Berm	19.1	Includes 200-foot-wide berm between the Quarry and the wash.
Processing Facility	82.6	Includes contact water pond, minimum 20-foot disturbance buffer. Excludes diversion channels.
North, South, and Quarry Infill OSFs	930.2	Includes contact water pond, minimum 20-foot disturbance buffer. Excludes diversion channels.
SOSF	373.9	Includes underdrain pond, minimum 20-foot disturbance buffer. Excludes diversion channels.
Ponds	0.0	Acreage of contact water ponds are included in the footprints of the OSFs and SOSF.
Haul Roads and Service Roads	56.5	Includes all haul roads and service roads with 20-foot disturbance buffer. Includes buckwheat exclusion area road reroute of 1,327 feet with a 10-foot disturbance width.
Stockpiles	30.0	Includes growth media stockpiles with minimum 20-foot disturbance buffer.
Explosives Storage Area	1.1	Includes explosive storage and area access road including 20-foot disturbance buffer.
Septic Leach Fields	10.0	Includes primary and reserve leach field for septic sewage management.
Communication Towers and ATV Trails	2.7	Includes Towers 3, 4, and 5, and 40-foot disturbance buffer for access to monitoring locations. Towers 1 and 2 would occur on surface disturbance footprints of other facilities.
Proposed Monitoring Locations and Access	3.8	Includes 5 proposed monitoring wells (0.5 acre each) and associated 40-foot disturbance buffer.
Project Area Exploration	35.0	Includes phased exploration activities (access routes, drill sites with sumps). This includes approximately 3.2 acres of existing exploration disturbance not within the North and South OSF Alternative footprint. No new exploration disturbance would occur in Tiehm's buckwheat designated critical habitat.
Water Supply Facilities	20.0	Includes access routes, drill site sumps, wells, power, and pipelines to bring water from agricultural wells in Fish Lake Valley.
Dewatering Facilities	30.0	Includes access routes, drill sites with sumps, wells, power, and pipelines, and would not occur in Tiehm's buckwheat designated critical habitat.
Cave Springs Road Realignment (within OPA)	46.7	Includes 28-foot width plus 60-foot disturbance buffer for existing and realigned segments within the OPA.
Argentite Canyon Road Realignment	2.0	Includes a 15-foot disturbance buffer.
Buckwheat Critical Habitat Fence	15.2	714 acres of Tiehm's buckwheat designated critical habitat would be fenced with 30-foot disturbance buffer.
Yards	100.4	General surface disturbance.
Fencing	0.0	All fencing, unless described for Tiehm's buckwheat, is located on other facility footprints, thus 0.0 acres of disturbance assumed.
Cave Springs Wash Berm	37.1	Assumes a 100-foot disturbance buffer.
Diversion Ditches	46.9	Assumes a 60-foot disturbance buffer.

Project Component	Area (acres)[1]	Comments
Access Road and Infrastructure (within the Access Road and Infrastructure Corridor)	192.7	Assumes a maximum of 100 foot disturbance buffer along the access road for 67,335 feet and 50 foot disturbance buffer along SR 264 for 32,888 feet.
Batch Plant	3.2	To be used during construction.
General Surface Disturbance	30.0	Includes surface disturbance anticipated to occur outside of designated critical habitat that is not currently associated with a specific location or facility.
North and South OSF Alternative Disturbance	**2,271**	Includes North and South OSF Alternative and existing disturbance

[1] All areas include a minimum 20-foot disturbance buffer around the feature unless otherwise specified. Includes existing and realigned segments within the OPA only. The access road is included as a separate line item.

2.2.1 North and South OSF Alternative Reclamation

Reclamation proposed for the North and South OSF Alternative would be similar to the Proposed Action. For areas within Tiehm's buckwheat designated critical habitat, reclamation would occur as described in the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b). The overall goal of the reclamation within designated critical habitat under this alternative is to support the restoration of ecosystem processes and function. Specifically, reclamation efforts inside of designated critical habitat would be designed to accelerate the establishment of habitat suitable for the various life history stages of the diverse pollinator guild that supports Tiehm's buckwheat, while limiting risk from undesirable species which are common in early-phases of reclamation. Facilities not subject to reclamation are provided in **Table 2-4**. Post-reclamation topography for the North and South OSF Alternative is provided on **Figure 2-12**. The final quarry lake would be approximately 110 surface acres due to changes in the Quarry Infill OSF.

Table 2-4 North and South OSF Facilities Permanent, Post Reclamation Features

Feature	Permanent Post Reclamation Feature Acres
Argentite Cayon Road Realignment	2.0
Cave Springs Road Realignment (within OPA) and Haul Roads and ATV Road	51.9
ET Cell	3.0
Diversion Channels	46.9
Quarry Lake	110.1
Total	**213.9**

2.2.2 North and South OSF Alternative ACEPMs

The ACEPMs for the North and South OSF Alternative include those described for the Proposed Action, and the following revised ACEPMs (Ioneer 2023a):

- Ioneer has committed to the operating practices described in the Plan (Ioneer 2022) and is working with the BLM and other cooperating agencies to refine and expand on ACEPMs to prevent unnecessary or undue degradation of public lands during the life of the Project. These practices are consistent with BLM's surface management regulations at 43 CFR 3809, Nevada Bureau of Mining Regulation and Reclamation regulations (NAC 519A), and other guidance documents. The purpose of 43 CFR 3809 (Surface Management) is to prevent unnecessary or undue degradation of public lands by operations authorized by the General Mining Law.
- Ioneer has been engaged with the BLM and the USFWS regarding the protection of Tiehm's buckwheat and measures to ensure the long-term viability of the species. Ioneer has developed the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* document specific to the North and South OSF Alternative (WestLand 2023b). The document is based on input from the USFWS, BLM, and is responsive to comments received during public scoping. This input provided the basis for development of

the North and South OSF Alternative designed to avoid and minimize impacts to Tiehm's buckwheat and its designated critical habitat. Ioneer would implement the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b).

2.3 No Action Alternative

Under the No Action Alternative, the proposed Project would not be approved. The existing 15 acres of exploration disturbance (i.e., drill sites, monitoring sites, and access roads), under the relinquished Notices (NVN-97202 and NVN-97262), has occurred on public lands administered by the BLM and would be reclaimed (**Figure 2-13**). No additional surface disturbance would occur under the No Action Alternative.

2.4 Alternatives Considered but Eliminated from Detailed Analysis

In accordance with 40 CFR 1502.14(a), agencies are required to describe the alternatives considered, but eliminated from detailed study and to provide a brief rationale for eliminating the alternative. Potential alternatives were reviewed to determine if they met the following criteria of a "reasonable alternative" as defined in CEQ 1502.1(z): "Reasonable alternatives means a reasonable range of alternatives that are technically and economically feasible, and meet the purpose and need for the proposed action." Alternatives were also reviewed to determine if they were environmentally reasonable or provided an environmental benefit over the Proposed Action. These alternatives are listed in **Table 2-5** with dismissal criteria provided in **Appendix C.** A description of each alternative and rationale for eliminating the alternative are provided in the SIR (BLM 2024a). Portions of these alternatives may have been incorporated into the Proposed Action or North and South OSF Alternative, and this is noted in the table in **Appendix C**.

Table 2-5 Alternatives Considered but Dismissed from Detailed Analysis

Alternative Category	Alternative Considered but Eliminated from Detailed Analysis
Quarry Footprint Alternatives	Larger Quarry
	Quarry North of Cave Springs Road
	Quarry Avoids All Tiehm's Buckwheat Designated Critical Habitat
	Quarry Avoids All Tiehm's Buckwheat Subpopulations
	Quarry Depth Avoids Groundwater Interception
Quarry Backfill/Infill Alternatives	In-Quarry Base Case Storage
	In-Quarry Alternative Storage
	Partial Backfill to Prevent Post-quarrying Quarry Lake
	Backfill of Quarry to Create Post-quarrying Flow-through Conditions
	Rapid Infilling of the Post-quarrying Quarry with Water.
Facilities Placement Alternatives	Adit Avoidance Alternative
	Moving Crushing Plant and Truck Facilities East closer to the Quarry
	Separate Stockpiles North-Northwest of the Quarry
	North OSF
	Reduced Quarry Plan
	North and Southwest OSF
	Comingled Stockpile West of the Quarry
	Processing Plant in Sparks, Nevada
	SOSF, Separate Facilities at Siting Area 1 (South of Cave Spring Road)
	SOSF, Comingled Facility at Siting Area 2 (North of Cave Springs Road)
	Cultural Resource Site Avoidance
	Surface Disturbance Avoids All Tiehm's Buckwheat Designated Critical Habitat
	Surface Disturbance Avoids All Tiehm's Buckwheat Designated Critical Habitat and a One Mile Buffer

Alternative Category	Alternative Considered but Eliminated from Detailed Analysis
Ore Conveyance Alternatives	Conveyor
	Autonomous Haul Trucks
	Electric Vehicle Fleet
Sulfuric Acid Plant Design	Importing Sulfuric Acid (vs having a Sulfuric Acid Plant on site)
	Single absorption with a tail gas scrubber (with caustic reagent)
	Single absorption with MAX3^{TM} (with solvent scrubber)
	Double absorption with heat recovery system and tail gas scrubber (with caustic reagent)
Leaching Alternatives	Heap Leach Facility
	Agitated Tank Tailings Storage Facility
Power Supply and Infrastructure Alternatives	55-kilovolt (kV) and 120-kV Transmission Lines and a 15-megawatt Service from NV Energy
	15-megawatt Prime Power Diesel Generation
	Grid Connection
	Diesel Internal Combustion Engine Alternative
	Natural Gas
	CNG/LNG/Propane Fuel
Aggregate Sourcing Alternatives	Near-Site Source
	Existing Commercial Sources
Haul Road From Quarry Road Alignment and Traffic Control Alternatives	Utilize Existing Road Where Possible
	Maximize Road Separation
	Overpass to Avoid Intersection
	Re-Route Road North of Processing Plant to Avoid Intersection
	Four-Way Stop
	Manned Guard Booth
Access Road Alternatives	Slowing of Quarrying Rate
	Silver Peak Access Road
	Gap Springs Access Road
	Alternate Adjacent Access Road
	Partial Paving
	Group Lithium-Boron trucks in Units From Site (compared to free flow)
	Conveyor vs Truck Traffic
	Traffic Control Devices to Manage Traffic
	Cave Springs Road Revised Reroute Alternative
Water Use Alternatives	Pumping From Fish Lake Valley
Mine Law	Permit the Project Under 2920 Regulations

2.5 BLM-Preferred Alternative

The North and South OSF Alternative is the BLM's preliminary environmentally preferred alternative. The BLM-preferred alternative will be determined following the Draft EIS public comment period.

2.6 Comparison of Effects by Alternative

Table 2-6 compares the anticipated effects from the Proposed Action and alternatives on the resources analyzed in this EIS. The existing or baseline conditions are described in **Chapter 3**. The anticipated effects from the Proposed Action and alternatives are described in **Chapter 4.** Additional detail supporting the information in Chapters 3 and 4, including analysis methods and rationale for the effect's conclusions can be found in the resource Supplemental Environmental Reports (SERs) (BLM 2024c through 2024u).

Table 2-6 Comparison of Effects by Alternative

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Air Quality			
Fugitive Particulate Emissions and Gaseous Emissions	Minor amount of emissions from completion of reclamation of 15 acres.	Total HAP emissions of 0.81 tpy for up to 17 years, and less emissions for six years of reclamation.	Similar to the Proposed Action.
PM, PM_{10}, and $PM_{2.5}$ Emissions	Minor amount of emissions from completion of reclamation of 15 acres.	2,899.97, 1,277.86, and 227.92 tpy, respectively, for up to 17 years, and less for six years of reclamation.	Similar to the Proposed Action.
NO_x, CO, SO_2, VOC, H_2S, and H_2SO_4 Emissions	Minor amount of emissions from completion of reclamation of 15 acres.	156.69, 130.84, 82.42, 7.92, 2.84, and 24.41 tpy, respectively, for up to 17 years and less for six years of reclamation.	Similar to the Proposed Action.
On-site GHG Emissions	Minor amount of emissions from completion of reclamation of 15 acres.	471,589 tpy of direct and 24,429 tpy of indirect GHG emissions for up to 17 years, and less emissions for six years of reclamation.	Similar to the Proposed Action.
Off-site GHG Emissions	Minor amount of emissions from completion of reclamation of 15 acres.	5,447.20 tons CO2e for up to 17 years, and less emissions for six years of reclamation.	Similar to the Proposed Action.
Mercury Emissions	Minor amount of emissions form completion of reclamation of 15 acres.	Mercury emissions of 4.7×10^{-4} tpy for up to 17 years, and less emissions for six years of reclamation.	Similar to the Proposed Action.
Ozone Impacts	Minor amount of emissions form completion of reclamation of 15 acres.	Maximum 8-hour impact of 0.69 parts per billion (ppb)	Similar to the Proposed Action.
Cultural Resources			
Direct Impacts to Cultural Resources	No impacts to cultural resources would occur.	12 sites potentially impacted by surface disturbance, four within 100 feet of surface disturbance.	19 sites potentially impacted by surface disturbance, four within 100 feet of surface disturbance.
Indirect Impacts to Cultural Resources	No impacts to cultural resources would occur.	29 sites potentially impacted by auditory, vibrational, and/or visual impacts.	Same as the Proposed Action.
Environmental Justice			
Disproportionate Effects on Environmental Justice Populations	No disproportionate effects to an environmental justice population are anticipated.	Impacts to environmental justice populations of concern may include air quality, visual, noise, water, traffic, hazardous material transportation, and social and economic values.	Same as the Proposed Action.
Geology and Minerals			
Surface Disturbance	15 acres of existing surface disturbance would be reclaimed.	Up to 2,306 acres of new surface disturbance of which 383 would be permanent.	Up to 2,271 acres of new surface disturbance of which 214 would be permanent.
Future mineral extraction	Not applicable. Under the No Action Alternative, the quarry would not be developed.	Removal of 406 Mt of overburden would impact future utilization of bedrock and/or unconsolidated mineral resources located under approximately 1,322 acres associated with the OSFs and SOSF.	Removal of 406 Mt of overburden would impact future utilization of bedrock and/or unconsolidated mineral resources located under approximately 1,304 acres associated with the OSFs and SOSF.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Ore removal	Not applicable. Under the No Action Alternative, the quarry would not be developed.	Permanent removal of 25 Mt of lithium-boron ore and 406 Mt of overburden (including 23 Mt of lithium-rich clay).	Same as the Proposed Action.
Quarry stability	Not applicable. Under the No Action Alternative, the quarry would not be developed.	Final slope configuration would result in a post-closure Factor of Safety close to or greater than 2.0 and 1.72 with the quarry lake.	Same as the Proposed Action.
Faulting	Not applicable. Under the No Action Alternative, the quarry would not be developed.	No significant damage to facilities are anticipated during the life of the Project.	Same as the Proposed Action.
Subsidence	Not applicable. Under the No Action Alternative, the quarry would not be developed.	No subsidence is predicted to occur.	Same as the Proposed Action.
Geochemistry	No impacts would occur.	80 percent of the overburden is classified as non-PAG and presents a low risk of acid rock drainage.	Same as the Proposed Action.
Hazardous Materials and Solid Waste			
Accidental Spills / Releases During Transportation or Storage	Limited potential for accidental spills or releases during reclamation of 15 acres of surface disturbance.	Diesel fuel release probability of 760 in 1,000 miles and 174.8 for each 230-mile transportation route. Corrosion inhibitor 3DT129 release probability of 30.5 in 1,000 miles and 7.0 for each 230-mile transportation route. Liquid phosphate release probability of 25 in 1,000 miles and 5.8 for each 230-mile transportation route.	Same as the Proposed Action.
Solid Waste Generation	No solid waste generated.	Up to two loads of solid waste annually for up to 17 years.	Same as the Proposed Action.
Land Use and Realty			
Impacts to ROWs	No impacts to land use or realty would occur.	Impacts to two ROWs Cave Springs Road (NVN 62084) and Argentite Canyon Road (N 54404) from realignment. Coordination required with holders of ROWs, geothermal leases, and mining claims off Hot Ditch Road and in the OPA for access.	Same as the Proposed Action.
Loss of Public Land for Multiple Uses	15 acres of existing surface disturbance would be reclaimed.	Up to 2,306 acres of new surface disturbance of which 383 would be permanent. 559 acres of Tiehm's buckwheat designated critical habitat fenced with locked gates, with 51 acres of subpopulations fenced within.	Up to 2,271 acres of new surface disturbance of which 214 would be permanent. 714 acres of Tiehm's buckwheat designated critical habitat fenced with locked gates.
Livestock and Grazing			
Loss of Forage	15 acres of existing surface disturbance would be reclaimed.	Disturbance of 140 acres (83 that provide forage) of the Red Spring Allotment, 2,145 acres (1,726 that provide forage) of the Silver Peak Allotment, and 21 acres (none provide forage) of the Fish Lake Valley Allotment. Fencing of 559 acres (469 that provide forage) of Tiehm's buckwheat designated critical habitat.	Disturbance of 140 acres (83 that provide forage) of the Red Spring Allotment, 2,110 acres (1,804 that provide forage) of the Silver Peak Allotment, and 21 acres (none that provide forage) of the Fish Lake Valley Allotment. Fencing of 714 acres (587 that provide forage) of Tiehm's buckwheat designated critical habitat.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Impacted Animal Unit Months (AUMs)	No reduction of AUMs would occur, and 15 acres of disturbance would be reclaimed.	Impacts to 4 AUMs in Red Spring Allotment, 72 AUMs in Silver Peak Allotment (15 of which would be permanent), and no impacts to AUMs in Ice House or Fish Lake Valley allotments. Impacts to 20 AUMS from fencing of Tiehm's buckwheat designated critical habitat in the Silver Peak Allotment.	Impacts to 4 AUMs in Red Spring Allotment, 75 AUMs in Silver Peak Allotment (8 of which would be permanent), and no impacts to AUMs in Ice House or Fish Lake Valley allotments. Impacts to 24 AUMS from fencing of Tiehm's buckwheat designated critical habitat in the Silver Peak Allotment.
Indirect Economic Impacts	No economic impacts from reduced AUMs would occur.	Up to $9,639 in annual economic impacts from reduction of 96 BLM-permitted AUMs for up to 23 years.	Up to $10,342 in annual economic impacts from reduction of 103 BLM-permitted AUMs for up to 23 years.
Livestock Water Resources	No impacts to surface water sites would occur.	Potential impacts to water supply at 32 surface water sites if sourced from the aquifer proposed for dewatering.	Same as the Proposed Action.
Native American Traditional Values			
Impacts to Traditional Cultural Properties, Properties of Traditional Religious and Cultural Importance, or Sacred Sites	No additional impacts to Native America traditional values would occur.	Three areas of concern have been identified and would be avoided by the current layout through Project design. Vegetation communities and wildlife species important to Native American Traditional Values may be impacted. Potential impacts to water supply at 32 surface water sites (including Cave Spring) if sourced from the aquifer proposed for dewatering.	Same as the Proposed Action.
Recreation Resources			
Impacts to Quality of Recreation	No impacts to recreation would occur and 15 acres of existing disturbance would be reclaimed.	Increased human presence and demand for recreation resources and opportunities. Increased noise, traffic congestion, fugitive dust and emissions from vehicle traffic, and lighting from vehicles and operation.	Same as the Proposed Action.
Off-Highway Vehicle (OHV) Use	No impacts to recreation would occur and 15 acres of existing disturbance would be reclaimed.	Disturbance to 869 acres (58 permanent) of semi-primitive motorized recreational areas. Disturbance to 1,975 acres (383 permanent) of OHV use restricted land, including 945 acres (80 permanent) limited to existing roads and trails and closed to competitive events and 1,030 acres (286 permanent) limited to existing roads and trails. Disturbance to 331 acres (17 permanent) of non-restricted areas.	Disturbance to 719 acres (47 permanent) of semi-primitive motorized recreational areas. Disturbance 1,910 acres of OHV use restricted land including, 1,084 acres (154 permanent) limited to existing roads and trails and 826 acres (51 permanent) limited to existing roads and trails and closed to competitive events.
Impacts to Recreational Opportunities	No impacts to recreation would occur and 15 acres of existing disturbance would be reclaimed.	Up to 2,306 acres of surface disturbance of which 383 would be permanent. Up to 559 acres of Tiehm's buckwheat designated critical habitat fenced from some recreational uses.	Up to 2,271 acres of surface disturbance (214 acres would be permanent). Up to 714 acres of Tiehm's buckwheat designated critical habitat fenced from some recreational uses.
Lands with Wilderness Characteristics (LWCs) and Wilderness Study Areas (WSAs)	No impacts to recreation would occur and 15 acres of existing disturbance would be reclaimed.	Surface disturbance to 426 acres (32 permanent) of LWC328 and 1,356 acres (224 permanent) of LWC338. The LWCs would still meet the 5,000 roadless acre criteria for the LWC designation. Some Project components would be visible from some areas of the Silver Peak WSA.	Surface disturbance to 532 acres (28 permanent) of LWC328 and 1,158 acres (117 permanent) of LWC338. The LWCs would still meet the 5,000 roadless acre criteria for the LWC designation. Some Project components would be visible from some areas of the Silver Peak WSA.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Social and Economic Values			
Employment	500 construction jobs and 350 quarrying and processing jobs would not be created.	Construction workforce of 500 people for four years, plus 113 indirect and induced jobs. Quarrying and processing workforce of 350 people for 14 years, plus 79 indirect and induced jobs.	Same as the Proposed Action.
Labor Income	There would be no labor income generated from the No Action Alternative.	Direct labor income per calendar year of $54,141,401 and indirect and induced labor income of $2,619,995 for construction. Direct labor income per calendar year of $125,142,545 and indirect and induced labor income of $18,709,469 for quarrying and processing.	Same as the Proposed Action.
Value Added	There would be no value added generated from the No Action Alternative.	Total estimated direct value added per calendar year of $102,788,237, and total indirect and induced value added would be $10,028,255 from construction. Total estimated direct value added per calendar year of $71,951,766, and total indirect and induced value added would be $7,019,778 from quarrying and processing.	Same as the Proposed Action.
Housing	There would be no additional demand for housing.	Demand for 328 housing units during construction; demand for 230 housing units during quarrying and processing.	Same as the Proposed Action.
Community Services, Healthcare, and other Services	There would be no increased demand for community services.	Increased need for improvements or modifications to the public utilities infrastructure, and additional requirements for law enforcement, fire protection and emergency medical services. Increased demand for healthcare services and practitioners. Increased demand for grocery stores, retail stores, and other convenience and commodity needs.	Same as the Proposed Action.
Taxes and Economic Activity	There would be no additional taxes or economic activity gained from the No Action Alternative.	Total tax generation per calendar year of $25,069,752 (direct, indirect, and induced), including $11,819,628 in federal taxes, $4,183,588 in state taxes, $5,911,690 in county-level taxes, and $3,154,846 in sub-county special district taxes during construction. Total tax generation per calendar year of $17,548,826 (direct, indirect, and induced), including $8,273,740 in federal taxes, $2,928,511 in state taxes, $4,138,183 in county-level taxes, and $2,208,392 in sub-county special district taxes during quarrying and processing. Potential for increased property tax to Esmeralda County.	Same as the Proposed Action.
Education	There would be no increase in school enrollment.	Increased school enrollment in Dyer, Silver Peak, Tonopah, Hawthorne, and Bishop with approximately 140 additional students during construction and 98 additional students during quarrying and processing.	Same as the Proposed Action.
Social Values and Cultural Landscapes	There would be no increase in population or change to the social and cultural landscape.	Additional disturbance, employment, and traffic generation may impact social values and cultural landscapes in the nearby communities. The communities could expect to see increased use of facilities and public lands. Water rights secured or leased from current agricultural water users in the Fish Lake Valley could reduce the level of agriculture in the area. Potential closure impacts including housing market and economic declines.	Same as the Proposed Action.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Soil Resources			
Disturbance to Soils	No impacts to soils would occur.	Up to 2,306 acres of new surface disturbance of which 383 would be permanent. Potential impacts to biological soil crusts (biocrusts), if present.	Up to 2,271 acres of new surface disturbance of which 214 would be permanent. Potential impacts to biocrusts, if present.
Threatened and Endangered Species			
BSSG Habitat and Habitat Use	15 acres of existing disturbance would be reclaimed.	Disturbance of up to 1,064 acres (279 permanent) of potential habitat. No disturbance to mapped habitat or proposed critical habitat. Potential avoidance of the area from increased noise and human presence. Potential impacts to water supply at 32 surface water sites if sourced from the aquifer proposed for dewatering.	Same as the Proposed Action except disturbance of up to 782 acres (135 permanent) of potential habitat.
Monarch Butterfly (*Danaus plexippus*) Habitat	15 acres of existing disturbance would be reclaimed.	Up to 2,306 acres (383 permanent) of new surface disturbance of potential habitat that may support milkweed and nectar sources.	Up to 2,271 acres (214 permanent) of new surface disturbance of potential habitat that may support milkweed and nectar sources.
Vehicle strikes (BSSG and Monarch Butterfly)	None expected beyond what is already occurring.	Access road travel, construction activities, and operation could result in vehicle strikes or crushing of BSSG and monarch butterflies resulting in fatality.	Same as the Proposed Action.
Tiehm's Buckwheat Critical Habitat Disturbance	15 acres of existing disturbance would be reclaimed. Potential for disturbance from other authorized or unauthorized activities.	Disturbance to 354 acres (97 permanent) of designated critical habitat. Up to 559 acres of designated critical habitat would be fenced.	Disturbance to 197 acres (45 permanent) of designated critical habitat. Up to 714 acres of designated critical habitat would be fenced.
Tiehm's Buckwheat Subpopulation Impacts	15 acres of existing disturbance would be reclaimed. Potential for disturbance from other authorized or unauthorized activities.	Up to 559 acres of designated critical habitat would be fenced. Within this, 51 acres of subpopulations would be fenced. No direct disturbance would occur within the eight Tiehm's buckwheat subpopulations.	Up to 714 acres of designated critical habitat would be fenced. No direct disturbance would occur within the eight Tiehm's buckwheat subpopulations
Tiehm's Buckwheat Pollinator Impacts	15 acres of existing disturbance would be reclaimed.	Up to 2,306 acres of new surface disturbance of which 383 would be permanent. Impacts to pollinator communities if present.	Up to 2,271 acres of new surface disturbance of which 214 would be permanent. Impacts to pollinator communities if present.
Tiehm's Buckwheat Water Impacts	No changes from what is already occurring.	Changes to overland flow patterns in designated critical habitat around Project features.	Same as the Proposed Action, but less flow altercation required from less proposed in designated critical habitat.
Dust	15 acres of existing disturbance would be reclaimed.	Fugitive dust potential to impact Tiehm's buckwheat and pollinator supporting habitat from reduced photosynthesis and decreased water-use efficiency.	Same as the Proposed Action, but less impacts from less disturbance in designated critical habitat.
Transportation and Access			
Road Alignments and Crossings	No impacts to road alignments or crossings would occur.	4.7-mile realignment of Cave Springs Road and 0.9-mile realignment of Argentite Canyon Road. The realigned Cave Springs Road would have three new crossings with Project roads.	Same as the Proposed Action except 1.2 miles of Argentite Canyon Road realignment and two new crossings with Project roads.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Traffic	No impacts to traffic would occur.	An additional 186 to 248 vehicle passes per day during construction, additional 230 to 288 vehicle passes per day during quarrying and processing, and additional 40 vehicle passes per day during closure on the access road. Traffic control systems on Cave Springs Road would temporarily stop public traffic at the two autonomous haul road intersections to the processing facility and North OSF causing delays. Pilot car would guide public through the OPA.	Same as the Proposed Action.
Vegetation			
Vegetation Removal	15 acres of existing disturbance would be reclaimed.	Up to 2,306 acres (383 permanent) of new surface disturbance of vegetation communities and ecological communities.	Up to 2,271 acres (214 permanent) of new surface disturbance of vegetation communities and ecological communities.
Establishment of Noxious Weeds	Existing disturbance would provide opportunity for establishment of noxious weed species until reclaimed.	Potential for establishment and spread of noxious species during construction, operation, and reclamation.	Same as the Proposed Action, but 35 acres less of disturbance.
Special Status Plant Species	No impacts to special status plant species would occur.	Potential impacts to sagebrush cholla (*Opuntia pulchella*) and Tecopa birdbeak (*Cordylanthus tecopensis*) from fugitive dust or sedimentation. No impacts from groundwater drawdown anticipated. Unknown if surface disturbance would impact Mojave fishhook cactus (*Sclerocactus polyancistrus*).	Same as the Proposed Action except one sagebrush cholla would be impacted by disturbance from the South OSF unless relocated.
Ethnobotanical Plant Species	No impacts to ethnobotanical plant species would occur.	New surface disturbance of 2,306 acres (383 permanent) may impact plant species of ethnobotanical importance.	New surface disturbance of 2,271 acres (214 permanent) may impact plant species of ethnobotanical importance.
Visual Resources			
Contrasting Visual Elements	No additional impacts to visual resources.	From Key Observation Points (KOPs) 1, 2, and 4, there would not be a conflict with the Visual Resource Management (VRM) Class IV objectives. From KOP 3, there would not be a conflict with the VRM Class III objectives. Visible portions from the Silver Peak WSA (VRM Class I) are not anticipated to change the overall quality of views.	Same as the Proposed Action.
Night Sky Impacts	No impacts to night skies would occur.	Nighttime lighting could cause an urban sky glow over the OPA. The brightness of the lights and darkness of the nearly black background would create a strong contrast, and thus make the lights visible.	Same as the Proposed Action.
Water Resources			
Quarry Lake Formation	No quarry lake would form.	113-acre (surface) quarry lake.	110-acre (surface) quarry lake.
Seep and Spring Flow	No impacts would occur.	Impacts to 32 surface water sites are not anticipated because they are thought to be perched. If the springs are sourced from upwelling groundwater on the upgradient side of a low permeability fault zone, decreased amounts of spring flow may occur.	Same as the Proposed Action.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Quarry Lake Water Chemistry	No impacts would occur.	NDEP Profile III reference values in the quarry lake would be in exceedance for arsenic from 50 to 200 years post-closure, boron from 5 to 200 years post-closure, fluoride from 5 to 200 years post-closure, and molybdenum from 5 to 200 years post-closure. The ecological risk assessment (ERA) indicated a low probability that risks to wildlife would occur based on the predicted water quality for the post-quarrying quarry lake.	Same as the Proposed Action.
Sedimentation and Erosion	No impacts would occur.	2,306 acres of disturbance may cause erosion and sedimentation during construction and operation.	2,271 acres of disturbance may cause erosion and sedimentation during construction and operation.
Groundwater Availability	No impacts would occur.	Drawdown of up to 300 feet near the quarry, followed subsequently by the majority of groundwater recovery over a period of approximately 60 years.	Same as the Proposed Action.
Water Rights	No impacts would occur.	Four surface water stock rights located within the predicted 10-foot drawdown contour associated with the long-term maximal drawdown prediction for the Proposed Action (iSP-01, SP-03, SP-06, and SP-07), and one groundwater stock right. One surface stock water right, one groundwater stock right, and nine groundwater irrigation rights that could be impacted by groundwater drawdown.	Same as the Proposed Action.
Groundwater Quality	No impacts would occur.	No impacts anticipated because evaporation of the quarry lake would cause it to be a terminal sink.	Same as the Proposed Action.
Wetland and Riparian Resources			
Wetland and Riparian Resources	No impacts would occur.	Direct disturbance to up 0.16 acre of wetlands within the Access Road and Infrastructure Corridor where the Fish Lake Valley Hot Springs cross the access road and 54.04 acres of riverine, 0.40 acres of freshwater emergent wetland, and 0.02 acres of freshwater pond National Wetland Inventory (NWI)-mapped wetlands. Potential impacts to riparian area near Chiatovich Creek from the water supply pipeline.	Same as the Proposed Action except disturbance to 54.87 acres of riverine NWI mapped wetlands.
Wildlife Resources Including Migratory Birds and Special Status Wildlife Species			
Water Sources	No impacts would occur.	Potential impacts to water supply at 32 surface water sites if sourced from the aquifer proposed for dewatering. One guzzler would be relocated. A quarry lake would form with a predicted low probability of risk to wildlife.	Same as the Proposed Action.
Displacement from Human Activity and Disturbance and Collision	No additional impacts would occur.	Human presence and noise could cause wildlife avoidance and displacement. Vehicles, vertical facilities, and lights may cause collisions. Increased competition between wildlife species for available resources.	Same as the Proposed Action.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Crushing and Vehicle Strikes	No additional impacts would occur.	Access road travel, construction activities, and operation could result in vehicle strikes or crushing of wildlife and/or burrows resulting in fatality.	Same as the Proposed Action.
Habitat Change	15 acres of surface disturbance would be reclaimed.	Removal of 2,306 acres (383 acres permanent) of avian nesting and foraging habitat, and insect species, mammal species, and reptile/amphibian species habitat.	Removal of 2,271 acres (214 acres permanent) of avian nesting and foraging habitat, and insect species, mammal species, and reptile/amphibian species habitat.
Mule Deer (*Odocoileus hemionus*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 2,136 acres (383 permanent) of year-round mule deer habitat.	Surface disturbance to 2,100 acres (214 permanent) of year-round mule deer habitat.
Desert Bighorn Sheep (*Ovis canadensis nelsoni*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 2,129 acres (383 permanent) of year-round desert bighorn sheep habitat.	Surface disturbance to 2,093 acres (214 permanent) of year-round desert bighorn sheep habitat.
Black-throated Gray Warbler (*Setophaga nigrescens*) Habitat	15 acres of surface disturbance would be reclaimed.	Permanent surface disturbance to one acre of habitat.	Surface disturbance to 120 acres (eight permanent) of habitat.
Brewer's Sparrow (*Spizella breweri*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 2,209 acres (381 permanent) of habitat.	Surface disturbance to 2,019 acres (206 permanent).
Pinyon Jay (*Gymnorhinus cyanocephalus*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 1,065 acres (281 permanent) of habitat.	Surface disturbance to 902 acres (143 permanent).
Golden Eagle Nests	No impacts would occur.	Two nesting territories are within one mile of surface disturbance and/or two miles of quarry blasting.	Same as the Proposed Action.
Golden Eagle Habitat	15 acres of surface disturbance would be reclaimed.	Removal of 2,306 acres (383 acres permanent) of potential foraging habitat.	Removal of 2,271 acres (214 acres permanent) of potential foraging habitat.
Cassin's Finch (*Haemorhous cassinii*), Common Nighthawk (*Chordeiles minor*), Loggerhead Shrike (*Lanius ludovicianus*), Ferruginous Hawk (*Buteo regalis*), and Western Burrowing Owl (*Athene cunicularia*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 2,306 acres (383 permanent) of potential habitat.	Surface disturbance to 2,271 acres (214 permanent) of potential habitat.
Botta's Pocket Gopher (*Thomomys bottae*) and Desert Kangaroo Rat (*Dipodomys deserti*) Habitat	15 acres of surface disturbance would be reclaimed.	Surface disturbance to 980 acres (96 acres permanent) of suitable soils.	Surface disturbance to 1,051 acres (99 acres permanent) of suitable soils.

Potential Impact	No Action Alternative	Proposed Action	North and South OSF Alternative
Pale Kangaroo Mouse (*Microdipodops pallidus*) Habitat	15 acres of surface disturbance would be reclaimed.	Impacts to 1,039 acres (104 permanent) of suitable habitat in the Access Road and Infrastructure Corridor. Potential for direct injuries or mortalities	Surface disturbance to 1,113 acres (62 acres permanent) of suitable soils.
Bat Habitat and Foraging	No additional impacts would occur.	Disturbance to three acres (one permanent) of cliff and canyon habitat and one acre (permanent) of pinyon-juniper habitat for forage and roosting; creation of quarry lake may attract foraging bats; creation of potential roosting habitat from quarry walls; removal of one adit.	Same as the Proposed Action except disturbance to 10 acres (less than one permanent) of cliff and canyon habitat and 120 acres (eight permanent) of pinyon-juniper habitat for forage and roosting.
Wong's Springsnail (*Pyrgulopsis wongi*) Habitat	No additional impacts would occur.	Potential impacts to water supply at 32 surface water sites (including Cave Spring) if sourced from the aquifer proposed for dewatering.	Same as the Proposed Action.
Fish Lake Valley Tui Chub (*Siphateles bicolor* ssp. 4) and Fish Lake Valley Pyrg (*Pyrgulopsis ruinosa*) Habitat	No additional impacts would occur.	Potential impacts to habitat from sedimentation and fugitive dust.	Same as the Proposed Action.
California Toad (*Anaxyrus boreas halophilus*) and Western Toad (*Anaxyrus boreas*) Habitat	No additional impacts would occur.	Disturbance to eight acres of potential habitat. Potential impacts to habitat from sedimentation and fugitive dust.	Same as the Proposed Action.
Wild Horses and Burros			
Habitat and Forage Loss	15 acres of surface disturbance would be reclaimed.	Disturbance to 2,286 acres (383 acres permanent) of the Silver Peak Herd Management Area (HMA); however, the appropriate management level (AML) land for the Silver Peak HMA is zero. 559 acres of Tiehm's buckwheat designated critical habitat would be fenced.	Disturbance to 2,171 acres (214 acres permanent) Silver Peak HMA. 714 acres of Tiehm's buckwheat designated critical habitat would be fenced.
Vehicle Strikes	No additional impacts would occur.	Increased traffic on the access road could lead to fatalities or injuries to wild horses or burros from collisions.	Same as the Proposed Action.
HMA Use	No additional impacts would occur.	Effects from human disturbance and noise could reduce the areas in the HMA utilized, causing an increased use in other portions of the HMA.	Same as the Proposed Action.

3.0 Affected Environment

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources that have the potential to be affected by activities related to the Proposed Action, the North and South OSF Alternative, and the No Action Alternative described in **Chapter 2**. To comply with NEPA, the BLM is required to address specific elements of the environment that are subject to requirements specified in statutes, regulations, or by Executive Order. **Table 3-1** lists the supplemental authorities and other resources addressed in this Draft EIS. Supplemental authorities and other resources that may be affected by the Proposed Action and alternatives are discussed further in **Chapters 3** and **4** and in the SERs for each resource (BLM 2024c through 2024u). Those elements listed under the supplemental authorities that are not present in the proposed Plan boundary or resource-specific study area or are present but would not be affected are not carried through in this EIS. The areas of analysis for resources analyzed are shown on **Figures 3-1**, **3-2**, **3-3**, and **3-4**.

Table 3-1 Supplemental Authorities and Other Resources

Supplemental Authority and Other Resources	Not Present	Present/Not Affected	Present/May be Affected	Rationale/Section Reference
Air Quality and Climate Change			X	Sections 3.1, 4.1 and 4.20.1; Air Quality SER (BLM 2024c)
Areas of Critical Environmental Concern	X			Resource not present.
Cultural Resources			X	Sections 3.2, 4.2 and 4.20.2; Cultural Resources SER (BLM 2024d)
Environmental Justice			X	Sections 3.3, 4.3 and 4.20.3; Environmental Justice SER (BLM 2024e)
Farmlands (Prime or Unique)	X			Resource not present.
Fire Management		X		Fire Prevention and Response is described in Appendix G of the Plan (Ioneer 2022)
Fisheries	X			Resource not present.
Floodplains			X	Sections 3.16, 4.16 and 4.20.16; Water Resources and Geochemistry SER (BLM 2024r)
Forest and Rangelands			X	Sections 3.14, 4.14 and 4.20.14; Vegetation Resources SER (BLM 2024p)
Geology and Minerals			X	Sections 3.4, 4.4, and 4.20.4; Geology and Minerals SER (BLM 2024f)
Hazardous Materials/Solid Waste			X	Sections 3.5, 4.5, and 4.20.5; Hazardous Materials and Solid Waste SER (BLM 2024g)
Land Use and Realty Resources			X	Sections 3.6, 4.6, and 4.20.6; Land Use and Realty SER (BLM 2024h)
Livestock and Grazing Resources			X	Sections 3.7, 4.7, and 4.20.7; Livestock and Grazing Resource SER (BLM 2024i)
Migratory Birds			X	Sections 3.18, 4.18, and 4.20.18; Wildlife Resources SER (BLM 2024t)
National Historic Trails	X			Resource not present.
Native American Traditional Values			X	Sections 3.8, 4.8, and 4.20.8; Native American Traditional Values SER (BLM 2024j)
Noise			X	Sections 3.3, 3.9, 3.18, 4.3, 4.9, 4.18, 4.20.3, 4.20.9, and 4.20.18; Environmental Justice SER (BLM 2024e), Recreation SER (BLM 2024k), and Wildlife Resources SER (BLM 2024t)
Noxious Weeds/Invasive Non-native Species			X	Sections 3.14, 4.14, and 4.20.14; Vegetation Resources SER (BLM 2024p)
Paleontological Resources	X			Resource not present

Supplemental Authority and Other Resources	Not Present	Present/Not Affected	Present/May be Affected	Rationale/Section Reference
Recreation			X	Sections 3.9, 4.9, and 4.20.9; Recreation SER (BLM 2024k)
Social and Economic Values			X	Sections 3.10, 4.10, and 4.20.10; Social and Economic Values SER (BLM 2024l)
Soils			X	Sections 3.11, 4.11, and 4.20.11; Soil Resource SER (BLM 2024m)
Special Status Species			X	Sections 3.14, 3.18, 4.14, 4.18, 4.20.14, and 4.20.18; Vegetation Resources SER (BLM 2024q) and Wildlife Resources SER (BLM 2024t)
Threatened and Endangered Species			X	Sections 3.12, 4.12, and 4.20.12; Threatened and Endangered Species SER (BLM 2024n)
Transportation and Access			X	Sections 3.13, 4.13, and 4.20.13; Transportation and Access SER (BLM 2024o)
Vegetation Resources			X	Sections 3.14, 4.14, and 4.20.14; Vegetation Resources SER (BLM 2024p)
Visual Resources			X	Sections 3.15, 4.15, 4.20.15; Visual Resources SER (BLM 2024q)
Water Resources and Geochemistry			X	Sections 3.16, 4.16, and 4.20.16; Water Resources and Geochemistry SER (BLM 2024r)
Wetland and Riparian Areas			X	Sections 3.17, 4.17, and 4.20.17; Wetland and Riparian Resources SER (BLM 2024s)
Wild and Scenic Rivers	X			Resource not present.
Wild Horses and Burros			X	Sections 3.19, 4.19, and 4.20.19; Wild Horses and Burros SER (BLM 2024u)
Wilderness, Lands with Wilderness Characteristics, and Wilderness Study Area			X	Sections 3.9, 4.9, and 4.20.9; Recreation SER (BLM 2024k)
Wildlife Resources			X	Sections 3.18, 4.18, and 4.20.18; Wildlife Resources SER (BLM 2024t)

3.1 Air Quality and Climate Change

The area of analysis for air quality includes the local airshed, which is defined as a 50-kilometer (km) (31-mile) radius buffer of the OPA (**Figure 3-3**) and includes portions of Esmeralda and Mineral counties in Nevada and Inyo and Mono counties in California and encompasses all or parts of 12 air quality planning areas as defined by the Nevada Bureau of Air Quality Planning. The nearest Class I area is the Ansel Adams Wilderness Area, located approximately 82 miles west. The Project is located in the Fish Lake Valley hydrographic area (HA) (HA 117). The area of analysis is located within an Air Quality Management Area that is in "unclassifiable/attainment" for all pollutants having an air quality standard.

The Project is located in rural southwestern Nevada with few nearby stationary air pollution sources. Several small, permitted emission sources exist throughout the area of analysis. Background pollutant concentrations are expected to be generally low. Elevated particulate concentrations occur from natural sources due to occasional strong winds in the area that cause exposed surface soils to become airborne.

The background concentrations account for existing natural and anthropogenic pollutant emissions. The Project would be in a rural area, distant from roads that support high levels of traffic and active industrial operations. For rural areas, NDEP approves the use of zero background concentrations for gaseous pollutants like CO, nitrogen dioxide (NO_2), and SO_2 and non-zero background concentrations for PM_{10} and $PM_{2.5}$. **Table 3-2** provides the background pollutant concentrations used for the area of analysis.

Table 3-2 Background Air Pollutant Concentrations

Pollutant	Averaging Period	Concentration Format	µg/m3 or ppb	Data Year(s)	Monitoring Site	Reference
NO_2	1-Hour	98th Percentile	3.3	2019-2021	Trona-Athol Seares Valley, California	USEPA Air Data
	Annual	Arithmetic Mean	33.2			
SO_2	1-Hour	99th Percentile	0.5[1]	2019-2021	Owens Valley, California	
	3-Hour	2nd high				
	24-Hour	2nd high				
	Annual	Arithmetic mean				
CO	1-Hour	2nd high	1.7	2019-2021	Owens Valley, California	
	8-Hour	2nd high	2.2			
PM_{10}	24-Hour	6th high	10.2	N/A	Great Basin National Park, Nevada	NDEP
$PM_{2.5}$	24-Hour	98th Percentile	8.0	N/A	Jarbidge Wilderness, Nevada	NDEP
	Annual	Arithmetic Mean	2.3	N/A		
Pb	3-Month	Rolling 3-Month	0	N/A	N/A	N/A

Sources: Trinity 2022a, 2023
[1] The 1-hour SO_2 background was applied for all averaging as a conservative measure.
$\mu g/m^3$ = micrograms per cubic meters
N/A = Not applicable

The air quality in the region is determined by the magnitude and distribution of pollutant emissions and the meteorological conditions that affect pollutant transport, dispersion, and deposition. Air quality in the area of analysis is governed by both pollutant emissions and meteorological conditions. Precipitation in the region averages between approximately four and six inches per year and is distributed fairly evenly throughout the year. The area receives about 16 inches of snow per year. The area of analysis experiences cool winters and warm summers with large diurnal and seasonal temperature variations that are typical for arid continental climates. Temperature inversions are common due to the local topography that consists of mountain ranges and low-lying basins. During inversions when wind speeds are low, air pollution can become trapped near the ground and dilution is minimized. Inversions are strongest during winter months when daytime hours are the shortest. There is a dominant north component to the wind (i.e., wind blowing from the south to the north). A similar localized wind direction regime is expected throughout the area of analysis due to orientation of mountainous terrain in the region.

The primary GHGs in the atmosphere include CO_2, methane, and nitrous oxide. These GHGs are referred to as “heat-trapping” gases that absorb heat and trap it in the atmosphere. The USEPA has implemented regulations and guidelines regarding evaluation of GHG emissions, and the manner in which NEPA documents should address these issues. The USEPA has formed a correlation of the various gases with CO_2 so that any particular GHG can be shown as a carbon dioxide equivalent (CO_2e). This methodology allows gaseous emissions to be reduced to CO_2e and compared with area wide GHG emissions on a local, state-wide, country-wide, or global level.

Mercury is a naturally occurring element that exists in the environment in its elemental form as well as mercury compounds. Small amounts of mercury emissions are generated by fuel-burning equipment, such as boilers and blasting. The Project is not considered a precious metals mining facility and therefore would not be subject to the Nevada Mercury Control Program.

3.2 Cultural Resources

The area of analysis for cultural resources is referred to as the area of potential effects (APE). To take into account different types of impacts, several zones of analysis (ZoA) that make up the APE have been identified (**Figure 3-1**). The Physical APE (PAPE) encompasses the Plan boundary where physical disturbance would occur. The BLM has defined the Vibratory, Auditory, and Visual portions of the APE for the Project as a set of overlapping ZoA for those discrete types of effects anticipated for the undertaking. The BLM does not anticipate a change in air quality or particulate inclusions, and any increase in dust or

emissions resulting from the Project's initial facility construction and blasting would be temporary and negligible; thus, an Atmospheric ZoA was not established.

Several Class III inventories have been conducted within the PAPE (Giambastiani and Moore 2012; Jamaldin et al. 2020; Vicari et al. 2020; Harmon 2022; Seymore and Harmon 2022; Richey and Felling 2023). These inventories identified 231 cultural resources within the PAPE, of which 149 are prehistoric, 56 are historic, and 26 are multi-component containing both prehistoric and historic components. Within the PAPE, 25 cultural resources and one architectural resource are eligible for the NRHP and 14 remain unevaluated.

The 40 NRHP-eligible or unevaluated cultural resources (i.e., historic properties) include eight prehistoric rock shelters, two rock shelters with lithic scatters, seven prehistoric habitations, eight lithic scatters, three prehistoric campsites, one prehistoric habitation/mining site, seven prehistoric habitat/historic refuse deposits, one rock shelter/cabin with its associated cabin also recorded individually, a multi-component habitation site, and one historic mining/borates works. An architectural inventory identified three historic architectural elements within the PAPE, including the Cave Springs Cabin (B12947/26ES1566), a corral (S2431/26ES2937), which is part of a larger historic site, and a modified water tank (S2430/26ES2935) (Ross-Hauer 2020). The Cave Springs Cabin (B12947) is individually eligible for the NRHP while the other two structures are not eligible.

A Class I inventory of the Vibratory, Auditory, and Visual APE was conducted to determine which NRHP-eligible cultural resources (i.e., historic properties) had the potential to be affected by the Project (Felling and Richey 2023). The Class I inventory identified 359 previously recorded cultural resources and four potential undocumented sites within these APEs (visual, auditory, vibrational). There were 187 removed from consideration because they were determined not eligible for listing on the NRHP. The remaining 176 NRHP-eligible or unevaluated cultural resources were then further scrutinized for the potential to be impacted, with 29 cultural resources having the potential to be indirectly impacted by the Project, including 27 sites, one archaeological district, and one architectural resource (Felling and Richey 2023).

3.3 Environmental Justice

The area of analysis for environmental justice includes Census Block Groups 320099501001 (Esmeralda County, Nevada), 320219707001, 320219707002, 320219707003, 320219708001, 320219708002 (Mineral County, Nevada), 320239601001, 320239602001, 320239602002 (Nye County, Nevada), 60270001001, 60270001002, 60270002001, 60270002002, 60270003001, 60270003002, 60270004001, 60270004002, 60270004003, 60270005001 (Inyo County, California), and 60510001011 (Mono County, California) (**Figure 3-4**). It is anticipated that most of the work force would live in these Census Block Groups and commute to the OPA due to proximity to the Project, availability of commercial and public facilities, services, and housing. Project-related impacts to air quality, visual, noise, water, traffic, and social and economic values are not anticipated to affect environmental justice communities beyond this area of analysis. The hazardous materials and solid waste area of analysis (Section 3.5) was assessed for environmental justice, which includes the Plan boundary and the main transportation and access routes on which materials would be transported. The reference area for minority, low-income, and American Indian or Alaska Native communities is the State of Nevada non-metropolitan (metro) population, which is defined as the State of Nevada population excluding the Reno Metro Area (including Sparks) and Las Vegas-Henderson-Paradise Metro Area.

Approximately 30 percent of the area of analysis is low-income. The reference area low-income population is approximately 26 percent. The Census Block Group within Esmeralda County that encompasses the Project has a low-income population of 44 percent which is higher than the reference population. There are 12 Census Block Groups within the area of analysis having low-income populations, with the Census Block Group in Mineral County having the highest percentage of low-income populations within the area of analysis, which includes Hawthorne, Mina, and Luning.

Approximately 38 percent of the area of analysis population is identified as belonging to a minority population. The reference area has a minority percentage of approximately 40 percent. There are four Census Block Groups within the area of analysis that have a minority population that is meaningfully greater than the reference population or equal to or greater than 50 percent of the population (320219707001,

320219707003, 320219708001, and 320219708002). The Census Block Groups with the highest percentage of minority residents are 320219708001 in Mineral County and 60270004001 in Inyo County. Census Block Group 60270004001 overlaps the Bishop Paiute Tribe Reservation. Census Block Group 320219708001 is located in Hawthorne near Walker Lake and overlaps the Walker River Paiute Tribe Reservation.

It is estimated that 14 percent of the area of analysis population is identified as belonging to an American Indian or Alaska Native population. The reference area has an American Indian or Alaska Native population percentage of six percent. There are eight Census Block Groups that have been identified within the area of analysis that have an American Indian or Alaska Native population equal to or greater than reference population (320219708001, 320219708002, 320239601001, 60270002001, 60270002002, 60270004001, 60270005001, and 60510001011). The Census Block Groups with the highest percentage of American Indian or Alaska Native residents are Census Block Group 320219708001 (Mineral County) and Census Block Group 60270004001 (Inyo County). Census Block Group 60270004001 is located in the city of Bishop and has an American Indian or Alaska Native population of 74 percent and overlaps the Bishop Paiute Tribe. Census Block Group 320219708001 is located in the town of Schurz and has an American Indian or Alaska Native population of 86 percent and overlaps the Walker River Paiute Tribe Reservation.

3.4 Geology and Minerals

The area of analysis for geology and mineral resources is the Plan boundary (**Figure 3-1**). The regional landscape is comprised of moderately to strongly dissected high desert mountains broken up by playa basins, low relief foothills, and arroyos. Basement rocks consist of Cambrian to Ordovician marine rocks and late Precambrian metamorphic rocks which were uplifted and intermittently eroded through the Tertiary. A late Miocene basin formed during extension adjacent to the northern margin of the nascent Silver Peak caldera. The proximity of the basin at this site permitted the hosting of a small alkaline lake with intermittent (ephemeral) life over a period of an estimated one to two million years (Albers and Stewart 1972; Reynolds and Chafetz 2020). The lacustrine basin sediments became the host of the Rhyolite Ridge lithium-boron deposit. The stratigraphic column for the OPA consists of Quaternary alluvium and other Quaternary sediments, Miocene-Pliocene lacustrine sediments, and Miocene volcanics (Robinson et al. 1976).

The Project host rocks are lakebed (lacustrine) strata of the late Miocene age Cave Spring Formation, hosted within a north to south oriented basin (South Basin). The Cave Spring Formation overlies the 6.0 Mega-annum-age Rhyolite Ridge Tuff and Argentite Canyon Formations (Albers and Stewart 1972; Robinson et al. 1976). The Cave Spring Formation consists primarily of marl and lesser amounts of claystones. Minor gritstone beds are comprised primarily of pumice clasts and lapilli tuff clasts which form distinctive marker horizons in the marl. The stratigraphy of the area of analysis consists of basal Rhyolite Ridge tuff, Argentite Canyon latite, and Cave Springs Formation (Reynolds and Chafetz 2020). Although primarily a “layer-cake” geology, the stratigraphy has minor folds subparallel to adjacent faults, and dips northerly and easterly (Robinson et al. 1976). The ore zone is in outcrop on the western part of the deposit, and dips easterly to depths greater than 700 feet below ground surface.

Boron mineralization occurs as the mineral searlesite, a hydrous sodium borosilicate, within marl horizons interbedded with claystones. The ore zone occurs within one marl bed averaging 65 feet in thickness over approximately four square miles (Reynolds and Chafetz 2020). Grades (concentrations) of searlesite range up to 50 percent within the marl unit in association with lithium bearing clays (illite–smectite group) that contribute significantly in value to the Project.

Estimated ore reserves for the Project deposit consist of total proven and probable reserves of 67.4 Mt averaging 0.18 percent lithium and 1.54 percent boron. The estimated mineral resource outlier to the estimated reserve contains measured, indicated, and inferred estimated resources totaling 164 Mt averaging 0.16 percent lithium and 1.42 percent boron (Fluor 2020). The Rhyolite Ridge deposit is the only known economically viable deposit of searlesite in the world (Mineral Data Publishing 2001).

Representative materials of Project lithologies were analyzed to determine their makeup and potential behavior when exposed to the weathering environment. Samples, 125 total, were subjected to acid-base accounting analyses to determine whether they were acid generating or neutralizing. Additional samples, 26 total, were subjected to meteoric water mobility procedure testing to examine the mobility of toxic metal

and other elements. An additional 19 samples were selected for kinetic testing and humidity cell testing for longer term chemical behavior assessment. Samples were examined to identify mineralogical components. The acid-base accounting testing showed that the average of the samples of overburden materials were acid neutralizing, with net neutralizing potential of 204. The meteoric water mobility procedure testing indicated that certain metals, e.g., arsenic, antimony, and aluminum, would exceed regulatory reference values for water standards in neutral to alkaline oxidizing conditions. Total dissolved solids (TDS) and fluorine would also exceed those standards. Other elements exhibited variable responses during testing (HydroGeoLogica 2020a).

There are three Holocene Active faults near the OPA. These faults are the Emigrant Peak Fault Zone (EPFZ) bounding the east side of Fish Lake Valley; the McAfee Canyon Fault (MCF); and segments of the Fish Lake Valley Fault Zone (FLVFZ). A fourth fault, the Silver Peak Range Fault located 3.3 miles southeast of the OPA, is inferred to be inactive (Pliocene) or at least it has been Early Quaternary since its last seismic event; it does not cross the OPA and is not considered hazardous to occupied infrastructure. Segmented splays of the EPFZ occur within the OPA but appear not to have been active since the mid to early Quaternary time. The faults at the quarry and facilities are considered inactive for planning and design purposes. The FLVFZ extends north from the North Death Valley Fault Zone into Nevada. It extends along the west side of Fish Lake Valley approximately 4.5 miles west of the OPA where it crosses the access road but does not impact any proposed occupied structures. The FLVFZ is considered Holocene Active. It displays as ruptures in Holocene lithologies, with an estimated recurrence interval of 500 to 1,500 years. It is considered one of the most active faults regionally. The MCF in its northern segment is located approximately 7.5 miles south-southwest of the OPA. It is considered to be Holocene Active along its entire extent. It does not cross the Plan boundary and is not considered hazardous to the site (NewFields 2019a).

In assessing risks in the event of seismic activity near or at the Plan boundary, for seismic events that occur once every 475 years, there is a 10 percent probability of that seismic event causing ground acceleration of 0.28 of gravity within the next 50 years. If such an event did occur, the ground acceleration on the most intense of these (return period of 2,475 years) is nearly double that experienced during the 475-year event. Based on modeling, applying the calculated probabilistic peak ground acceleration data for the Plan boundary, the shaking at the site could range from very strong to severe, resulting in moderate to heavy potential damage to infrastructure. In Esmeralda County, no damage to infrastructure has resulted from seismic events during historic times. The likelihood of such damage occurring has been assessed as being not anticipated by Esmeralda County Hazard Mitigation Steering Committee (NewFields 2019a).

3.5 Hazardous Materials and Solid Waste

The area of analysis for hazardous materials and solid waste includes the Plan boundary and the main transportation routes and access roads on which materials would be transported. These routes include: 1) the roads from the Plan boundary north on SR 264 to SR 773, then east on U.S. 6, then northeast on U.S. 95 to Fallon, then northwest on U.S. 50A to Fernley, then continuing west on Interstate 80 (I-80) to Reno; and 2) the roads from the Plan boundary south and east on SR 264/266 through Dyer, Oasis, and Lida, then southeast on U.S. 95 to Beatty, and continuing southeast on U.S. 95 to Las Vegas (**Figure 3-4**). The affected environment for hazardous materials includes air, water, soil, and biological resources that may be impacted by an accidental release of hazardous materials during transportation to and from the OPA, and during storage and use within the quarry area. Both transportation routes utilize the access road to the OPA and are approximately 230 miles long. Sensitive receptors along the transportation routes include the Amargosa River, an intermittent stream that flows through Beatty, and Chiatovich Creek, on the route from Las Vegas. The route from Reno would pass within 200 feet of Walker Lake and cross two streams draining to the lake, Dry Creek, and Cottonwood Creek. The Carson River, Truckee River, and Walker River would also be crossed on the route from Reno.

Previous exploration has occurred periodically in the OPA since 1962 in the form of boreholes and trenches. Although not in operation, the Mineral Ridge Mine, located east of the area of analysis, is authorized for mining. If the Mineral Ridge Mine goes into operation, there would be additional truck traffic (e.g., hazardous materials or waste) on the access road in the area of analysis (BLM 2014). Historical records for the OPA indicate that activity has been strictly exploration with no active mining or processing operations, resulting in limited potential for release of hazardous materials.

3.6 Land Use and Realty

The area of analysis for land use and realty includes the Plan boundary (**Figure 3-1**). The area of analysis is located within the administrative boundaries of the BLM Battle Mountain District, TFO. Land in the Project vicinity currently are managed under the guidance of the Tonopah RMP (BLM 1997).

The area of analysis encompasses approximately 7,166 acres within Esmeralda County. Esmeralda County has a land area of approximately 3,582 square miles, nearly all of which is land (water accounts for less than 0.5 square mile). Approximately 94.3 percent of the county is federal land administered by the BLM (Esmeralda County 2011). The Access Road and Infrastructure Corridor crosses a portion of private land at the intersection with SR 264, and then crosses BLM-managed land. The access road (Hot Ditch Road and Cave Springs Road-Coyote Summit) is currently maintained by Esmeralda County under a Title V ROW grant (NVN-062084). The Esmeralda County ROW extends through the OPA to Silver Peak.

There are numerous land use authorizations and mining claims not controlled by Ioneer within the area of analysis, primarily around the Access Road and Infrastructure Corridor. The primary land uses within the area of analysis are mineral exploration, livestock grazing, dispersed recreation, agricultural operations, and wildlife habitat. Recreation activities are primarily dispersed, and include hunting, hiking, ATV use, and sightseeing. The Silver Peak WSA is located approximately 1,200 feet southwest of the OPA (Ioneer 2022). There are two named hot springs (Fish Lake Valley Hot Springs [known as the Hot Box] and Silver Peak Hot Springs) located near the area of analysis.

3.7 Livestock Grazing

The area of analysis for livestock grazing is the grazing allotments that overlap the Plan boundary and the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-2**). The area of analysis includes the Ice House, Red Spring, Silver Peak, and Fish Lake Valley allotments.

The Ice House Allotment is 41,695 acres of BLM-administered land with a total permitted use of 229 AUMs. There are 114 active AUMs and 115 temporarily suspended AUMs, all associated with cattle grazing. There is one permittee utilizing the allotment with a season of use from May 1 to September 28. The allotment is classified under the maintain category, meaning that the objective is to maintain current satisfactory conditions (BLM 2023b). There are seven seeps or springs that occur within this allotment (USGS 2022), and three stock watering points of diversion (NDWR 2022). There is one range improvement, a stockwater well, on the west side of the allotment.

The Red Spring Allotment is 149,150 acres of BLM-administered land with a total permitted use of 2,643 AUMs. There are 2,520 active AUMs and 123 temporarily suspended AUMs, all associated with cattle grazing (BLM 2023b). There are two permittees utilizing this allotment; one permitted to graze from May 15 to June 30 and October 1 to February 28, the other permitted to graze from July 1 to September 15. The allotment is classified under the improve category, meaning that it is managed as a high priority to improve the current resource condition (BLM 2023b). There are 29 seeps or springs that occur within this allotment (USGS 2022), and eight stock watering points of diversion (NDWR 2022). There are 13 range improvement projects in the allotment, and all are water-related, spring developments, pipelines, wells, and supplemental troughs for water hauling. The Access Road and Infrastructure Corridor encompasses approximately 555 acres (0.4 percent) of this allotment.

The Silver Peak Allotment is 281,489 acres of BLM-administered land with a total permitted use of 3,165 AUMs. There are 1,530 active AUMs and 1,635 temporarily suspended AUMs (BLM 2023b). Suspended AUMs can be reinstated with each water range improvement repair (Truax 2020). There is one permittee utilizing the allotment permitted for year-round use by cattle. The allotment is classified under the maintain category, meaning the objective is to maintain current satisfactory conditions (BLM 2023b). There are 75 seeps or springs that occur within this allotment (USGS 2022), and 35 stock watering points of diversion (NDWR 2022). There are 48 range improvement projects within the allotment, of which eight are within the Plan boundary. There is one corral near the bottom of the proposed West OSF, a spring-associated water development above the proposed West OSF, and a drift fence across an access road below the Project. The remaining five improvements are in the avoidance area around Cave Spring. The OPA and Access

Road and Infrastructure Corridor would encompass approximately 6,532 acres of rangeland (2.3 percent of the allotment) located in the central portion of the Silver Peak Allotment.

The Fish Lake Valley Allotment is 8,965 acres of BLM-administered land with a total permitted use of 144 AUMs. All 144 AUMs are active and associated with cattle grazing. There is one permittee utilizing the allotment with a year-round season of use. The allotment is classified under the custodial category, meaning that the objective is to custodially manage the existing resource values (BLM 2023b). There are no seeps or springs that occur within this allotment (USGS 2022), and one stock watering point of diversion (NDWR 2022). Leidy Creek, Perry Aiken Creek, and McAfee Creek provide water in the allotment. Range improvements are limited to fences.

3.8 Native American Traditional Values

Federal agencies are required by law (NHPA of 1966 and Archaeological Resources Protection Act of 1979) to consult with Native Americans on actions that may affect their traditions or uses of public lands. Specifically, the agencies are required to follow the Section 106 process as recorded in 36 CFR 800 - Subpart B, as amended January 11, 2001. The goal of the BLM as stated in Policy Manual Section 8160 is to "assure that tribal governments, Native American communities, and individuals whose interests might be affected have a sufficient opportunity for productive participation in BLM planning and resource management decision making."

The area of analysis for Native American traditional values encompasses the Plan boundary, Fish Lake Valley, and Clayton Valley (**Figure 3-3**). This area includes the extent of potential effects to prehistoric cultural resources and other identified areas of concern to the Tribes.

The Project region is within the territory of the Northern Paiute, who occupied an expansive area prior to Euro-American contact that spanned parts of Nevada, Oregon, and California. The Project is also within the territory of the Western Shoshone who historically resided in parts of Nevada, Utah, and Idaho. The linguistic boundary between the Northern Paiute and Western Shoshone has been documented running north/south through the Silver Peak Range and the current area of analysis (Steward 1933, 1938). The Silver Peak Range was inhabited seasonally by both groups during the ethnohistoric period, and both often shifted between established seasonal camps in the vicinity based on the availability of plant and animal resources and social events (Steward 1938; Jamaldin et al. 2020). Ethnographic groups in the vicinity of the area of analysis include the Paiute of Fish Lake Valley, Deep Springs Valley, and Owens Valley, along with Shoshone groups near Lida.

The Fish Lake Valley Paiute lifeway has been described as semi-nomadic, noting that they maintained valley floor residences of primary use during the winter but attachment to such villages was impermanent (Steward 1933, 1938). In 1870, the Fish Lake Valley population was estimated to be around 100 people, who lived between eight villages that each had multiple satellite camps (Steward 1938). Men hunted deer, antelope, and mountain sheep year-round individually and communally in the Silver Peak Range and the White Mountains, although large game was of secondary importance to plant resources including seeds, roots, and Joshua Tree buds along with small game such as rabbits, fish, lizards, rodents, and caterpillars. Women traveled between established camps during the early spring and summer for the gathering of roots, seeds, and berries, and in the fall entire villages moved to the Silver Peak Range for pinyon nut harvesting (Steward 1938). Community activities included communal hunts, rabbit dives with Paiute and Shoshone from neighboring valleys, and fall festivals after pinyon harvesting (Steward 1938).

The Deep Springs Valley and Fish Lake Valley Paiutes' socio-political system was enmeshed (Steward 1938). Census data indicates that 23 persons lived in Deep Springs Valley in 1870. Because of the low population, interactions with groups to the west in Owens Valley and east in Fish Lake Valley for rabbit drives, dances, and marriage were common. Deep Springs Valley Paiute subsistence relied on seeds as primary resources, but pinyon and animal resources such as deer, antelope, mountain sheep, ducks, and rabbits were also of value (Steward 1938). Fish Lake Valley was a common destination for Deep Springs Valley Paiute to gather seeds and pinyon (Steward 1938).

The Owens Valley Paiute primarily occupied land within Owens Valley and the adjacent Inyo and Coso ranges along with the White Mountains in California. Census records for 1870 reveal that 1,000 Paiutes resided in Owens Valley. Paiute groups in Owens Valley did not need to travel great distances to gather food resources (Steward 1933, 1938). Subsistence and settlement in Owens Valley were based on seasonal resources. Valley floor villages were established along water sources and seasonal camps in upland locations were utilized during the fall for the purpose of procuring acorn, pinyon, and large and small game. Unlike the Fish Lake Valley and Deep Springs Valley Paiutes, specific seed, pinyon, and hunting plots and harvesting rights were owned by Owens Valley nuclear families and bands, or communities comprised of both nuclear families and immediate relatives along with unrelated persons (Steward 1933, 1938). In addition, Owens Valley groups enacted communal hunts in the valley and mountain ranges, and constructed ditches to irrigate seed plots (Steward 1933).

The Lida Shoshone were distributed around present day Lida Valley, southeast of Fish Lake Valley. The Lida Shoshone were described as a small population of five families linked to additional interrelated Western Shoshone villages in the vicinity near Montezuma, Tule Canyon, and Stonewall Mountain (Steward 1938). Although Steward (1938) references the Clayton Valley Shoshone, it appears no groups actually resided in the valley but instead the area was used temporarily by groups from outside of the valley to gather seeds and berries. The Lida Shoshone often met with Paiute groups from Fish Lake Valley for pinyon harvests, rabbit drives, and festivals. The groups sometimes camped together for autumn pinyon gathering in the Silver Peak Mountains, but the Lida Shoshone also gathered pinyon independently in the mountains along the western rim of Lida Valley (Steward 1938). Steward (1933) makes mention of the Fish Lake Valley Shoshone, but it is likely that he is referring to Shoshone that intermarried with the Fish Lake Valley Paiute and resided in Paiute villages there. Little additional information for the Lida Shoshone are available outside of Steward (1938), but their ethnographic subsistence emphases on seeds, roots, pinyon, deer, mountain sheep, antelope, and small game was noted.

The introduction of Euro-Americans to the region during the transition between the ethnohistoric and historic periods had numerous effects on *in situ* Northern Paiute and Western Shoshone groups. In 1874, Pyramid Lake and Walker River became formal reservations for the Northern Paiute. Additional Paiute colonies and reservations were established in the early twentieth century, including the Stillwater Reservation, Lovelock Colony, Fallon Colony, Reno-Sparks Colony, Yerington Colony, Susanville Reservation, Yerington Reservation, Benton Reservation, and Big Pine Reservation (Fowler 1989).

3.9 Recreation

The area of analysis for recreation is the Plan boundary (**Figure 3-3**). Specific recreation uses in and around the area of analysis consist of hot spring use, sightseeing, rockhounding, exploring, horseback riding, OHV use, fishing, and hunting. Recreation use in the area of analysis is generally dispersed with few areas receiving regular visitor use.

Lands administered by the BLM TFO designated for recreational opportunities are categorized as “primitive,” “semi-primitive nonmotorized,” “semi-primitive motorized,” “roaded natural,” and “rural” (BLM 1997). The area of analysis includes 1,679 acres of lands designated as semi-primitive motorized, which have a setting characterized by an essentially unmodified natural environment with a relatively low concentration of users but often with evidence of other area users. Land use restrictions generally are limited, and OHV use is permitted (BLM 1997). The remaining 5,487 acres of the area of analysis do not have a recreational designation. While OHV use is permitted in the area of analysis, there are 1,814 acres in the area of analysis that are limited to existing roads and trails and closed to competition events, 4,227 acres that are limited to existing roads and trails, and 1,125 acres where no restrictions exist (BLM 1997). Two Special Recreation Permit holders use areas are proximal to the area of analysis: (1) Zero1 Offroad leads OHV tours on Cave Springs Road; and (2) an annual OHV event, the Rebelle Rally, used Cave Springs Road as a route in 2018.

Within the OPA, both sides of Cave Springs Road are classified as LWCs including LWC338 to the south and LWC328 to the north, totaling 4,922 acres. LWC327 is within the Access Road and Infrastructure Corridor and overlaps 32 acres of the corridor on the north side of the access road. Per BLM Manual 6320, these three LWCs were determined to possess wilderness characteristics, be of manageable size, and provide opportunity for solitude and primitive recreation.

There are two named hot springs near the area of analysis including: Fish Lake Valley Hot Springs; and Silver Peak Hot Springs. Fish Lake Valley Hot Springs is the closest hot springs to the area of analysis, located immediately north of the Access Road and Infrastructure Corridor and approximately four miles to the west of the OPA. Silver Peak Hot Springs is located approximately 12 miles east of the area of analysis near the town of Silver Peak. There are no state parks or designated wilderness areas in the area of analysis. The Silver Peak WSA is located approximately 1,200 feet south of the area of analysis. There are two Recreation Management Areas (RMAs) including the Sump Extensive RMA (located approximately five air miles north of the area of analysis) and Clayton Valley Sand Dunes Special RMA (located approximately 15 air miles southeast of the area of analysis).

The area of analysis is within NDOW Hunt Unit 211 and offers hunting opportunities for mule deer, desert bighorn sheep, pronghorn (*Antilocapra americana*), and upland game birds, such as chukar (*Alectoris chukar*).

3.10 Social and Economic Values

The area of analysis for social and economic values includes Esmeralda, Nye, and Mineral counties in Nevada and Inyo County in California (**Figure 3-4**). Esmeralda County had a population of 729 people in 2020, a decrease of 6.9 percent from 2010. Nye County had an estimated population of 51,591 people in 2020, approximately 86 percent of which live in Pahrump. Nye County grew by approximately 17 percent between 2010 and 2020. Tonopah, which is the largest community near the Project, had a population of 1,942 people in 2020, a decrease of 19 percent from 2010. Mineral County had a population of 4,554 in 2020, a decrease of 4.6 percent from 2010. Inyo County had a population of 19,016 people, an increase of 2.5 percent from 2010. However, the population of Bishop decreased by approximately 1.6 percent over the same period. The four counties in the area of analysis have similar demographics as the non-metro Nevada population. Demographics in Nye and Inyo counties are driven by a higher percentage of multiracial individuals and individuals in the 'Some Other Race' category similar to the Nevada non-metro population. Mineral County's diversity is primarily driven by a large Native American population (15.6 percent). Inyo County also has a large Hispanic or Latino population of 23 percent of residents (USCB 2020).

Average weekly mining wages and salaries are among the highest for any industry in the Nevada non-metro counties, with an average weekly wage ranging from $693 for Lincoln County to $2,235 for Elko County in the fourth quarter of 2021. Wages in the natural resources and mining sector were higher than other sectors in Nye and Mineral counties. In Nye County, wages in the professional and business services sector were higher than other sectors, with average weekly wages of $1,895 and in Inyo County the construction sector had the highest average weekly wages of $1,484. The exception in Nye County is likely due to the economic activity in the southern portion of the county in and around Pahrump, located in the southern portion of Nye County 60 miles west of Las Vegas and approximately 180 miles southeast of the OPA. Pahrump is the largest population center and Tonopah is the county seat. Within the area of analysis, Inyo County has the highest per capita personal income ($60,124), followed by Esmeralda County ($47,507), Mineral County ($47,029), and Nye County ($39,534) (USBEA 2020). Since 2000, per capita incomes in the area of analysis increased by 27.4 percent. In the Nevada non-metro counties, per capita income increased during the same period by a range of 53 percent to 83 percent, in Pershing County and Douglas County, respectively. At the same time, average earnings per job increased overall in the area of analysis from $53,756 in 2000 to $67,568 in 2020 (Headwaters Economics 2020). Individual counties in the area of analysis and Nevada as a whole each saw growth in the average earnings per job from 2000 to 2020 except for Esmeralda County, which saw a decrease of 13.2 percent (Headwaters Economics 2022).

The median household income for the Nevada non-metro counties ranged from $31,500 in Mineral County to $79,375 in Elko County in 2020. The median household income for Nye ($47,308), Esmeralda ($31,845), and Mineral ($31,500) counties ranked 15th, 16th, and 17th of 17 counties in Nevada, respectively. Inyo County's estimated median household income was $59,296 (USCB 2020).

As of November 2022, the combined labor force in the three Nevada counties is estimated at 19,819, approximately 18,687 of whom are employed. The remaining 1,132 unemployed individuals represent a 5.7 percent unemployment rate (NDETR 2022). As of November 2022, the labor force in Inyo County is estimated at 8,260, approximately 7,980 of whom are employed. The remaining 280 unemployed individuals represent a 3.3 percent unemployment rate (CEDD 2022). The three combined Nevada counties

unemployment rate is greater than both the 4.9 percent statewide unemployment rate and the 3.7 percent national rate (seasonally adjusted data); the Inyo County unemployment rate is lower than both the state of Nevada and national unemployment rates (NDETR 2022). Estimates for the individual county unemployment rates in November 2022 were estimated at 3.6 percent for Esmeralda County, 3.8 percent for Mineral County, 6.0 percent for Nye County (NDETR 2022), and 3.3 percent for Inyo County (CEDD 2022). The four counties combined natural resources and mining sector employment comprises approximately 11.2 percent (1,863 jobs) of the total Nevada non-metro county employment in that sector, a large majority of which is devoted to metal mining in the State. This sector includes the sub-categories of agriculture, forestry, fishing, and hunting, in addition to mining, quarrying, and oil and gas extraction.

The majority of housing units in the area of analysis are located in Nye County with 24,793 units followed by Inyo County with 9,457 units, Mineral County with 2,367 units, and Esmeralda County with 768 units. U.S. Census Bureau American Community Survey estimates for 2021 reported that the town of Tonopah had 1,475 units in Nye County. Vacancy rates for both rental and homeowner units combined were highest in Esmeralda County at 37 percent (approximately 284 units) and Mineral County at 26.6 percent (approximately 630 units). However, overall vacancy rates for rental units was lower than overall total vacant housing units being approximately 12.7 percent vacancy for Esmeralda County and approximately 4.7 percent for Mineral County. The town of Tonopah had approximately 410 vacant housing (homeowner and rental) units with a rental unit vacancy rate of approximately 4.9 percent; Hawthorne had approximately 391 vacant housing units with a rental unit vacancy rate of approximately 12.0 percent; Bishop had approximately 190 vacant housing units with a rental vacancy rate of 3.4 percent. Overall vacancy rates for rental housing in the area of analysis is limited. Actual vacancy rates vary as this data is based on a sample. There is some short-term housing available in Tonopah, which has 12 hotels/motels and recreational vehicle (RV) spaces with over 400 rooms and 50 RV spaces. Goldfield has one hotel with nine rooms and an RV park with 20 units. Dyer also has an RV park with 23 units as well as three cabins. Hawthorne has three hotels with a combined 180 rooms and an RV park with 19 units. Bishop has 36 hotels/motels of which a survey of nine of these had a combined total of 580 rooms (NewFields 2019b).

In Esmeralda County, most of Fish Lake Valley residents rely on private wells for water. Goldfield and Silver Peak rely on community water supply systems. Nye County, Mineral County, and Inyo County have municipal water systems that serve their communities. Per the Esmeralda County Master Plan, “any significant increase in population will further reduce the limited water resources and impose additional burdens on the county taxpayers to provide new or expanded services by the county” (Esmeralda County 2011). Much of the wastewater generated in the area of analysis is treated and disposed of in private on-site septic tanks and drain fields. Goldfield (Esmeralda County), Tonopah (Nye County), Hawthorne (Mineral County), and Bishop (Inyo County) have community wastewater treatment systems. Landfills are located in all four counties within the area of analysis (NewFields 2019b). Waste from Fish Lake Valley and Silver Peak are transferred from drop box locations to the municipal landfill in Goldfield (Esmeralda County 2006).

Sheriff offices are located in Goldfield (Esmeralda County) (approximately 90 minutes from the Project); Tonopah (approximately 80 minutes from the Project), Beatty (approximately 130 minutes from the Project), and Pahrump (approximately 210 minutes from the Project) (Nye County); Hawthorne (approximately 115 minutes from the Project) (Mineral County); and Bishop (approximately 140 minutes from the Project) (Inyo County). The Nevada Highway Patrol has a substation in Tonopah. Crime in the area of analysis was lower as compared to Nevada’s crime rates. The jail in Goldfield has been identified as needing potential improvements due to outdated design. Some concerns include lacking sufficient medical care, access to legal materials, inmate safety, understaffing, and separation of inmates of different genders (Esmeralda County 2012). Esmeralda County commissioned an engineering cost study in 2013 to assess costs for construction of a new jail. At that time, the cost of the new jail construction was $6,500,000 (approximately $10,777,000 in 2024 with inflation) (Boland 2024). The BLM, NDF, and California Department of Forestry and Fire Protection have the primary responsibility for fighting wildfires on public lands. Local volunteer fire departments are in Dyer, Tonopah, Goldfield, Bishop, Silver Peak, and Hawthorne, as well as other various locations. Departments are staffed by volunteers who provide fire suppression and emergency medical services and either provide ambulance service or work with other ground and air ambulance services and hospitals. Closest to the Plan boundary, the Fish Lake Valley Fire Protection District (Esmeralda County) is a volunteer fire department based out of Dyer. The fire barn is 16.4 miles from the junction of the Project

access road and SR 264. The community of Dyer has an ambulance service and coordinator. The ambulance barn is located approximately 11 miles from the junction of the Project access road and SR 264. Residents in the Dyer area generally receive emergency medical services in the hospital in Bishop, while those in Silver Peak, Tonopah, or Goldfield go to the emergency room in Hawthorne (BLM 2024l).

There are no medical facilities in Esmeralda County, thus sick or injured persons are typically transported to a medical facility in Bishop, Hawthorne, or Tonopah. The medical care in Tonopah is Frontier Medical Group, LLC (urgent care clinic) and Tonopah Primary Care, LLC (family medicine). Critical emergencies would be transported to hospitals in Las Vegas (250 miles southeast of the OPA) or the hospital in Bishop (76 miles southwest of the OPA). There is one hospital in Hawthorne (109 miles northwest of the OPA) that serves Mineral County, the Mount Grant General Hospital (BLM 2024l).

Schools closest to the Plan boundary are located in Tonopah, Goldfield, Dyer, Silver Peak, Hawthorne, and Bishop. Students in Goldfield, Dyer, and Silver Peak attend kindergarten through eighth grade locally and commute to Tonopah for high school. Students in all other towns attend kindergarten through high school in their respective communities. For pre-school through high school 2020 enrollment, Esmeralda County had approximately 110 students enrolled, Mineral County had approximately 626 enrolled (313 enrolled in Hawthorne), Nye County had approximately 5,449 enrolled (164 enrolled in Tonopah), and Inyo County had approximately 3,241 enrolled (650 enrolled in Bishop). Per pupil expenditure for the 2021-2022 school year was $29,329.08 total in Esmeralda County ($26,306.01 state/local spending), $15,781.34 total in Mineral County ($14,199.81 in state/local spending), and $12,855.57 total in Nye County ($11,970.83 in state/local spending) (BLM 2024l). The percentage of persons that attained a high school degree ranged from 37.6 percent in Mineral County to 27 percent in Esmeralda County. Completion of a bachelor's degree was highest in Inyo County (16.4 percent) and lowest in Nye County (7.5 percent). Student to teacher ratios in Esmeralda County (9:1) and Mineral County (19:1) are lower than the State average of 20:1, while Nye County is equal at 20:1. Student to teacher ratios for 2021 for Inyo County were not available (BLM 2024l).

Local government entities that would be most closely associated with the Project are Esmeralda and Nye counties. Esmeralda County operates a Board of Commissioners that represent three districts and oversees the county, as well as the communities of Dyer, Silver Peak, and Goldfield. Nye County operates with a five-member Board of Commissioners and a full-time county manager in Tonopah. Tonopah is governed by the Tonopah Town Board, a five-member town board and a full-time town manager (Nye County 2022a, 2022b). Mineral County has a three-member Board of Commissioners and a Public Administrator in Hawthorne. Inyo County operates with a five-member Board of Supervisors charged with representing both the interests of their individual districts and those of the county as a whole (Inyo County 2022). The city of Bishop in Inyo County is governed by a five-member City Council and includes a mayor (BLM 2024l).

Esmeralda, Nye, and Mineral counties approved operating deficit budgets for 2021 expecting that annual revenues would fall short of annual expenses (Esmeralda County 2021; Nye County 2021; Mineral County 2021; Inyo County 2021). The net proceeds of the minerals tax rate are dependent on the ratio of the net proceeds of a mining operation to the gross proceeds, with a maximum tax rate of five percent and a minimum tax rate of two percent. Local government finance in Nevada is an admixture of locally derived and state-shared revenues. Local revenues primarily are derived from ad valorem property taxes on real and personal property (e.g., business equipment, agricultural equipment, etc.), and the net proceeds of mines in the jurisdiction. Local governments also collect revenues from fines, licenses and permits, and fees for services. State-shared revenues include sales, motor vehicle, fuel, and gaming taxes. State revenue sharing aims to help address economic disparities between the urban centers of Reno and Las Vegas and the rural agricultural and mining communities. Expenditure lines with the most spending allocated are public safety, public work, and government employee wages and services (BLM 2024l).

The area of analysis can be described as rural with large tracks of public lands that provide economic resources for mining, ranching, and energy development, as well as for recreation and tourism. The large amount of public open space contributes to the area's quality of life for residents. Seven groups were identified with interest in the management of public lands in portions of Esmeralda and Nye counties including ranchers and livestock grazing permittees, neighboring private landowners, minerals and oil and gas leaseholders, renewable energy leaseholders, ROW holders, recreation users, and resource protectionists (BLM 2011). The resident population ranges from "multigenerational families to seasonal

retirees and weekend tourists to temporary residents that (sic) work in the agricultural and mining industry. Regardless of their longevity to the region, most residents have a strong connection to public lands that surround and encompass their community and view them as playing a significant role in their personal quality of life. For residents, these lands provide economic opportunities, recreation, open space, a connection to the western historic landscape, and other intangible benefits" (BLM 2011). Social issues related to the management of public lands include the continuing importance of mining and agriculture plus the potential for renewable energy development. Included among the social issues is the potential need for local culture and infrastructure to adapt, which "may be essential to accommodating more retirees and tourists" (BLM 2011).

3.11 Soil Resources

The area of analysis for soil resources is the Plan boundary (**Figure 3-1**). The area of analysis is within Major Land Resource Area 29 Southern Nevada Basin and Range in the Great Basin section of the Basin and Range province of the Intermontane Plateaus. The area's basins are bordered by sloping fans and terraces. Its mountains are uplifted fault blocks with steep side slopes. Most of the valleys in this Major Land Resource Area are closed basins containing sinks or playa lakes. The soils dominantly have a mesic temperature regime, an aridic or xeric moisture regime, and mixed mineralogy. They generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy-skeletal or sandy-skeletal (NRCS 2022a).

The OPA is in the Silver Peak Range, which is characterized by rugged mountains, rolling foothills, deep ravines, canyons, and dry washes. The Access Road and Infrastructure Corridor is located within an endorheic valley with a dry salt pan lake in the center, flanked by broad alluvial fans. These areas are dry with few springs and one perennial stream, Chiatovich Creek, in the vicinity. An ephemeral drainage referred to as Cave Springs wash is within the OPA. Water from this drainage originates from seasonal stormwater and snowmelt from the Silver Peak Range, which flows toward Fish Lake Valley and eventually evaporates from or infiltrates the dry salt pan lake (BLM 2024m).

There are 25 soil map units in the Plan boundary including: Blacktop-Rock Outcrop-Pintwater association; Blacktop-Rodad-Theriot association; Zadvar-Veet-Lyda association; Stewval-Downeyville-Rock Outcrop association; Stewval-Pintwater-Rock Outcrop association; Stewval-Bellehelen-Rock Outcrop association; Stewval-Bellehelen-Gabbvally association; Roic-Advokay-Blacktop association; Wardenot-Izo association; Wardenot-Stonell-Roic association; Stonell-Wardenot-Izo association (moist); Penelas-Weepah association; Penelas-Slatery-Rock Outcrop association; Lyda-Ardivey-Izo association; Gynelle-Cirac association; Gynelle-Oricto association, alkali; Zaba-Gynelle association; Zaba-Yomba-Slaw association; Rustigate-Kawich-Cirac association; Slaws-Playa complex; Slaw-Kawich-Nuyobe association; Cirac-Luning association; Cirac-Rustigate-Settlement association; Cirac-Kawich association; and Luning-Sodaspring association (NRCS 2022b).

Soils within the OPA are formed in place within residuum, and within colluvium and alluvium derived from limestone, mixed, sedimentary, and volcanic rocks. Landforms include drainageways, inset fans, fan remnants, hillsides, hills, mesas, piedmonts, playas, dunes, alluvial flats, and mountainsides. Soil profiles consist of deep, coarse-textured, gravelly soils; deep and shallow fine grained sandy, silty, loamy, and clayey soils over bedrock or cemented pan; and shallow, coarse-textured soils over weathered and unweathered bedrock (NRCS 2022b).

Soils within the Access Road and Infrastructure Corridor are formed in place from alluvium or lacustrine deposits or formed in eolian sands. Landforms include fan skirts, alluvial flats, lake plains, sand dunes, sand sheets, and playas. Soil profiles consist of deep gravelly, sandy, or loamy surfaces; deep, gravelly, sandy, and fine grained loamy for clayey subsoils; and silty loam, cemented pan, silty clay, bedrock, and gravelly sand bases (NRCS 2022b).

Biocrusts were not mapped during baseline surveys in the area of analysis; however, they likely occur. Hydric soils were identified in the Cirac-Rustigate-Settlement association which occurs on 31 acres in the Access Road and Infrastructure Corridor near SR 264. There are no soil map units classified as prime or unique farmland in the area of analysis. There are five map units classified as farmland of statewide

importance which occur on 305 acres in the lower elevations of the Access Road and Infrastructure Corridor (BLM 2024m).

3.12 Threatened and Endangered Species

The area of analysis for BSSG and monarch butterfly is the Plan boundary and the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-1**). The area of analysis for Tiehm's buckwheat is the Plan boundary which encompasses all subpopulations of Tiehm's buckwheat, and Tiehm's buckwheat designated critical habitat (**Figure 3-1**).

3.12.1 Bi-State Sage-Grouse

In 2013, the USFWS proposed to list the BSSG as threatened under the ESA and designate 1.8 million acres of critical habitat. In 2015, USFWS determined that the BSSG was no longer warranted for listing under the ESA. In 2018, the decision was challenged in federal court and BSSG was again considered for listing. In 2020, USFWS concluded that BSSG was no longer warranted for listing under the ESA because of the successful implementation of habitat conservation actions (USFWS 2020a). On May 16, 2022, the U.S. District Court for the Northern District of California overturned the 2020 decision. As a result, the 2013 proposed threatened status was reinstated and 1.8 million acres again considered proposed critical habitat. The USFWS will issue a new final listing decision.

The area of analysis is within the White Mountain population management unit (PMU) (Bi-State Action Plan 2012). Approximately 1,284 acres of proposed critical habitat for BSSG occurs within the area of analysis (**Figure 3-5**); however, no BSSG proposed critical habitat occurs in the Plan boundary (EM Strategies 2020a, 2020b, 2022a; NDOW 2020a, 2020b; USFWS 2013). There are approximately 400 acres of general BSSG habitat 2.1 miles north of the OPA, of which, 205 acres occurs within the area of analysis and 584 acres of general BSSG habitat 2.4 miles east of the OPA, of which, 125 acres occurs within the area of analysis (EM Strategies 2022a). Another area of general BSSG habitat is found 2.8 miles west of the access road and infrastructure corridor on the west side of SR 264 (EM Strategies 2020b; USFWS 2013).

No leks have been documented in the vicinity (four-mile radius) of the Plan boundary (EM Strategies 2020b, 2020c; NDOW 2020a, 2020b, 2022). A single BSSG was observed in the western portion of the OPA during 2022 baseline surveys (EM Strategies 2022a).

The BSSG area of analysis contains some of the habitat elements necessary for seasonal habitat for the species, including big sagebrush (*Artemisia tridentata*) dominated communities with perennial grasses and forbs (EM Strategies 2020b). Approximately, 16,222 acres of Great Basin Xeric Mixed Sagebrush Shrubland and Inter-Mountain Basins Big Sagebrush Shrubland are within the area of analysis (EM Strategies 2020b). However, wet meadow vegetation communities were not observed in the Plan boundary during baseline surveys. Thirty-two spring sites occur within the area of analysis. There is one spring located within the proposed critical habitat east of the OPA. This spring is inside the area of analysis and the maximum extent of the predicted 10-foot drawdown area.

3.12.2 Monarch Butterfly

The monarch butterfly is a federal Candidate species. In 2020, USFWS published a 12-month finding in which a determination was made that the species was warranted for listing under the ESA but precluded by work on higher priority listing actions and final listing determinations (USFWS 2020b). In May 2022, the USFWS published a Candidate Notice of Review in which the monarch butterfly was still classified as warranted for listing but precluded by work on higher priority actions (USFWS 2022b).

Adult females lay eggs on milkweed species, which the caterpillars rely upon for energy to derive protective toxins as individuals develop. Once an egg is laid, the development to adulthood lasts approximately 30 days. During the spring and summer, adult monarch butterflies spend their two-to-six-week lifespan mating and nectaring on flowers. Multiple generations are produced during this time, with the final fall generation migrating to overwintering sites and living for six to nine months (Jepson et al. 2015). Monarch butterflies require a diversity of blooming nectar resources within their breeding grounds and along their migration

routes (USFWS 2020c). Data from monarch butterflies tagged in the southwestern states in the fall suggest that those in Nevada migrate to California to overwinter (Southwest Monarch Study 2023).

Desert milkweed (*Asclepias erosa*) was observed in several drainage areas throughout the western portions of the OPA and in the access road and infrastructure corridor. Milkweed in general are host plants for the monarch butterfly. Approximately 163 individual desert milkweed plants were observed, and no monarch butterflies were observed during baseline surveys (EM Strategies 2022a). Although monarch butterflies have been reported in the general vicinity of the Silver Peak Range, there have been no sightings reported in the monarch butterfly area of analysis.

3.12.3 Tiehm's Buckwheat

On October 7, 2019, the USFWS received a petition to list Tiehm's buckwheat under the ESA as an endangered or threatened species and to concurrently designate critical habitat. On June 4, 2021, the USFWS announced its 12-month finding that the petitioned action to list Tiehm's buckwheat was warranted. On October 7, 2021, the USFWS issued a proposed rule to list Tiehm's buckwheat as endangered under the ESA. On February 3, 2022, the USFWS issued a proposed rule for Tiehm's buckwheat critical habitat, which encompasses a 500-meter area around species subpopulations. On December 16, 2022, USFWS published a final rule listing Tiehm's buckwheat as an endangered species and designating 910 acres of critical habitat, effective January 17, 2023 (USFWS 2022a). The NDF received a petition to add Tiehm's buckwheat to the State list of fully protected species of native flora in NAC 527.010, also on October 7, 2019. NDF is currently reviewing the species for listing under their regulations.

Tiehm's buckwheat is a narrow-ranging endemic plant known from only one population, comprising eight subpopulations, in the Rhyolite Ridge area of the Silver Peak Range in Esmeralda County (**Figure 3-6**). The single population is restricted to approximately 10 acres across a three-square-mile area, located entirely on public lands administered by BLM (USFWS 2022a). A habitat suitability model was developed to assist in identifying potential suitable habitat for additional populations (Ioneer 2020). Two new subpopulations, subpopulation 7 and 8, were identified in 2019 (EM Strategies 2020b). No additional populations were found within the ten-mile radius of the existing population (Ioneer 2020). In September 2020, an herbivory event from white-tailed antelope ground squirrels (*Ammospermophilus leucurus*) was reported in subpopulations 1 through 6 (Grant 2020; EM Strategies 2020d). Over 60 percent of the plants in subpopulations 1, 2, 3, 4, and 6, were damaged or killed from herbivory (EM Strategies 2020c). **Table 3-3** shows the population data and area occupied by Tiehm's buckwheat during 2021 and 2023 censuses. Based on the 2021 and 2023 population counts, there are a total of 15,758 plants and 24,916 plants on 9.98 acres, respectively (USFWS 2022a; Fraga 2021; EM Strategies 2020a; WestLand 2023b). The number of plants has increased between 2021 and 2023 in all subpopulations, which indicates that the population is recovering from the 2020 herbivory event.

Table 3-3 Population and Area Occupied by Tiehm's Buckwheat

Subpopulation	2021 Direct Count of Tiehm's Buckwheat Plants[1,2]	2023 Direct Count of Tiehm's Buckwheat Plants[4]	Area Occupied by Tiehm's Buckwheat (acres)[3]
1	4,420	5,600	4.81
2	1,719	4,190	1.56
3	1,165	1,943	0.63
4	649	1,888	1.04
5	3	31	0.05
6a	7,787	7,784	1.22
6b		3,476	0.66
7	14	Count for Subpopulation 6a includes Subpopulation 7	0.01
8	1[3]	4	<0.001
Total	**15,758**	**24,916**	**9.98**

Sources [1] USFWS 2022a, [2] Fraga 2021, [3] EM Strategies 2020b, [4] WestLand 2023b

Tiehm's buckwheat appear to be primarily dependent on occasional precipitation for its moisture supply (Morefield 1995). Research has shown Tiehm's buckwheat to be a soil specialist or edaphic endemic specifically adapted to grow on its preferred soil type (USFWS 2022c). WestLand (2023b) describes other research that shows potential overlap in soil chemistry between occupied and unoccupied sites; therefore, soil chemistry is likely not the only ecological feature distinguishing occupied and unoccupied sites. Surveys have been conducted since 1994 to understand the extent of occupied habitat. A habitat suitability model was developed to assist in identifying potential suitable habitats to help focus survey work for additional populations (Ioneer 2020). Surveys were conducted in 2018 and 2019 to confirm the status of known populations, measure occupied areas, and identify any possible new populations. The 2018 survey verified the known six subpopulations. The 2019 survey located two new subpopulations: subpopulation 7 included 50 individuals; and subpopulation 8 included one individual (EM Strategies 2020a). The 2023 census confirmed four individuals in subpopulation 8 (WestLand 2023b*)*. No additional populations were found within the ten-mile radius of the existing population (Ioneer 2020).

Additional information was collected in 2019 to assess the viability of the population. Results from this effort indicated a stable demographic structure across the species and that recruitment is occurring in all subpopulations. Tiehm's buckwheat seeds were collected and sent to the Nevada Department of Agriculture for testing and were found to be 16 percent viable, which is slightly lower than an average 20 percent for native buckwheat. Leaf tissue samples were taken for genetic analysis. Genetic analysis confirmed Tiehm's buckwheat is a distinct species and is most genetically similar to Shockley's buckwheat (*Eriogonum shockleyi* var. *shockleyi*) (EM Strategies 2020a).

Pollinator interactions with Tiehm's buckwheat were studied in 2020 within and outside of occupied Tiehm's buckwheat habitat (McClinton et al. 2020). Similar overall abundance and diversity was found between site types. In 2022, sampling was conducted with specimens collected within and outside of Tiehm's buckwheat population areas. Species richness did not differ between site types; however, diversity was found to be greater in Tiehm's buckwheat sites than surrounding areas (WestLand 2023c). Scientific information does not indicate any specialist pollinators of Tiehm's buckwheat (USFWS 2022a). Tiehm's buckwheat contributes to arthropod abundance and diversity because Tiehm's buckwheat is the dominant insect-pollinated plant species in its habitat where it occurs. In 2021, the Hill-Shannon and Hill-Simpson diversity indices were found to be higher within the Tiehm's buckwheat populations areas indicating potential pollinator community in the Tiehm's buckwheat population is composed of species that are rarer, on average, than species in the surrounding area (WestLand 2023c). An abundant insect pollinator community is important for Tiehm's buckwheat for seed production and maintaining the species, as it was found that seed production significantly increased when Tiehm's buckwheat plants were exposed to insect pollinators (McClinton et al. 2020; McClinton et al. 2022; USFWS 2022b).

3.13 Transportation and Access

The area of analysis for transportation and access is the Plan boundary and the main transportation routes and access roads on which materials would be transported (**Figure 3-4**). These routes are described as: From Rhyolite Ridge north on SR 264 to SR 773, then east on US 6, then northeast on US 95 to Fallon, then northwest on US 50A to Fernley, then continuing west on I-80 to Reno; and From Rhyolite Ridge south and east on SR 264/266 through Dyer, Oasis, and Lida, then southeast on US 95 to Beatty, and continuing southeast on US 95 to Las Vegas.

Public access to the OPA from US 6, a two-lane arterial highway that provides the east-west connection between US 95 in Nevada and US 395 in California, is to turn south onto SR 264 or SR 773. US 6, SR 264, and SR 773 are paved roads. Continue traveling southward on SR 773 to SR 264 or continue traveling southward on SR 264 for approximately 13 miles to the intersection with Hot Ditch Road. Hot Ditch Road is the beginning of the access road and continues for eight miles before becoming Cave Springs Road. Continue on Cave Springs Road for five miles until the OPA is reached. The access road is unpaved from SR 264 through the OPA. The access road crosses BLM-managed land and is currently maintained by Esmeralda County under a Title V ROW grant (case NVN-062084) (BLM 1976a). The ROW extends through the OPA and on to Silver Peak. A separate ROW grant has also been issued to Mineral Ridge Mine coincident with Cave Springs Road from the Mineral Ridge Mine operations on Coyote Summit to SR 264. This ROW passes through the OPA and includes the access road (case NVN-060661) (BLM 1976b).

Esmeralda County maintains the Hot Ditch Road and Cave Springs Road and conducts regular maintenance and repair to keep the unpaved roads open. Precipitation or snowmelt events can cause certain segments to wash out, resulting in both erosion and deposition. Historically, this has required grading and rerouting of portions of the roads to maintain public access. NDOT maintains SR 264 (Category 5 Major Collector) and U.S. 6 at the junction with SR 264 (Category 4 Minor Arterial).

Based on 2021 data, highway traffic in the area of analysis has been steadily increasing for the last 15 years. Traffic levels in the immediate vicinity of the Project are the lowest in the area of analysis. Average annual daily traffic (AADT) counts on U.S. 6 west of the intersection with SR 264 recorded 520 vehicles and 470 vehicles were recorded on U.S. 6 east of the intersection with SR 264. On SR 264, the AADT count was 220 vehicles (NDOT 2022). County-wide traffic safety data indicate that crash rates range from 54.9 crashes per 100 million vehicle miles traveled in Esmeralda County to 203.4 crashes per 100 million vehicle miles traveled in Storey County. In general, counties with urban areas and higher populations have a higher crash rate than those counties that are primarily rural (NDOT 2021; CalTrans 2020).

Manual traffic counts were taken in 2019 at four locations along the access road between October 6 and 12, 2019 (NewFields 2020a). Traffic through the OPA on Cave Springs Road ranged from approximately 14 vehicles per day on weekdays to 23 vehicles per day on weekends. On Hot Ditch Road, the traffic volume was 37 vehicles per day on weekdays and 50 vehicles per day on the weekend, likely due to recreational visits to the Hot Box (Fish Lake Valley Hot Springs), hunting, and off highway vehicle use. These traffic counts include 12 to 14 vehicles per day (weekday and weekend) associated with the existing authorizations and baseline data collection supporting the Project as the OPA was being accessed at the time of the traffic counts. The data collected in October 2019 provide an estimated range of traffic volumes along the access road; however, average daily traffic can vary substantially along rural roads such as the Hot Ditch Road and Cave Springs Road, with holiday weekends in particular seeing a substantial increase in recreational-related traffic associated with the use of Fish Lake Valley Hot Springs and the general area (e.g., camping, and as a staging area for OHV use) (NewFields 2020a). The traffic from the authorized, but not currently operational, Mineral Ridge Project were not included in the traffic counts. Once operational, Mineral Ridge Mine traffic would use the Cave Springs Road through the OPA for access to the Mineral Ridge Mine for truck traffic and light vehicles would utilize Coyote Road (BLM 2014). When operational, the Mineral Ridge Mine estimates 16 to 18 commuter vehicles (for two operating shifts), and two to four semi tractor-trailers for freight and chemical delivery and product shipment, for a total daily average (round-trip) traffic count of 40 vehicles per day, seven days per week (NewFields 2020a).

3.14 Vegetation Resources

The area of analysis for vegetation resources is the Plan boundary and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-1**).

A total of 19 vegetation communities occur in the area of analysis (EM Strategies 2020b, 2020c, 2022a; USGS 2005). Five vegetation communities comprise 96 percent of the area of analysis: Inter-Mountain Basins Mixed Salt Desert Scrub (17,076 acres); Great Basin Pinyon-Juniper Woodland (16,506 acres); Great Basin Xeric Mixed Sagebrush Shrubland (15,266 acres); Inter-Mountain Basins Cliff and Canyon (3,281 acres); and agriculture (1,941 acres). There are 20 ecological sites within the area of analysis. The dominant ecological sites include shallow calcareous loam 8-12” P.Z. (11,559 acres); shallow calcareous slope 8-12” P.Z. (10,350 acres); loamy 5-8 P.Z. (6,057 acres); loamy slope 3-5” P.Z. (5,177 acres); and cobbly loam 5-8” P.Z. (5,090 acres). These five ecological sites comprise 68 percent of the area of analysis.

One noxious weed, saltcedar (*Tamarix ramosissima*), was observed within the Access Road and Infrastructure Corridor. The following non-native species that are not considered noxious in the State of Nevada were also observed: red brome (*Bromus rubens*); cheatgrass (*Bromus tectorum*); saltlover (*Halogeton glomeratus*); prickly Russian thistle (*Salsola tragus*); bristly fiddleneck (*Amsinckia tessellata*); flixweed (*Descurainia sophia*); Russian olive (*Elaeagnus angustifolia*); yellow sweetclover (*Melilotus officinalis*); rabbitsfoot grass (*Polypogon monspeliensis*); and yellow salsify (*Tragopogon dubius*) (EM Strategies 2020b, 2020c, and 2022a).

Tiehm’s buckwheat (discussed in Section 3.12.3), sagebrush cholla (*Opuntia pulchella*), and Mojave fishhook cactus were identified in the area of analysis (EM Strategies 2020b, 2022a). Candelaria blazingstar

(*Mentzelia candelariae*), Tecopa birdbeak, and an additional occurrence of sagebrush cholla were identified south of the access road and infrastructure corridor (EM Strategies 2020b, 2020c).

Two occurrences of sagebrush cholla were observed in the area of analysis (EM Strategies 2020c, 2022a). One was found in the southern portion of the OPA in an inset alluvial fan, at 6,581 feet AMSL, on a west-southwest aspect. The second was found south of the Access Road and Infrastructure Corridor in a gravelly wash. The location and number of individual Mojave fishhook cactus was not documented (EM Strategies 2022a). It is known to occur on rocky alluvial, often alkaline soils within Mojave Desert scrub habitats between 1,500 and 7,500 feet of elevation (FNAA 2023). The Mojave fishhook cactus was added to the BLM special status species list in November 2023 after baseline surveys were completed; therefore, species specific surveys for the Mojave fishhook cactus were not conducted, and data on population and distribution of this species within the Plan boundary is unknown. The Nevada Division of Natural Heritage reported a known population of Candelaria blazingstar approximately one mile north of the OPA. Suitable habitat includes barren gravelly and clay soils on volcanic ash deposits, scree slopes, washes, and areas recovering from disturbance. No new occurrences of the plant were found (EM Strategies 2020b, 2020c, 2022a). Tecopa birdbeak is known to occur on open, moist, alkali crusted clay soils of seeps, springs, outflow drainages, and meadows at elevations between 2,100 and 4,900 feet AMSL. Potential habitat was surveyed within the Access Road and Infrastructure Corridor, but no plants were found (EM Strategies 2020c). However, Tecopa birdbeak was identified approximately 700 feet south of the access road in the wetland area created from the Fish Lake Valley Hot Springs (NDNH 2020).

A variety of plants occur in the area of analysis that are of ethnobotanical importance to native American Tribes. A study published in 1990 interviewed Southern Nevada Tribes and documented 75 plant species of cultural significance to the Tribes (Stoffle et al. 1990). Within the area of analysis, 37 plant species occur that were identified as of cultural importance to the Tribes, singleleaf pinyon (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), narrowleaf willow (*Salix exigua*), desert bitterbrush (*Purshia glandulosa*), and skunkbush sumac (*Rhus trilobata*), were identified as some of the most important species for the Tribes.

3.15 Visual Resources

The area of analysis for visual resources is the Plan boundary and the range of possible viewpoints as seen from the KOPs associated with the Project (**Figure 3-2**).

Four KOPs were selected for the Project at locations that represent the characteristic landscape viewable by the general public at points where the general public has access (NewFields 2023). KOP 1 is located approximately 1.5 miles northwest of the OPA along Cave Springs Road. This KOP faces southeast and represents views seen by motorists heading east along the road. KOP 2 is located at the eastern edge of the OPA on Cave Springs Road, about one mile from the quarry area. This KOP faces west-northwest and represents views seen by west-bound motorists along Cave Springs Road or visitors to Cave Spring. KOP 3 is located approximately 15 road miles west of the OPA on SR 264. This KOP faces east as seen by motorists along SR 264. This KOP was selected as it represents the broad landscape views from SR 264 looking towards the area of analysis. KOP 4 is located at the Fish Lake Valley Hot Springs, known as the "Hot Box," approximately five miles northwest of the OPA. This KOP faces southeast as seen by visitors at the Hot Box, a partially developed hot springs area. This KOP was selected to represent views of the area of analysis from a commonly visited recreation area. Visitors are noted to enjoy the panoramic views to the east and south at the hot springs area.

3.16 Water Resources

The area of analysis for water resources is the groundwater model domain (**Figure 3-3**).

3.16.1 Surface Water Resources

On the eastern margins of the White Mountains, there are mapped stream segments that contain perennial flow, principally Chiatovich Creek, Indian Creek, Leidy Creek, Perry Aiken Creek, McAfee Creek, and Cottonwood Creek. There are no perennial or intermittent streams or ponds located within the OPA. Drainages in the OPA originate in the Silver Peak Range with 131 mapped ephemeral tributaries combining to form one primary channel, Cave Springs wash, bisects the OPA and exits toward Fish Lake Valley.

Seeps and springs are surface expressions of subsurface waters (i.e., regional groundwater or localized perched groundwater). There are 73 springs within five miles of the proposed quarrying and groundwater pumping activities, of which 32 are within the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (NewFields 2020b; Piteau 2023b). There are seven perennial drainages, 140 ephemeral drainages, and three wetlands in proximity to the OPA. The results of the investigations concluded that all drainage features terminate prior to reaching a jurisdictional drainage; therefore, are not subject to federal jurisdiction (Stantec 2019; USACE 2020).

There are no Federal Emergency Management Agency Flood Insurance Rate Maps available to depict the flood threat extent for the Esmeralda County (NewFields 2020b). A floodplain is defined as "an area of low-lying ground adjacent to a stream or river, formed mainly of stream or river sediments and subject to flooding." Areas in the Plan boundary are prone to wash outs, which typically occur in the vicinity of the access road. Ioneer would implement an Access Road Improvement and Maintenance Plan (NewFields 2020c), which includes strategies for managing wash out prone areas.

3.16.2 Groundwater Resources

Field investigations to characterize the hydrogeology of the OPA and its immediate vicinity were conducted to establish the baseline hydrogeologic conditions for groundwater at the Project. These investigations included drilling of 117 exploration holes, installing three test production wells, collecting readings from three monitoring wells and 12 multi-level VWP clusters (35 total VWP instruments), collecting water level measurements from the monitoring wells and piezometers, taking water quality samples from the six test wells and monitoring wells, slug and/or air lift testing of boreholes within selected geologic units, and aquifer pumping and recovery testing using production wells. Within the groundwater model boundary, there are 40 additional groundwater wells with water level data tracked by NDWR and 77 locations with static water level data reported to NDWR (HydroGeoLogica 2020b; NewFields 2020b; Piteau 2023b).

The hydrogeology consists of basement Paleozoic rocks overlain by Lower Volcanics (collectively the lower plate), plus interbedded sedimentary rocks of the Cave Spring Formation and Upper Volcanics (collectively the upper plate), Basin Fill Alluvium, and Modern Alluvium. Hydrologic testing of these hydrogeologic units included two long-term pump tests (TW-01 and TW-02) with monitoring at multiple wells, and short-term single well tests conducted in open boreholes and monitoring wells (HydroGeoLogica 2020b).

Under predevelopment conditions for Fish Lake Valley, the predominant inflow component for the groundwater system is recharge from precipitation. Under predevelopment conditions, the principal groundwater outflow component is loss of groundwater through the ET process. Under the existing conditions, subsurface outflow and consumption of groundwater by agriculture represent the principal components of groundwater outflow. The Maxey-Eakin recharge estimate for the area of analysis is 30,770 acre-feet annually with 30,000 acre-feet of recharge estimated in Fish Lake Valley, 710 acre-feet within the portion of Clayton Valley and 60 acre-feet within the portion of Big Smoky Valley included in the groundwater flow model. The perennial yield of Fish Lake Valley hydrographic basin HA 117 is estimated to be 30,000 acre-feet annually, with most of the recharge in the basin due to recharge from the White Mountains. Measured groundwater discharges via seep and spring flows in the area of analysis totaled approximately 690 gpm (1,100 acre-feet) on an annual average basis and interbasin subsurface flows from Fish Lake Valley are estimated to be 360 gpm (600 acre-feet). The remainder of the groundwater outflow is attributed to loss via the ET process from the valley alluvium, the Fish Lake, and its playa area. Conceptual agricultural pumping outflow under existing conditions, estimated from the last five years of pumping, is estimated at 29,700 acre-feet annually (Piteau 2023b).

Groundwater elevations range from approximately 8,000 feet AMSL in the mountain ridgetop areas east and south of the OPA to approximately 4,800 feet AMSL at the valley floor alluvium northwest of the OPA. The general direction for groundwater flow is southeast to northwest across the OPA. Current piezometric levels in Fish Lake Valley range from approximately 4,700 feet AMSL to approximately 4,860 feet AMSL. Piezometric levels are highest (approximately 4,820 feet AMSL) in the northwest and decline towards the north. Within HA 117, the Fish Lake Valley alluvium has experienced drawdown on the order of 20 to 200 feet over the past 50 years, attributable to groundwater pumping for agricultural usage in the basin. However, groundwater levels in the OPA have exhibited a near steady-state condition during the available

monitoring period (2018-2020) except when influenced by hydrologic testing conducted to characterize the hydrogeologic units in the OPA (HydroGeoLogica 2020b).

3.16.3 Water Rights

There are 91 active water rights including 52 groundwater rights, 29 surface water rights, and 10 geothermal rights within a five mile radius of the Plan boundary. No federally reserved water rights or Public Water Reserves were identified at the time of the review of the NDWR database; however, federally reserved water rights or Public Water Reserves could be filed in the future. The water rights are utilized for stock water, power production, mining and milling, commercial supply, recreation, quasi-municipal, and domestic supply purposes with a total authorized diversion of 51,004 acre-feet annually (Piteau 2023b).

3.16.4 Water Quality

Surface Water Quality: Spring discharge generally met Nevada water quality standards with the exception of arsenic in the springs sampled nearest to the OPA, which ranged from 0.013 to 0.15 milligrams per liter (mg/L). One spring also exhibited a pH value above 9 standard units, while another spring had nitrate concentrations above the Nevada standard (Confluence 2019; HydroGeoLogica 2020a).

Groundwater Quality: Water chemistry samples collected from four wells in the OPA had relatively consistent water chemistry with neutral to alkaline pH and TDS between 250 and 550 mg/L. The dominant major ions were sodium and bicarbonate alkalinity. Arsenic concentrations in all the samples exceeded the Nevada standard for arsenic with concentrations ranging from 0.055 to 0.18 mg/L. Antimony in two wells and aluminum in two wells have been observed at concentrations above their respective Nevada standards in one individual sampling event each (HydroGeoLogica 2020a).

3.16.5 Mineralogy

The geologic units within the OPA are alluvium; Cave Springs Formation, which is a mixture of lacustrine, gritstone, carbonate/marl, high-lithium clay, lithium/boron ore searlesite, barren siltstone, marls, and silicified units; Rhyolite Ridge tuff breccia; and Silver Peak Formation. Mineralization includes lithium-only type enrichment of clay-rich layers and lithium-boron enrichment of clay-poor layers. Lithium-boron mineralization includes the mineral phase searlesite, and typically has higher silica, sodium and potassium and lower calcium and magnesium contents than zones without searlesite. Pyrite is the most common sulfide mineral present. Acid-generation from quarried materials is governed by pyrite oxidation kinetics with some or all the generated acid neutralized in situ (HydroGeoLogica 2020a).

3.16.6 Geochemical Testing

Geochemical tests evaluate the potential for overburden, post-quarrying quarry walls, ore stockpiles, and ore processing residuals to generate acidic metal-laden effluents that may impact surface water and groundwater quality. It was determined that most alluvial and bedrock overburden material is acid-neutralizing but has the potential to leach some metals and metalloids at neutral pH conditions. Approximately 20 percent of the overburden material is classified as acid-generating with acid-generation from longer-term leaching tests generally consistent with static test results. Acid leachate contains sulfate, metals, metalloid oxyanions, and fluoride above reference values. While analyte concentrations in acidic leachate decrease over time, aluminum, iron, and manganese tend to persist above reference levels along with the acidic conditions. Prior to processing, ore materials are acid-neutralizing and have leaching characteristics similar to acid-neutralizing overburden except they yield higher concentrations of metalloid oxyanions, boron, and lithium, when leached. These higher leachate concentrations are attributable to the higher concentrations of these analytes in the ore zone. Process residuals such as spent ore and sulfide salts behave as acid-generating materials that release sulfate, sodium, magnesium, fluoride, metals, and metalloids when leached. While concentrations of acidic leachate decrease over time, sulfate, aluminum, and iron associated with the acidic conditions tend to remain above reference levels. The neutralized filter cake, which is a residual from the ore processing, behaves as an acid-neutralizing material but can release residual sulfate, fluoride, and boron when leached (HydroGeoLogica 2020a).

3.17 Wetland and Riparian Resources

The area of analysis for wetland and riparian resources is the Plan boundary and the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-1**).

An aquatic resources survey was conducted on a portion, approximately 7,191 acres, of the area of analysis. Three wetlands were documented (Stantec 2019). Of these, one wetland, Wetland 3, occurs within a portion of the Access Road and Infrastructure Corridor, and is an emergent wetland supported by water output from the Fish Lake Valley Hot Springs. There are 0.16 acres of wetland in the area of analysis associated with Wetland 3. The remaining two are located outside of the area of analysis, south of the access road. The aquatic resources surveyed were isolated to the isolated Fish Lake Valley basin and are not regulated by the U.S. Army Corps of Engineers and Section 404 of the Federal Clean Water Act (USACE 2020).

Approximately 46,599 acres within the area of analysis were not delineated during the 2019 aquatic resources survey. Publicly available data (i.e., NWI) were used to determine wetlands that may be present in the unsurveyed area. There are 762.0 acres of riverine, 5.5 acres of freshwater forested/shrub, 5.0 acres of freshwater pond, and 1.3 acres of freshwater emergent wetlands in the area of analysis. It is likely the NWI mapping overestimates the amount of riverine wetlands since the 2019 field surveys identified all but one feature in the field surveyed portions to be ephemeral drainages. Chiatovich Creek is a perennial stream supporting riparian habitat that flows east from the White Mountains and crosses the Access Road and Infrastructure Corridor near where the access road meets SR 264. Approximately 212 feet of Chiatovich Creek is within the area of analysis with an ordinary high-water mark width of seven feet and riparian shrub community width of approximately 30 feet (Stantec 2019).

3.18 Wildlife Resources

The area of analysis for general wildlife, special status species (excluding golden eagles), and migratory birds, is the Plan boundary and the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-1**). The area of analysis for golden eagles is the Plan boundary and the 10-mile buffer of the OPA (**Figure 3-3**).

3.18.1 General Wildlife

3.18.1.1 Aquatic Species

No non-special status aquatic species have been identified in the area of analysis, although they likely occur. Potential habitat exists at surface water sites within the area of analysis.

3.18.1.2 Avian Species

The area of analysis supports a multitude of avian species, such as game birds, passerines, raptors, and special status species. Thirty-seven non-special status, non-raptor avian species were observed within the area of analysis (Enviroscientists 2011; EM Strategies 2020b, 2020c, 2022a). Of these, 36 are protected under the Migratory Bird Treaty Act. Chukar are a State of Nevada gamebird and are not protected under the Migratory Bird Treaty Act. Five non-special status raptor species have been observed in the area of analysis including Cooper's hawk (*Accipiter cooperii*), great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and turkey vulture (*Cathartes aura*). The total of all avian species documented, including special status species, is 53. One small raptor nest and one common raven (*Corvus corax*) nest were observed within the OPA in 2022 and 2023, and six large raptor nests (not golden eagle) were observed within one mile of the OPA in 2023 (Ioneer 2023b).

3.18.1.3 Insect Species

Two insect species were observed in the western portion of the area of analysis, including the house fly (*Musca domestica*) and common checkered skipper (*Pyrgus communis*) (Enviroscientists 2011).

3.18.1.4 Mammal Species

Twenty-two non-special status mammal species have been observed in the area of analysis, or its four-mile radius (Enviroscientists 2011; EM Strategies 2020b, 2020c, 2022a; NDOW 2020a). Non-special status big game species include mule deer and pronghorn. There are 48,034 acres of year-round mule deer habitat in the area of analysis, and no mapped pronghorn habitat (NDOW 2020b). Wild horses (*Equus ferus*) and wild burros (*Equus asinus*) were observed during baseline surveys (EM Strategies 2020b, 2020c), and are discussed in the Wild Horses and Burros SER for the Rhyolite Ridge Lithium-Boron Project (BLM 2024t). Small mammal species documented include badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), chipmunk (*Tamias* sp.), chisel-toothed kangaroo rat (*Dipodomys microps*), coyote (*Canis latrans*), deer mouse (*Peromyscus maniculatus*), desert cottontail (*Sylvilagus audubonii*), gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), little pocket mouse (*Perognathus longimembris*), Merriam's kangaroo rat (*Dipodomys merriami*), mountain cottontail (*Sylvilagus nuttallii*), skunk (*Mephitis* sp.), white-tailed antelope ground squirrel (*Ammospermophilus leucurus*), and woodrat (*Neotoma* sp.).

3.18.1.5 Reptile and Amphibian Species

Fifteen reptile species were documented in area of analysis, including coachwhip (*Masticophis flagellum*), common side-blotched lizard (*Uta stansburiana*), desert horned lizard (*Phrynosoma platyrhinos*), desert whiptail (*Aspidoscelis tigris*), Great Basin collared lizard (*Crotaphytus bicinctores*), Great Basin fence lizard (*Sceloporus occidentalis* ssp*. longipes*), long-nosed leopard lizard (*Gambelia wislizenii*), panamint rattlesnake (*Crotalus stephensi*), sagebrush lizard (*Sceloporus graciosus*), southwestern speckled rattlesnake (*Crotalus mitchellii* ssp. *pyrrhus*), spiny lizard (*Sceloporus magister*), western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), yellow-backed spiny lizard (*Sceloporus uniformis*), and zebra-tailed lizard (*Callisaurus draconoides*) (Enviroscientists 2011; EM Strategies 2020b, 2022a; NDOW 2020a). No amphibian non-special status species have been documented.

3.18.2 Special Status Species

3.18.2.1 Aquatic Species

The Fish Lake Valley tui chub has been documented approximately 2,200 feet south of the Access Road and Infrastructure Corridor portion of the area of analysis (NDNH 2020), the Fish Lake Valley pyrg has been documented approximately 1,300 feet outside the Access Road and Infrastructure Corridor of the area of analysis (NDNH 2020), and the Wong's springsnail has been documented approximately 150 feet outside the Access Road and Infrastructure Corridor of the area of analysis and at Cave Spring within the area of analysis (NDNH 2020).

3.18.2.2 Avian Species, Including Golden Eagles

Special status avian species within the area of analysis include black-throated gray warbler, Brewer's sparrow, Cassin's finch, common nighthawk, ferruginous hawk, golden eagle, loggerhead shrike, pinyon jay, and western burrowing owl (Enviroscientists 2011; EM Strategies 2020b; NDOW 2020a). Golden eagles are protected under the Bald and Golden Eagle Protection Act of 1940, as amended. BSSG are discussed in Section 3.12.1.

3.18.2.3 Insect Species

No special status insect species have been identified in the area of analysis. Monarch butterfly is discussed in Section 3.12.2.

3.18.2.4 Mammal Species

Special status mammal species known to occur within the area of analysis of its four-mile radius include Botta's pocket gopher, desert kangaroo rat, pale kangaroo mouse, and desert bighorn sheep (EM Strategies 2020b, 2020c, 2022a; NDOW 2020a, 2020b). Special status bat species in the area of analysis include Mexican free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), canyon bat (*Parastrellus hesperus*), hoary bat (*Lasiurus cinereus*), little brown bat (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western small-footed myotis (*Myotis ciliolabrum*). In addition, a call was collected potentially from a pallid bat (*Antrozous pallidus*)

or big brown bat (*Eptesicus fuscus*) during the acoustic bat surveys (EM Strategies 2020b). Spotted bats (*Euderma maculatum*) have potential to occur in the area of analysis; therefore, have been included.

3.18.2.5 Reptile and Amphibian Species

Special status amphibian species observed within the area of analysis or its vicinity include the western toad and a subspecies of the western toad, the California toad. The western toad has been observed in the wetland approximately 2,200 feet south of the access road (NDOW 2020a), and the California toad has been observed either in the area of analysis or its four-mile radius (NDOW 2020a).

3.19 Wild Horses and Burros

The area of analysis for wild horses and burros is the extent of the Silver Peak HMA and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour (**Figure 3-2**). The Silver Peak HMA encompasses approximately 239,801 acres of public lands administered by the BLM and 2,661 acres of private land for a total of 242,462 acres. The HMA is dominated by the salt desert scrub vegetation type, which is found in the alluvial fans and lower foothills, while the sagebrush vegetation type occurs in the mountains and hills with a mixture of pinyon-juniper woodlands. Water sources in the HMA include 66 seeps and springs, five troughs from range improvement projects, and Chiatovich Creek. Of the 31 seeps and springs that were surveyed in the area of analysis, 12 were documented as dry (HydroGeoLogica 2020b); therefore, not considered reliable for wild horse or burro use.

An AML is the number of wild horses or burros that can be sustained in a designated HMA that achieves and maintains a thriving natural ecological balance in keeping with the multiple-use management concept. The AML for the Silver Peak HMA in the portion that overlaps the Magruder Mountain grazing allotment is four to six burros (BLM 2004), and zero wild horses and burros for the remaining areas in the HMA (BLM 2006). The current population estimates for the Silver Peak HMA are 16 horses and zero burros (BLM 2023c), with all horses being in excess of the zero AML and burros below the low end of the AML. The Plan boundary occurs outside of the portion of the Silver Peak HMA that overlaps the Magruder Mountain grazing allotment; therefore, any wild horses or burros observed in the Plan boundary are in excess of the zero AML for that portion of the HMA. Wild horses and evidence of grazing has been documented in the OPA (EM Strategies 2020b, 2020c).

4.0 Environmental Consequences

The Proposed Action and alternatives outlined in Chapter 2.0 may cause changes in the human environment. This document assesses and analyzes these potential changes and discloses the effects to the decision-makers and public. This process of disclosure is one of the fundamental aims of NEPA. There are many concepts and terms used when discussing impacts assessment that may not be familiar to the average reader, and these are discussed below.

Effects or impacts means changes to the human environment from the Proposed Action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the Proposed Action or alternatives, including those effects that occur at the same time and place as the Proposed Action or alternatives and may include effects that are later in time or farther removed in distance from the Proposed Action or alternatives. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic (such as the effects on employment), social, or health effects. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect would be beneficial (40 CFR 1508.1).

Intensity refers to the severity or level of magnitude of impact. Public health and safety, proximity to sensitive areas, level of controversy, unique risks, or potentially precedent-setting effects are all factors to be considered in determining intensity of effect. This document primarily uses the terms major, moderate, minor, or negligible in describing the intensity of effects.

Context means that the effect(s) of an action must be analyzed within a framework, or within physical or conceptual limits. Resource disciplines: location, type, or size of area affected (e.g., local or regional); and affected interests are all elements of context that ultimately determine significance. Both long- and short-term effects are relevant. For impact definitions specific to each resource, see **Appendix D** and the resource SERs for the Rhyolite Ridge Lithium-Boron Project (BLM 2024c through 2024u).

The impacts described below for the Proposed Action are for the implementation of the Plan as described in Section 2.1. The North and South OSF Alternative is similar to the Proposed Action, primarily differing in the location of facilities and is described in Section 2.2. The No Action Alternative is described in Section 2.3 and, if selected, the Project would not be approved and existing disturbance would be reclaimed.

4.1 Air Quality and Climate Change

4.1.1 Proposed Action

The Proposed Action activities would be a source of fugitive and point source emissions of particulate and gaseous air pollutants. Fugitive emissions would be generated by blasting, drilling, overburden and ore material handling, vehicle traffic, and wind erosion from disturbed areas. Point source emissions would be generated from the sulfuric acid plant, silos and bins, the sulfur unloading and receiving pit and acid tanks, water pumps, lab baghouse, cooling towers, dryers, start-up burner, auxiliary boiler, diesel generators, diesel emergency generator, storage tanks, conveying and crushing ore, ore processing operations, and fire-water pump. Gaseous and particulate air emissions would be emitted from operation of mobile diesel equipment. The conversion of existing agricultural wells in Fish Lake Valley from agricultural use to mining and milling may result in additional fugitive emissions from agricultural fields no longer being irrigated.

Based on maximum estimated emissions of criteria pollutants and HAPs, the Project would be considered a Class II minor source of air pollution as defined by NDEP (NAC 445B.037). A Class II minor source is one that emits less than 100 tpy of any regulated criteria pollutant (not including fugitive and mobile source emissions), less than 25 tpy of total HAPs, and less than 10 tpy of any single HAP. Ioneer has obtained a Class II Air Quality Operating Permit (AP 1099-4256) for the Project which authorizes the emissions from all Project-related construction and operation activities and includes annual emissions reporting requirements. Within the general provisions of the permit, or on a source by source basis, the NDEP air quality permit requires testing and recordkeeping, as determined by the agency. Additionally, if there are any non-compliance issues, NDEP has the ability to review each situation that may be deemed a short-

term excess emissions event with documented corrective actions and procedures. Lastly, appropriate monetary violations may be issued to the facility, as applicable and depending on the violation, and modifications to a permit may be required. Calculated air pollutant emissions due to quarrying and processing under the Proposed Action are provided in **Table 4-1**.

Dispersion modeling analyses were conducted to assess potential air quality impacts resulting from full-scale quarrying and processing. **Table 4-2** details the modeling results for the Project.

Off-site road impacts were modeled by evaluating seven most used road segments within the 50-km boundary surrounding the Project. Each segment incorporated commuter and delivery vehicle routes. These segments include Segment A: Paved travel on US 95, Segment B: Paved travel on US 95, Segment C: Paved travel US 6 and SR 773, Segment D: Paved travel US 6 and SR 264, Segment E: Paved travel SR 264, and Segment F: Unpaved travel along Project access road (Trinity 2023). Segment G: Paved travel SR 264 off-site sources were evaluated in two ways. First, all Segments A through G, except for Segment F were modeled. A portion of Segment F was excluded as it was included in the initial "onsite" sources. This analysis included all receptors that exceeded the Significant Impact Levels (SIL) for each criteria pollutant. Modeled impacts by segment were aggregated and conservatively combined with the on-site impacts irrespective of time and location (**Table 4-3**).

Table 4-1 Projected Air Emissions Due to the Proposed Action Quarrying and Processing

Emission Source	Annual Air Emissions (tpy)										
	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	H_2S	H_2SO_4	HAPs	CO_2e
Fugitive Emissions	2,625.08	1,181.09	173.66	3.27	76.18	0.01	0.00	0.00	0.00	0.00	420,856
Non-Fugitive Emissions	75.78	55.48	43.66	93.80	28.11	82.35	4.92	2.84	24.41	0.16	30,301
Mobile/Tailpipe Emissions	199.11	41.29	10.61	59.62	26.55	0.06	3.00	0.00	0.00	0.65	20,431
Total	**2,899.97**	**1,277.86**	**227.92**	**156.69**	**130.84**	**82.42**	**7.92**	**2.84**	**24.41**	**0.81**	**471,589**

Source: Trinity 2022a, 2023
NOx = nitrogen oxides; VOC = volatile organic compound; H_2SO_4 = sulfuric acid

Table 4-2 Proposed Action Air Modeling Results (On-site Sources)

Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	NVAAQS ($\mu g/m^3$)	Compliance
CO	1-hour	5,418.88	1,717	7,135.88	40,000	40,500	Yes
	8-hour	834.21	1,374	2,208.21	10,000	10,500	Yes
NO_2	1-hour[1]	172.81	OLM	172.81	188	188	Yes
	Annual[1]	69.99	-	69.99	100	100	Yes
$PM_{2.5}$	24-hour	10.89	8.0	18.89	35	35	Yes
	Annual	5.62	2.3	7.92	9[2]	12	Yes
PM_{10}	24-hour[3]	77.19/94.56	10.2	87.39/104.76	150	150	Yes
	Annual	26.27	9.0	35.27	-	50	Yes
SO_2	1-hour	146.58	7.9	154.48	196	196	Yes
	3-hour	107.45	7.9	115.35	1,300	1,300	Yes
	24-hour	15.35	7.9	23.25	-	365	Yes
	Annual	3.50	7.9	11.40	-	80	Yes
H_2S	1-hour	28.13	-	28.13	-	112	Yes

Source: Trinity 2023 (See Table 6-1 in Trinity 2023 for further detail)
$\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; NVAAQS = Nevada Ambient Air Quality Standards
[1] Background hourly NO_2 concentrations are incorporated directly into the model; OLM – Ozone Limiting Method also applied.
[2] The Environmental Protection Agency promulgated the lower NAAQS for annual $PM_{2.5}$ on February 7, 2024, and is expected to be in force in April 2024.
[3] The form of the NAAQS is the high 6th high and the NVAAQS is the high first high.

Table 4-3 Proposed Action Air Modeling Results (SIL Exceedance Receptor Impacts)

Averaging Period	CO		NO_2		$PM_{2.5}$		PM_{10}		SO_2			
	1-hour	8-hour	1-hour	Annual	24-hour	Annual	24-hour	Annual	1-hour	3-hour	24-hour	Annual
A	0.41	0.05	0.08	1.30E-03	1.92E-03	6.10E-04	0.03	2.88E-03	5.10E-04	2.50E-04	4.00E-05	0
B	0.02	2.64E-03	5.49E-03	2.90E-04	4.70E-04	1.90E-04	5.47E-03	1.31E-03	2.00E-05	1.00E-05	0	0
C	0.12	0.02	0.06	3.46E-03	4.61E-03	2.06E-03	0.07	0.02	1.60E-04	1.10E-04	3.00E-05	1.00E-05
D	0.03	4.86E-03	3.99E-03	5.00E-05	5.70E-04	1.20E-04	7.60E-03	5.30E-04	5.00E-05	4.00E-05	0	0
E	0.06	8.70E-03	0.03	3.80E-04	1.72E-03	2.80E-04	0.03	2.19E-03	1.80E-04	8.00E-05	1.00E-05	0
F	0.81	0.11	6.25	0.61	1.53E-03	2.30E-04	0.57	0.2	2.52E-02	1.44E-02	5.29E-03	1.95E-05
G	1.17E-03	1.60E-04	5.00E-05	0	0	0	1.20E-04	1.00E-05	0	0	0	0
Total Off-site Conc. (µg/m^3)	1.44	0.19	6.44	0.62	0.01	0	0.71	0.18	0.03	0.01	0.01	2.95E-05
Total On-site Conc. (µg/m^3)	7,135.88	2,208.21	172.81	69.99	18.89	7.92	104.76	35.27	154.48	115.35	23.25	11.4
Total Conc. (µg/m3)	7,137.32	2,208.40	179.25	70.61	18.9	7.92	105.47	35.49	154.51	115.36	23.26	11.4
NAAQS (µg/m^3)	40,000	10,000	188	100	35	91	150	-	196	1,300	-	-
NVAAQS (µg/m^3)	40,500	10,500	188	100	35	12	150	50	196	1,300	365	80
Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Trinity 2023 (See Table 6-2 in Trinity 2023 for further detail)
[1] The USEPA promulgated the lower NAAQS for annual $PM_{2.5}$ on February 7, 2024, and is expected to be in force in April 2024.

Segment F contributes the largest portion of off-site impacts primarily because it is closest to the Plan boundary and the widest off-site road segment. The 5,000 meters of Segment F closest to the Plan boundary were modeled. A receptor grid was set to 1 km in all directions from Segment F. Additional receptors generated along the road at the boundary of the volume source exclusion zone were added at a spacing of 25 meters, to ensure the maximum impacts from the representative road section are captured (Trinity 2023).

Modeling results for the Proposed Action indicate that air quality impacts would be below the NAAQS/NVAAQS, and no substantial adverse impacts would occur. Modeling also indicates that impacts would be localized near the Project site and dissipate with distance from Project activity. Additionally, the refined analysis confirmed that commuter and deliver vehicle traffic would not cause any NAAQS/NVAAQS exceedances along any of the road segments (**Table 4-4**). The Proposed Action would be compliant with both primary and secondary NAAQ standards. These impacts would be local and short term in duration, primarily occurring during active quarrying and processing. Air pollutant concentrations would return to background levels after quarrying and processing cease and reclamation is completed.

Table 4-4 Proposed Action Air Modeling Results (Combined On-site/Off-site Sources)

Pollutant	Averaging Period	Patial Worst-Case Segment (µg/m^3)	Total On-site Impact (µg/m^3)	Total Concentration (µg/m^3)	NAAQS (µg/m^3)	NVAAQS (µg/m^3)	Compliance
CO	1-hour	37.16	7,136	7,173	40,000	40,500	Yes
	8-hour	14.84	2,208	2,223	10,000	10,500	Yes
NO_2	1-hour	6.24	172.81	179.05	188	188	Yes
	Annual	0.65	69.79	70.44	100	100	Yes
$PM_{2.5}$	24-hour	8.70E-02	19.43	19.52	35	35	Yes
	Annual	4.88E-02	8.21	8.26	9[1]	12	Yes
PM_{10}	24-hour[2]	0.84/1.10	102.4/121.96	103.24/123.06	150	150	Yes
	Annual	0.36	41.94	42.30	-	50	Yes
SO_2	1-hour	2.66E-02	154.48	154.51	196	196	Yes
	3-hour	1.79E-02	115.35	115.37	1,300	1,300	Yes
	24-hour	6.22E-03	23.25	23.26	-	365	Yes
	Annual	2.04E-03	11.40	11.40	-	80	Yes

Source: Trinity 2023 (See Table 6-3 in Trinity 2023 for further detail)
[1] The Environmental Protection Agency promulgated the lower NAAQS for annual $PM_{2.5}$ on February 7, 2024, and is expected to be in force in April 2024.
[2] The form of the 24-hr PM_{10} NAAQS is the high 1st high

Emission calculations indicate that total estimate HAP emissions from all sources associated with the Proposed Action would be up to 0.81 tpy, and mercury emissions would be about 4.7 x 10^{-4} tpy. Operations associated with the Proposed Action would result in approximately 471,589 tpy of direct GHG emissions and 24,429 tpy of indirect GHG emissions in terms of CO_2e. Indirect GHG emissions are related to transport and delivery of quarried materials (i.e., lithium and boron) (Trinity 2023). Per the USEPA Greenhouse Gas Equivalence Calculator, the Proposed Action would produce approximately the same amount of GHG emissions annually as that produced by 56,713 households (100,134 gasoline-powered passenger vehicles) annually due to energy consumption (USEPA 2022). Non-road mobile equipment GHG emissions were also estimated. The equipment consists of a series of cranes, telehandlers, light plants, forklifts off-highway haul trucks and dozers among others (Trinity 2022a). The emissions were established by a weighted average engine horsepower and load factor for each equipment type. Total annual GHG emissions for all aggregated non-road construction equipment were estimated at 14,333 tons CO_2e (Trinity 2022a).

Off-site vehicle GHG emissions were established for each of the seven off-site road segments (**Table 4-3**). The number of vehicles for each segment were based on Federal Highway Administration calculation methodology. In aggregate, the predicted GHG annual emissions was 5,447.20 tons CO_2e (Trinity 2023).

The Proposed Action would be subject to the GHG Reporting Rule as the expected emissions would be greater than 25,000 tpy. Appropriate GHG emissions would need to be provided to the USEPA on an annual basis as appropriate (Trinity 2023).

An ozone impact analysis determined that the Proposed Action would result in maximum 8-hour modeled impact of 0.69 ppb of ozone. The Significant Impact Level for Precursor ozone is 1 ppb; therefore, the Proposed Action impacts would comply with the ozone NAAQS.

NOx and SO_2 are both precursors to secondary $PM_{2.5}$ formation. The proposed secondary $PM_{2.5}$ precursor emissions increase can be expressed as a percent of the lowest Modeled Emission Rates for Precursors (USEPA 2020) for each precursor and then summed to determine predicted secondary $PM_{2.5}$ impacts. A value of less than 100 percent indicates that the NAAQS and NVAAQS would not be exceeded when considering the combined impacts of the direct and secondary precursor emissions for the 24-hour and annual $PM_{2.5}$. The 24-hour and annual Secondary $PM_{2.5}$ impact calculations are 44.4 percent and 54.8 percent, respectively (Trinity 2022a). Because the calculation is less than 100 percent, the Proposed Action impacts would comply with the NAAQS and NVAAQS for $PM_{2.5}$.

Air pollutant emissions from the Proposed Action would occur; however, several air pollution control measures would be implemented by Ioneer, including the following. Diesel generators would use Tier 4 engines that are compliant with the appropriate New Source Performance Standards and National Emission Standards for HAPs requirements for Reciprocating Internal Combustion Engines. Diesel engines would be maintained and operated in accordance with the manufacturer's specifications and use ultra-low sulfur diesel fuel. The OSFs would be watered to reduce fugitive dust emissions. Disturbed areas would be seeded with an interim seed mix to minimize fugitive dust emissions. Particulate generated on the unpaved haul roads and operational areas would be controlled by applying water, polymer, and/or dust suppression reagents. Emissions from conveying, screening, and crushing operations associated with ore processing would be controlled by using fogging systems, or by fully/partially enclosing material transfer points. The sulfuric acid plant stack would use a tail gas scrubber to control SO2 emissions, thereby complying with New Source Performance Standards. Good operating practices would be implemented to manage emissions of particulates, hydrogen sulfide, and sulfuric acid from the various processes at the sulfuric acid plant. Small amounts of volatile organic compound fugitive emissions from the on-site storage of petroleum-based fuels would be managed by using BMPs for fueling operations and using light-colored paint for tank exteriors. The lithium carbonate dryer stack would be controlled by a baghouse with a vendor guaranteed grain loading rate of 0.010 grain per cubic feet. The boric acid dryer would be controlled by a wet scrubbing system that uses process water for the scrubbing and recirculate the bleed to the Boric Acid Dissolution tank. PM, PM10, and PM2.5 emissions emitted when loading material into the silos and emissions would be controlled by the use of bin vents. Air emissions from the laboratory would be controlled with a baghouse (Ioneer 2022; NDEP 2022; Trinity 2022a).

4.1.2 North and South OSF Alternative

Dispersion modeling was not explicitly conducted for the North and South OSF Alternative, but the relocation of sources was reviewed and compared to the Proposed Action results. The emissions are expected to be similar to the Proposed Action. The majority of standards relative to the Proposed Action are well within compliance requirements and are anticipated to be similar under the North and South OSF Alternative. The annual PM_{10} NVAAQS show the highest impacts along Cave Springs Road, primarily associated with the haul roads (specifically the segment that heads to the North OSF). However, the receptors along the northern and southern boundaries are well below 1 $\mu g/m^3$. While the haul road would extend further south to access the Quarry Infill OSF and South OSF, the total emissions are anticipated to remain similar to the Proposed Action.

The North OSF, Quarry Infill OSF, and West OSF were modeled for PM_{10} under the Proposed Action. The first and sixth highest concentrations were determined (7.03 and 8.20 $\mu g/m^3$). For the sensitivity analysis, the stockpiles were shifted to reflect the new geographic locations for the North and South OSF Alternative. Based on a sensitivity analysis that assessed the alternative's proposed locations of the OSFs, the highest impact areas were increased by 2.0 to 3.5 $\mu g/m^3$ (8.98 and 11.91 $\mu g/m^3$). Those highest impact receptors also shift from the OPA to approximately 300 meters southward. Although there are minor potential impact increases, this alternative is not likely to exceed any NAAQS. The alternative would produce an overall

impact below the 150 µg/m^3 PM_{10} 24-hour NAAQS. Similarly, 1-hour NO_2 impacts would incrementally increase at the Project OPA boundaries relative to the Proposed Action due to the longer haul road to access the South OSF, but the highest values would remain near the acid plant and quarry (due to blasting), which would not change under this alternative. As a result, 1-hour NO_2 impacts are not expected to increase significantly to cause a NAAQS compliance issue. The associated impacts of this alternative would be localized and short-term, primarily occurring during active quarrying and processing. Air pollutant concentrations would return to background levels after reclamation is completed.

4.1.3 No Action Alternative

Under the No Action Alternative, the Project would not be constructed or operated. The air quality impacts associated with the Proposed Action would not occur and existing air quality conditions would remain unchanged. The existing 15 acres of exploration disturbance under the relinquished Notices (NVN-97202 and NVN-97262), has occurred on public lands administered by the BLM and would be reclaimed. No emissions inventory has been prepared for the previously authorized explorations operations. However, it is reasonable to assume that the No Action Alternative would have less emission generation levels than the Proposed Action, and this alternative would be compliant with all NAAQS.

4.2 Cultural Resources

4.2.1 Proposed Action

Of the 40 NRHP-eligible or unevaluated cultural resources within the PAPE, 12 would potentially be physically impacted by access road improvements, including widening the road to 100 feet. Road improvements are conceptual at this time, and road design would be modified to avoid the 12 NRHP-eligible cultural resources along the road if possible. If these cultural resources cannot be avoided, the Proposed Action would have an adverse effect on historic properties that would be permanent and localized. Four cultural resources are within 100 feet of surface disturbance: one adjacent to haul/service road construction, one adjacent to a diversion channel, one adjacent to the access road, and one adjacent to the Argentite Road realignment. These sites would be avoided. Additionally, disturbance associated with approximately 35 acres of exploration disturbance in the OPA, 30 acres of disturbance for dewatering facilities in the OPA, 20 acres of disturbance for water supply facilities in the Plan boundary, and Tiehm's buckwheat designated critical habitat and subpopulation fencing would be designed to avoid these sites. The Cave Springs Cabin (B12947) would be avoided by Project activities; therefore, there would be No Adverse Effect from physical activities to NRHP-eligible architectural resources (Ross-Hauer 2020).

A total of 29 NRHP-eligible or unevaluated cultural resources (22 prehistoric sites, three historic resources, and four multicomponent sites) have the potential to be affected by auditory, vibrational, and/or visual impacts. The prehistoric sites include 10 rock shelter sites, two complex habitation sites, three basic habitation sites, and seven lithic scatters with simple or complex flaked stone assemblages. The historic resources consist of a segment of an underground pipeline, the Mineral Ridge Historic Mining District, and a stone cabin. The multicomponent sites include a prehistoric complex habitation component and a historic refuse deposit, a prehistoric complex habitation component, a site with rock shelters and rock alignments, and a prehistoric rock shelter component and historic stone cabin with a corral (Ross-Hauer 2020). Of the 29 cultural resources, 15 will not be affected by auditory, vibrational, and/or visual impacts, while a total of 14 cultural resources (13 cultural resources and one architectural resource) could be impacted by auditory, vibrational, and/visual impacts. Three cultural resources (CrNV-64-6245/26ES1000, CrNV-64-19981/26ES2958, and CrNV-64-19986/26ES2963) could be adversely affected by vibration and/or blasting. Nine of the sites are located more than 100 feet from heavy machinery areas and more than 722 feet from the quarry.

As long as Project-related activities remain at least 100 feet (30 meters) away from the boundaries of these nine sites, this will prevent impacts to these historic properties from vibrations (Felling and Richey 2023). The remaining cultural resource (CrNV-64-7851/26ES1566) and its associated architectural resource (B12947) would be 1,014 feet from the quarry; therefore, not susceptible to vibratory impacts from blasting, but instead would be vulnerable to auditory and visual impacts (Felling and Richey 2023). Three cultural resources (CrNV-64-6245/26ES1000, CrNV-64-19981/26ES2958, and CrNV-64-19986/26ES2963) could be adversely affected by vibration from heavy machinery and/or blasting.

Of the 191 cultural resources that are not eligible for the NRHP, 100 are within the project disturbance footprint, 40 are within 100 feet (30 meters), and the remaining 51 are greater than 100 feet away. The 100 sites would be destroyed, 40 may be disturbed or destroyed, and the remaining 51 would likely be avoided.

A MOA between the BLM, SHPO, Ioneer, and other consulting parties is being prepared and would be executed. The MOA would lay out the steps that the agency and other parties take to consider and resolve any adverse effects that the Project would have on historic properties. Unavoidable adverse impacts to historic properties would be minimized and/or mitigated through implementation of an HPTP, which is also in preparation.

4.2.2 North and South OSF Alternative

Impacts would be similar to the Proposed Action, except that of the 40 NRHP-eligible or unevaluated cultural resources within the PAPE, 19 would potentially be physically impacted. Of these, 12 could be disturbed by access road improvements, one from the Argentite Road realignment, two from the North, South, and Quarry Infill OSFs, and one from diversion channels. Project design would be modified to avoid NRHP-eligible cultural resources along the roads and diversion channels if possible. If cultural resources cannot be avoided, the alternative would have an adverse effect on historic properties that would be permanent and localized. Three cultural resources are within 100 feet of surface disturbance and would be avoided: one cultural resource adjacent to haul/service road construction, one site adjacent to the Argentite Road realignment, and one site adjacent to the access road. Additionally, disturbance within the OPA associated with approximately 35 acres of exploration, 30 acres for dewatering facilities, 30 acres for general surface disturbance, and Tiehm's buckwheat designated critical habitat fencing, and disturbance within the Plan boundary associated with approximately 20 acres for water supply facilities would be designed to avoid these sites.

Of the 191 cultural resources that are not eligible for the NRHP, 109 are within the project disturbance footprint, 34 are within 100 feet (30 meters), and the remaining 48 are greater than 100 feet away. The 109 sites would be destroyed, 34 may be disturbed or destroyed, and the remaining 48 would likely be avoided.

4.2.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed and associated impacts to cultural resources would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. There would be no impacts from the No Action Alternative to NRHP-eligible cultural resources.

4.3 Environmental Justice

Environmental justice seeks to address if there would be any minority, low-income, and/ or tribal populations that would be disproportionately affected by the Project. Mineral and Inyo counties were found to have a minority population. All counties within the area of analysis were found to have a low-income population. Mineral, Nye, Inyo, and Mono counties had American Indian or Alaska Native populations.

4.3.1 Proposed Action

Potential impacts to environmental justice populations may include impacts to air quality, visual, noise, water, traffic, hazardous material transportation, and social and economic values. Effects to air quality, visual, and noise would be expected to lessen with increasing distance from the Project as these impacts tend to occur around a general proximity to disturbance and attenuate the further from disturbance. Impacts to air quality are not anticipated to exceed NAAQS (Section 4.1). As a result of the Project being compliant with NAAQS, compliance reporting required for the Class II Air Quality Permit of the Project, and the maximum modeled impacts occurring within or close proximity to the OPA, disproportionate impacts to communities with environmental justice concerns are not anticipated.

Visual impacts would not occur in populated areas of conflict with the established interim BLM VRM Class Objectives (Section 4.15). Visual impacts would primarily occur around Cave Springs Road, and those utilizing that route would see visually apparent modifications to the landscape associated with the quarry, OSFs, SOSF, and associated infrastructure including the at-grade pipeline mounded at approximately 50-

foot increments, the booster station, and powerline utility poles. Communities with environmental justice concerns may use the surrounding area for recreational purposes, and increased noise and human activity may reduce the recreation experience in proximity to the Project, primarily reducing the feeling of solitude.

Ioneer has acquired all necessary water rights for construction and quarrying and processing. During quarrying and processing, water from quarry dewatering wells would be supplemented with water from new or existing wells on private land in Fish Lake Valley. The annual basis groundwater pumping would be equal to the agricultural pumping, less the NDWR adjustment. The analysis of effects on water rights assumes that existing consumptive uses in Fish Lake Valley would continue at their current rate which are near the Fish Lake Vally basin's perennial yield. There are 10 perennial surface waters and five surface stock water rights within the projected 10-foot drawdown contour. In addition, the one-mile buffer of the projected 10-foot drawdown contour includes 13 additional surface water locations, two additional stock water rights, and six irrigation water rights. Spring flow in the area may be dependent on groundwater flow and decreased groundwater levels may reduce the discharge of water via springs. The amount of spring flow reduction would be dependent on the actual increase in the horizontal groundwater gradient and could result in a cessation of groundwater sourced flow unless water levels recovered, which is predicted to occur over a period of approximately 200 years (Piteau 2023b). Given Esmeralda County has a low-income population of approximately 44 percent, which is greater than the reference population, impacts to groundwater levels may affect a population with environmental justice concerns.

Groundwater pumping would reduce the total quantity of groundwater available for other consumptive use within the Fish Lake Valley basin. Depending on the specific nature of the water rights transferred to the Project, those rights would represent 13 percent of the basin's perennial yield. When utilized for agriculture, this volume of water would be equivalent to alfalfa hay irrigation by up to eight quarter-section irrigation pivots. Due to anticipated impacts associated with groundwater drawdown and changes to historical agricultural water use, groundwater pumping for the Proposed Action may disproportionately affect populations with environmental justice concerns including in Esmeralda County, which has a low-income population of approximately 44 percent, which is greater than the reference population.

Groundwater quality is not anticipated to be affected downgradient of the quarry lake due to being predicted to be a terminal sink. The ERA determined a low probability of risks to wildlife from the quarry lake. Concentrations of arsenic, boron, fluoride, and molybdenum could be expected to exceed secondary enforceable and non-enforceable standards as well as NDEP Profile III reference values (Piteau 2024b). Given Esmeralda County has a low-income population of approximately 44 percent, which is greater than the reference population, potential impacts from the quarry lake may affect a population with environmental justice concerns. Additionally, the underdrain and contact water collection systems would minimize the volume of leachate contacting the environment. Therefore, potential for degradation of water quality by overburden leaching is limited (HydroGeoLogica 2020b) and monitoring of materials placed in the facility and nearby water chemistry would be established per NDEP WPCP requirements to verify that the facility is not contributing to water quality degradation.

There would be a noticeable increase in traffic on roadways. A Transportation and Access Plan (Ioneer 2022) has been prepared which includes discussion of public safety and maintenance measures that would be implemented. The Proposed Action would increase traffic on area roadways from bus traffic, truck traffic, and light vehicle traffic for a total of approximately 248 total trips per day for construction and 288 total trips per day for the quarrying and processing phase (Section 4.13). Given Esmeralda County has a low-income population of approximately 44 percent, which is greater than the reference population, and there are low-income, minority, and Native American populations that meet the environmental justice screening requirements within Census Block Groups along the transportation route, transportation-related impacts may disproportionately affect populations with environmental justice concerns.

Trucks would be used to transport hazardous materials both ways between Las Vegas or Reno. Hazardous material transportation would increase daily traffic along these routes during the life of the quarry. These routes pass through areas with low-income, minority, and Native American populations. The probability of release of hazardous material was determined to be the same between the Las Vegas and Reno routes. Diesel fuel had the highest probability of release, followed by corrosion inhibitor, and liquid phosphate. The Project is anticipated to be a Small Quantity Generator of hazardous material, so impacts from hazardous

material transportation from the OPA are anticipated to be low. Implementation of the Emergency Response and Spill Contingency Plan and ACEPMs would reduce the risk of potential impacts should a spill or release occur. In the potential case of transportation spills to water bodies, there could be long-term, major, and regional impacts that may affect communities with environmental justice concerns. There is a low probability of hazardous material transportation incidents (Section 4.5). Given Esmeralda County has a low-income population present of approximately 44 percent, which is greater than the reference population, and there are low-income, minority, and Native American populations that meet the environmental justice screening requirements within Census Block Groups along the hazardous material transportation route, hazardous material transportation-related impacts may affect populations with environmental justice concerns.

The Proposed Action would increase the population within the area of analysis from direct, indirect, and induced employment. Whereas this may have beneficial socioeconomic effects due to additional, good paying employment opportunities, the potential population increase would also have impacts to housing availability, public facilities and infrastructure, local government finances, and the overall social and cultural landscape that could disproportionately and adversely impact environmental justice populations identified in the area of analysis. It is assumed Project-related population would reside in communities like Tonopah, Hawthorne, and Bishop due to proximity to the Project. Total non-local population increase, when accounting for single households without children and married households with children, is anticipated to be 1,273 people with approximately 976 being adults of working age. This is a relatively large increase in population within the area of analysis that has relatively low rental vacancy rates and public services may not currently be at sufficient capacities to appropriately accommodate this population increase. Since some of these impacts may run through reclamation and closure, these impacts would occur over the long term. Even though it is anticipated that construction and operations would generate annual calendar year taxes of approximately $15,413,110 in county and sub-county special district taxes, this tax revenue would be generated over the course of the Project operations and may not provide immediate tax revenue relief relative to when the population increases occur. These impacts may result in local government budget shortfalls if counties in the area of analysis have to hire additional staff, or public services/infrastructure capacity improvements are needed to accommodate increased demand for these services. Impacts to county budgets may affect capacity to increase services and infrastructure to accommodate Project-related population. This could disproportionately and adversely impact environmental justice populations in the area of analysis by potentially decreasing access to public social services including health care, food banks, and education. Given Esmeralda County has a low-income population of approximately 44 percent, which is greater than the reference population, and other Census Block Groups within the area of analysis have low-income, minority, and Native American populations meeting the environmental justice screening requirement, potential social and economic impacts may affect a population with environmental justice concerns. Overall impacts to communities with environmental justice concerns within the area of analysis are anticipated to be moderate to major, long-term, and regional.

4.3.2 North and South OSF Alternative

Impacts of the North and South OSF Alternative on environmental justice would be the same as described for the Proposed Action.

4.3.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed and impacts to the resources discussed under the Proposed Action would not occur, including the potential increased employment opportunities. Impacts are anticipated to be minor, short-term, and regional.

4.4 Geology and Minerals

4.4.1 Proposed Action

The Proposed Action would disturb 2,306 acres, including the quarry, the West, North, and Quarry Infill OSFs, the SOSF, potentially preventing future utilization of bedrock and/or unconsolidated mineral resources located under these facilities. Impacts would be major, long-term to permanent, and localized impacts. The remainder of proposed surface disturbance associated with facilities that would be reclaimed. These areas would be temporarily unavailable for utilization of bedrock and/or unconsolidated mineral

resources located under these types of facilities. Because these areas would be available in the future after Project completion, impacts would be minor to moderate, long-term, and localized.

Local bedrock geology and mineral resources would be affected by the removal of approximately 25 Mt of ore and 406 Mt of overburden from the quarry (Ioneer 2022). Quarrying would disrupt the natural geology and mineral resource within the quarry boundaries, approximately 472 acres and backfilled with the Quarry Infill OSF to 201 acres of remnant open quarry at closure but would not remove the geology and mineral resources outside of those limits. During quarrying and processing, the anticipated level of impacts to mineral resources under the quarry would be major, permanent, and localized to the local geology. The Proposed Action mineable quantities of searlesite with thin interbeds of lithium-bearing ilite/smectite, is unique as to this type of mineralization. The removal and processing of the mineral resource would be a minor to moderate, permanent, and localized impact.

Based on the review of local faults and seismicity, and guidance by Esmeralda County Hazard Mitigation Steering Committee, it is anticipated no significant infrastructure damage would occur to facilities within the Plan boundary during the life of the Project. The access road crosses the EPFZ at the mouth of Cave Springs wash; therefore, there is potential that it could be impacted by activity on the EPFZ. Impacts due to geologic hazards would be negligible, long-term, and localized.

4.4.2 North and South OSF Alternative

Under the North and South OSF Alternative the impacts to geology and mineral resources would be the same as described for the Proposed Action except placement of the South OSF, containing a maximum of 120 Mt, would occur over part of the Cave Springs Formation. Placement of material over the Cave Springs Formation would be major, long-term to permanent, and localized. There would be approximately 2,271 acres of surface disturbance (35 acres less than the Proposed Action).

4.4.3 No Action Alternative

Under the No Action Alternative, the Project would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. No additional surface disturbance would occur.

4.5 Hazardous Materials and Solid Waste

4.5.1 Proposed Action

Hazardous materials and fuels could be accidentally released within the OPA during quarrying or as a result of leakage from storage facilities or equipment. The OPA is dissected by a Cave Springs wash, which is predominately dry, Cave Spring is within the OPA and has avoidance buffer around it where no surface disturbance or Project activity would occur, and groundwater is at least 100 feet below ground surface (NDWR 2014). Thus, any fuel spill or release of a hazardous material would be limited to impacts to the soil. In the event of a spill in the OPA, Ioneer's Emergency Response and Spill Contingency Plan would be implemented, which includes procedures for the prevention, response, containment, and safe cleanup of any spills or discharges of substances that potentially may degrade the environment (Ioneer 2022). The Proposed Action would be conducted in accordance with this plan so that impacts from spills or releases would be minimized and the spill materials would be contained and removed. A hazardous material spill or accidental release in the OPA would be a negligible to minor, short-term, and localized impact.

The Project is anticipated to qualify as a Small Quantity Generator that produces up to two loads of hazardous materials per year; therefore, impacts from hazardous waste generated within the OPA and transported from the OPA are not anticipated. The Proposed Action would require transport of hazardous materials to the OPA via the two travel routes (one from Reno to the OPA and one from Las Vegas to the OPA). The probability of a release was estimated for the two travel routes assuming up to 33 truckloads of 12,000 gallons of diesel fuel per month, five truckloads of two tons of corrosion inhibitor 3DT129 per month, and eight deliveries of one ton of liquid phosphate per year would be required for the Proposed Action for the 17-year Project life. The probability of a release would be the same for either transportation route, as the travel distance is approximately the same (230 miles). Release probability for the chemicals evaluated

were calculated for both travel routes. The release probability is calculated by the life of Project truck deliveries multiplied by distance (miles) multiplied by accident rate/mile for the chemical analyzed.

Diesel fuel would have a release probability of 760 in 1,000 miles and 174.8 for each 230-mile transportation route. Corrosion inhibitor 3DT129 would have a release probability of 30.5 in 1,000 miles and 7.0 for each 230-mile transportation route. Liquid phosphate would have a release probability of 25 in 1,000 miles and 5.8 for each 230-mile transportation route. A spill of hazardous materials or fuels along either route that does not impact a water body or stream channel would impact soil adjacent to the highway. A spill of this type would be a minor to moderate, short-term, and localized impact, as the spill could be contained and remediated. A spill or release into a water body would be a moderate to major, long-term, and regional impact, as remediation within one year may not be possible and the spread of the spill could result in impacts over a large area.

In the event of a release during transport, the commercial transportation company would be responsible for first response and cleanup. Each transportation company is required to have an emergency response plan to address spills and accidental releases of hazardous materials. Local and regional law enforcement and fire protection agencies also may be involved to secure the site and protect public safety. Title 49 of the CFR requires that the carrier notify local emergency response personnel, the National Response Center (for discharge of reportable quantities of hazardous substances), and the United States Department of Transportation (USDOT) in the event of an accident involving hazardous materials.

4.5.2 North and South OSF Alternative

Under the North and South OSF Alternative, impacts of hazardous materials and solid waste would be the same as the Proposed Action.

4.5.3 No Action Alternative

Under the No Action Alternative, the Project would not be approved and developed; thus, Project-related spills would not occur. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. No additional potential for release of hazardous materials would occur following reclamation.

4.6 Land Use and Realty

4.6.1 Proposed Action

The Project is consistent with BLM plans and policies that designate land use within the area of analysis as open for mineral exploration and development, as described in the Tonopah RMP (BLM 1997), and is consistent with the multiple use designations in the Esmeralda County Public Lands Policy Plan (Esmeralda County 2013). The Project would be expected to comply with adopted plans and policies of potentially affected governmental entities, so any possible conflicts would be negligible, short-term, and localized.

The Proposed Action would require realignment of a section of Cave Springs Road (NVN-062084) and a section of Argentite Canyon Road (N 54404). The realignments are proposed to remain post closure and would be transferred to Esmeralda County at closure, presumably by way of an amendment to the county's existing ROW grant with BLM (Ioneer 2022). The portion of Cave Springs Road that travels through the OPA would remain open to the public. Road delays and limited ATV access may occur during construction. During quarrying and processing, road delays may occur as the public would be escorted by a pilot car through the OPA along Cave Springs Road for safety. Traffic would be subject to a traffic control system which would include two railroad style crossing gates until the pilot car arrived. Hot Ditch Road provides access to numerous geothermal leases. It is anticipated that Ioneer would coordinate with ROW holders, and geothermal lessees that may be impacted to ensure continued access is maintained to these authorizations during the life of the quarry. There are four mining claims located in the OPA. No surface facilities are proposed to occur on these claims. There are numerous claims along the access road that Ioneer does not control. Ioneer would coordinate with mining claim holders to allow continued access to claims. Impacts to land use authorizations would be minor to moderate, short-term, and localized.

Surface disturbance from the Proposed Action (2,306 acres or 32 percent of the area of analysis) would reduce the amount of land available for livestock grazing, dispersed recreation, and other multiple use authorizations. The loss of land within the area of analysis for multiple use authorizations would be a minor, short-term, and localized impact since there are other areas of public land within the vicinity of the Project that offer opportunities for similar activities.

During quarrying and processing, the Project's water supply would be from new or existing wells on private land in Fish Lake Valley, which would be pumped from two new booster stations via pipelines to the OPA. Ioneer has acquired or leased all necessary water rights, for which the points of use and/or diversion would be transferred to the appropriate locations within the Plan boundary. As part of the water rights acquisition, an equivalent amount of agricultural pumping would cease, resulting in the Project having no "net change" in the amount of groundwater pumped in Fish Lake Valley (WestLand 2023a). This would reduce agricultural operations within the area of analysis, as the manner of use would change from agricultural to mining and milling use. It is assumed at the end of the Project the leased water rights would be returned to an agricultural manner of use. As such, this would result in a long-term, moderate, localized impact.

Most of the disturbance associated with the Proposed Action would be returned to open space, grazing, dispersed recreation, and wildlife habitat following successful reclamation. Post-reclamation disturbance (383 acres or five percent of the area of analysis) would not be reclaimed. These areas, such as the quarry and quarry lake, would be restricted from public access for safety reasons. Impacts would be permanent, minor to moderate, and localized.

Fencing and signage would be implemented along the limits of proposed disturbance at the quarry and West and Quarry Infill OSFs, around designated critical habitat, and exclusion fencing would be constructed around the Tiehm's buckwheat subpopulations. The fencing would be for the protection of Tiehm's buckwheat subpopulations and designated critical habitat. The designated critical habitat fencing is anticipated to restrict the available area within the area of analysis by approximately 559 acres. Fencing would include locked gates in certain areas to control access to designated critical habitat (BLM 2024). The Tiehm's buckwheat exclusion area fencing would be contained fully within the designated critical habitat fenced area, or fencing around the limits of proposed disturbance, and would amount to approximately 51 acres. Impacts would be minor to moderate, long-term, and localized.

4.6.2 North and South OSF Alternative

Impacts on land use and realty would be the similar to those described under the Proposed Action, except there would be 2,271 acres of surface disturbance (32 percent of the area of analysis) and 214 acres (three percent of the area of analysis) of permanent, post-reclamation disturbance. Up to 714 acres of Tiehm's buckwheat designated critical habitat would be fenced, removing some multiple uses in that area. No exclusion fencing around subpopulations would be constructed under this alternative. Impacts would be minor, long-term, and localized.

4.6.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. No additional surface disturbance would occur.

4.7 Livestock Grazing

4.7.1 Proposed Action

The Proposed Action would disturb 140 acres of the Red Spring Allotment, 2,145 acres of the Silver Peak Allotment, 21 acres of the Fish Lake Valley Allotment, and no acres of the Ice House Allotment. Rangelands available for livestock grazing were determined to be areas within two miles of water sources and with less than 30 percent slopes (Holechek 1988). This results in a stocking rate of 21 acres per AUM for the Red Spring Allotment and 24 acres per AUM for the Silver Peak Allotment. The portion of the Fish Lake Valley Allotment affected by the Proposed Action is greater than two miles from water; therefore, there would be no impact to permitted AUMs. There would be no impact to permitted AUMs in the Ice House Allotment because there is no surface disturbance proposed there.

Disturbance within the Access Road and Infrastructure Corridor would impact up to 83 acres of rangeland that provides forage for livestock in the Red Spring Allotment. The Proposed Action would impact four AUMs which is less than one percent of permitted use. The surface disturbance in the Red Spring Allotment would be reclaimed, therefore, impacts would be negligible, long-term, and localized.

Of the 2,145 acres proposed for surface disturbance in the Silver Peak Allotment, there would be 1,726 acres within two miles of water sources and on slopes less than 30 percent. All 85 acres of proposed conceptual disturbance associated with exploration, water supply, and dewatering, were assumed to occur in areas available to livestock for forage. In total, 72 AUMs would be affected which is two percent of permitted use. This would be a moderate, long-term, and localized impact. Of the 72 AUMs impacted, 15 AUMs would be permanently impacted by disturbance associated with the quarry and its lake, stormwater controls, roads, and Communication Tower 3. Impacts would be minor, permanent, and localized.

The Proposed Action includes construction of fences to prevent access by wildlife, livestock, and wild horses and wild burros around certain facilities. The fenced areas would be within the disturbance footprint of the Proposed Action facilities; thus, would not impact additional AUMs. The fences around the processing facility, explosives storage area, contact water ponds, and quarry would exclude livestock access to approximately 302 acres within the Silver Peak Allotment. These facility fences would remain until reclamation and revegetation is deemed successful. If necessary, cattle guards or gates would be installed along roadways to maintain existing access to public areas. All sub-populations of Tiehm's buckwheat and designated critical habitat would be fenced to prevent disturbance, encompassing 559 acres. Of those 559 acres, 469 acres of designated critical habitat provide forage for livestock. Fencing associated with the Proposed Action would impact 20 AUMs. Therefore, impacts to livestock grazing resources from fences would be minor, long-term, and localized.

Reductions to permitted AUMs must be made in accordance with the BLM's grazing regulations, including the requirement for a grazing decision as set forth in 43 CFR Subpart 4160. While the Project would result in a reduction of AUMs, the BLM may adjust permitted AUMs, if appropriate, based on forage made available for livestock following reclamation. Factors considered by the BLM for permitting AUMs made available following reclamation are the ability for livestock to access forage, production in the reclaimed areas, and if mining facilities require long-term vegetative cover for success.

Economic impacts from a reduction of 96 BLM-permitted AUMs would equate to $9,639 in annual impacts to the permittee(s). The 2018 economic output of the food and agriculture sector in Esmeralda County was $12.9 million, of which beef cattle ranching and farming comprised $656,555 (NDA 2021). This economic impact would be minor, long-term to permanent, and regional, affecting the permittees of the Red Spring and Silver Peak allotments and the food and agriculture sector of Esmeralda County's economy.

Cave Springs Road and Argentite Canyon Road provide access to the Silver Peak Allotment. Under the Proposed Action, both roads would be re-routed, though the roads would continue to provide public and permittee access. The increased activity in the OPA, traffic control systems on the Cave Springs Road, and construction of facilities may exclude or deter cattle from traveling up the Cave Springs Wash to areas of the Silver Peak Allotment. However, these areas of Argentite Canyon and the upper end of Cave Springs Wash would continue to be accessible from the south and east. Therefore, Proposed Action impacts on accessibility to livestock grazing resources are anticipated to be minor, long-term, and localized.

There are eight range improvement projects within the Plan boundary in the Silver Peak Allotment. Improvement and maintenance of the Cave Springs Road would not impact the cattle guard and drift fence. One range improvement project, the Cave Canyon Corral, is directly adjacent to the proposed Cave Springs Wash Berm. The berm would be constructed between the corral and the realigned Cave Springs Road, and roads would be able to cross the berm (Ioneer 2022). The corral would still be accessible after construction of the berm. The remaining range improvement projects would not be affected by surface disturbance associated with the Proposed Action.

Following reclamation, an approximately 113-acre post-quarrying quarry lake would remain (Piteau 2022b). An ERA was conducted for the water quality in the post-quarrying quarry lake, and the results indicate that the predicted constituent concentrations in the quarry lake would not cause an adverse effect to terrestrial

wildlife (Cedar Creek 2022). No adverse effects to livestock are expected. Impacts from the post-quarrying quarry lake would be negligible to minor, permanent, and localized.

The one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour overlaps 207 acres of the Fish Lake Valley Allotment, 2,095 acres of the Ice House Allotment, 29 acres of the Red Spring Allotment, and 27,778 acres of the Silver Peak Allotment. Within the buffered drawdown contour associated with quarry dewatering, there are 10 spring sites in the Ice House Allotment and 22 springs in the Silver Peak Allotment (HydroGeoLogica 2020b; Piteau 2023b). There are no springs or livestock water developments within the buffered drawdown contour associated with the supply wells in Fish Lake Valley. The groundwater drawdown effects associated with quarry dewatering activities would not be expected to affect water availability for livestock inside the one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour (Piteau 2023b). Most of the springs within the drawdown contour are likely perched features as suggested by their elevated, hillside locations (HydroGeoLogica 2020b). Impacts to surface water availability from groundwater drawdown would depend on the source of groundwater at the springs. If these springs are perched, then groundwater drawdown from the Proposed Action would not affect discharge flows. If the springs are sourced from upwelling groundwater, the dewatering of the quarry may decrease the amount of water upwelling to discharge via the springs. The amount of spring flow reduction would be dependent on the actual increase in the horizontal groundwater gradient and could result in a cessation of groundwater sourced flow unless water levels recovered, which is predicted to occur over a period of more than 200 years (Piteau 2023b). Reduced flows or cessation of flows would limit the amount of area available to livestock for grazing. Although not anticipated, if impacts to spring sites are realized, then impacts to livestock grazing within the Ice House and Silver Peak allotments would be moderate, long-term to permanent, and localized

4.7.2 North and South OSF Alternative

Impacts would be similar to the Proposed Action except total surface disturbance would be approximately 2,271 acres. Impacts from surface disturbance within the Red Spring Allotment would be the same as those described for the Proposed Action and affect four AUMs. In the Silver Peak Allotment, 2,110 acres would be disturbed, of which 1,804 acres provide forage for livestock and 75 AUMs would be affected. All 115 acres of proposed conceptual disturbance associated with exploration, general surface disturbance, water supply, and dewatering, were assumed to occur in areas available to livestock for forage. There would be 200 acres of permanent disturbance which would permanently impact eight AUMs representing less than one percent of permitted use. The North and South OSF Alternative would include fencing of the outer extent of undisturbed Tiehm's buckwheat designated critical habitat, excluding 714 acres from livestock grazing within the Silver Peak Allotment. Approximately 587 acres of the designated critical habitat provides forage for livestock. Fencing associated with alternative would impact 24 AUMs. A total of 99 AUMs, or three percent of the permitted use of the Silver Peak Allotment, would be impacted. Impacts to AUMs would be moderate, long-term to permanent, and localized. Impacts to 103 BLM-permitted AUMs would equate to $10,342 in annual impacts to the permittee(s). This economic impact would be minor, long-term to permanent, and regional, affecting the permittees of the Red Spring and Silver Peak allotments and the food and agriculture sector of Esmeralda County's economy.

4.7.3 No Action Alternative

Under the No Action Alternative, impacts to livestock forage availability would continue to occur in the Silver Peak Allotment from 15 acres of existing disturbance until reclamation is complete. This equates to less than one AUM. Impacts would be negligible, long-term, and localized. No additional impacts to livestock grazing are anticipated to occur.

4.8 Native American Traditional Values

4.8.1 Proposed Action

Impacts to prehistoric cultural resources are described in Section 4.2. Multiple tribes expressed preference to avoid prehistoric cultural resources. Where avoidance is not reasonably feasible, the BLM would consult with the appropriate Native American tribe(s) and individuals to obtain information about the identified concerns and what mitigation measures might be appropriate. After consulting with the appropriate tribe(s), the BLM, in consultation with the Tribes and the Nevada SHPO, would then determine the appropriate

course of action. Pursuant to the American Indian Religious Freedom Act and Executive Order 13007, access to areas of concern and sacred sites would be maintained for the Tribes; however, there would be traffic restrictions through the Plan boundary which include a pilot car on Cave Springs Road. Impacts to access would be negligible to major, long-term, and localized.

The Duckwater Shoshone identified two areas culturally significant and requested these two areas be avoided by Project activities with the Project being re-designed to avoid them. The Western Shoshone Defense Project also identified Cave Spring as culturally significant. These areas would be avoided through Project design. Cave Spring is likely a perched feature as suggested by its elevated, hillside location (HydroGeoLogica 2020b); therefore, the groundwater drawdown from the Proposed Action would not affect discharge flows. However, if Cave Springs is sourced from upwelling, there could be a decrease in the amount of water upwelling to discharge via the spring. If the culturally significant areas and impacts to Cave Springs cannot be avoided by Project design, impacts would be localized, minor to major, and permanent from the loss of these two culturally significant areas. Other impacts such as illegal collecting and/or inadvertent damage to areas of tribal concern (if identified) potentially could occur as a result of increased human activity in the Plan boundary.

Tribal consultation/coordination is ongoing and would continue through the life of the Project. If avoidance of areas of tribal concern is not feasible, specific operating procedures, stipulations, or mitigation measures would be developed in consultation/coordination with the affected Tribes to reduce or eliminate impacts.

The BLM would continue to consult on resources significant to the Tribes that do not meet the definition of a historic property under the NHPA. Tribal access to these resources would be maintained consistent with the American Indian Religious Freedom Act and Executive Order 13007.

The potential for the inadvertent discovery of human remains during construction activities exists within proposed disturbance areas and could result in adverse impacts. If construction or other Project personnel discover what is believed to be human remains, funerary objects, or items of cultural patrimony on federal land, construction would cease within 330 feet of the discovery and the BLM would be notified. The location of the find would not be publicly disclosed, and the remains would be secured and preserved in place. Any discovered Native American human remains, funerary objects, or items of cultural patrimony found on federal land would be handled in accordance with the Native American Graves Protection and Repatriation Act (43 CFR Part 10). Construction would not resume in the area of the discovery until the BLM has issued a Notice to Proceed.

If Native American human remains and associated funerary objects are discovered on private land during construction activities, construction would cease within 330 feet of the discovery and the Esmeralda County coroner or sheriff would be notified. The location of the find would not be publicly disclosed, and the remains would be secured and preserved in place. Treatment of any discovered Native American human remains and associated funerary objects found on private land would be handled in accordance with Nevada Revised Statute 383.150.

4.8.2 North and South OSF Alternative

Under the North and South OSF Alternative, impacts to tribal resources of concern would be similar to that described under the Proposed Action.

4.8.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed and associated impacts to Native Americans concerns would not occur. Under this alternative, the existing 15 acres of exploration disturbance that has occurred on public lands administered by the BLM would be reclaimed. There would be no impacts from the No Action Alternative to Native American Traditional Values from existing conditions.

4.9 Recreation

4.9.1 Proposed Action

Dispersed recreational users would be unable to access areas of proposed disturbance, including those fenced for public safety. The outer extent of Tiehm's buckwheat designated critical habitat would be fenced (approximately 559 acres) and gates locked (BLM 2024), which would restrict public access of the two existing two-track roads in the Tiehm's buckwheat designated critical habitat. Recreationists attempting to drive through the area would have to find other ways around, creating additional travel time and reducing overall access to public land. Impacts would be moderate, long-term, and localized. Surface disturbance would reduce the amount of land available for dispersed recreation. Of the 2,306 acres of surface disturbance, approximately 869 acres would occur to semi-primitive motorized recreational areas, of which 58 acres would be permanent and the remaining 811 acres would be reclaimed. The loss of recreational area would be a minor to moderate, long-term to permanent, and localized impact.

Surface disturbance would impact 426 acres of LWC328 (32 acres permanently) and 1,356 acres (224 acres permanently) of LWC338. Surface disturbance and noise from quarrying and increased human activity would reduce the amount of land available for recreationists that provide solitude or primitive and unconfined recreation. The LWC's would continue to meet the 5,000 roadless acre criteria for wilderness designation and continue to provide opportunities for solitude and primitive recreation. While no surface disturbance would occur within LWC327, recreationists could experience impacts from increased traffic, and road improvement and maintenance activities occurring in the Access and Infrastructure Corridor. These activities would occur in a discrete area along the southern boundary of LWC327. These activities are not expected to diminish the opportunity for solitude and primitive recreation within the majority of the LWC. Impacts to LWCs from surface disturbance and increased human activity would be minor, long-term to permanent, and localized.

Existing roads or trails through the OPA currently open to OHV use would continue to be available for public use; however, there would be delays traveling through the OPA. Cave Springs Road would be rerouted for continued public access through the OPA and would have traffic control systems and a pilot car for public safety. Signage would also be used along the access road and within the OPA for safety. Surface disturbance would impact 1,975 acres of OHV use restricted land, including 945 acres (80 acres permanent) limited to existing roads and trails and closed to competitive events and 1,030 acres (286 acres permanent) limited to existing roads and trails. There would also be disturbance to 331 acres (17 permanent) of non-restricted areas. Approximately 383 acres would be permanently disturbed. While trails and roads through the OPA used by OHV recreationists would not be closed, additional traffic and delays may potentially cause OHV recreationists, including Special Recreation Permit holders, to use alternate routes to access areas they previously accessed. Impacts would be minor, long-term to permanent, and localized.

Cave Springs Road through the OPA would remain open to the public, and use of the access road from the Proposed Action would not restrict visitor access and associated recreation at the Fish Lake Valley Hot Springs (Hot Box). There would be an additional 186 to 248 vehicle trips per day during the construction phase and an additional 230 to 288 vehicle trips per day during quarrying and processing on the access road. Recreationists at the Fish Lake Valley Hot Springs would notice an increase in Project-related traffic. Recreationists may experience reduced quality of recreational opportunities (e.g., hot spring use, camping, hiking) at the hot springs because of increased noise, traffic congestion, fugitive emissions from vehicle traffic, and lighting from vehicles. ACEPMs would reduce fugitive emissions, but impacts would still occur from noise, traffic congestion, and lighting. These impacts would be moderate, long-term, and localized. The groundwater model does not predict impacts to the Fish Lake Valley Hot Springs (Piteau 2023b); therefore, impacts would be negligible.

The SOSF, processing facility, and booster station would be visible in the background from the Fish Lake Valley Hot Springs. Due to the distance and ACEPMs, the facilities would appear as small, dark gray to dark brown, low forms that would blend in with the existing mountain landscape. Impacts to recreationists from the view of the Proposed Action would be minor, long-term, and regional. Some Project components are anticipated to be visible from portions of the Silver Peak WSA, particularly from ridgetops and mountain peaks in the far northern part of the WSA. However, the overall quality of views from within the Silver Peak WSA are not anticipated to change substantially. Views would be blocked in most areas by trees and with

appropriate ACEPMs, the facilities would not stand out in appearance or color. The Proposed Action would not impact the TFO's ability to administer the non-impairment standard if Congress were to designate the Silver Peak WSA as Wilderness. Impacts to recreationists utilizing the WSA would be minor, long-term to permanent, and regional.

Access for hunting would be restricted from areas of surface disturbance or security fencing. Big game species such as pronghorn, desert bighorn sheep, and mule deer may be displaced by Project activities. The Proposed Action would be constructed within 695 feet of the NDOW big game guzzler in the OPA which may cause big game to avoid using the water source. Ioneer would relocate and rebuild the guzzler based on NDOW recommendations to provide a water source away from the OPA. Hunters would also have to travel further and to different locations to be able to have the same hunting opportunities as those prior to the construction of the Proposed Action. Displaced big game species may resume using the area once operational activities are complete and quarrying has ended. Impacts to hunting would be moderate, long-term, and localized.

There would be an increase in the regional human population. Added residents could increase the demand for recreation resources and opportunities in the region, which may cause congestion in areas that previously provided solitude. Impacts would likely be realized at recreational areas, such as the Fish Lake Valley Hot Springs, parks, and other developed recreation facilities in the nearby communities of Tonopah and Dyer. Such impacts would be expected to be minor to moderate, long-term, and regional.

4.9.2 North and South OSF Alternative

Impacts to recreation would be the same as those described for the Proposed Action except there would be 2,271 acres of surface disturbance. Approximately 719 acres of disturbance would occur to semi-primitive motorized recreational areas with 47 acres being permanently impacted. Surface disturbance would impact 1,910 acres of OHV use restricted land, of which, 1,084 acres are limited to existing roads and trails and 826 acres that are limited to existing roads and trails and closed to competitive events. Permanent disturbance would affect 154 acres designated as limited to existing roads and trails and 51 acres that are limited to existing roads and trails and closed to competitive events. Impacts from surface disturbance to recreational areas would be minor, long-term to permanent, and localized. Surface disturbance would impact 532 acres (28 permanent) of LWC328 and 1,158 acres (117 permanent) of LWC338. This would reduce the amount of land available for recreationists that provide solitude or primitive and unconfined recreation. Impacts would be minor, long-term to permanent, and localized. Up to 714 acres of Tiehm's buckwheat designated critical habitat would be fenced, and the area would remain accessible by foot. Impacts would be minor, long-term, and localized.

4.9.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated impacts to recreation would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed and there would be no impacts to recreation.

4.10 Social and Economic Values

4.10.1 Proposed Action

Construction would include up to 500 positions for Years 1 through 4; operation (quarrying and processing) would include up to 350 positions for Years 4 through 17 (quarrying would overlap with construction activities); and closure and reclamation would include personnel as needed for six years.

While the non-local employees and their families would be dispersed throughout the communities within the area of analysis, it is reasonable to assume that the majority of the construction workforce would reside in Tonopah and Hawthorne, Nevada due to infrastructure, services, and proximity to the Project. All communities within the area of analysis could expect population growth resulting from the Proposed Action. Because of the nature of construction activities, it is likely the personnel needed would reside in temporary quarters, such as motels or RV parks, during the work week and return to permanent residences elsewhere. It is anticipated that the Project construction would result in 500 direct employment opportunities and would generate 113 indirect and induced jobs (IMPLAN 2023). It is anticipated that the induced and indirect jobs

would be a higher percentage of local people, whereas the direct employment is anticipated to be a higher percentage of non-local people. It is assumed that some of the anticipated impacts from population increase from construction would remain during quarrying and processing, due to some overlap in timing. The increase in population from the construction phase would result in minor to major, long-term, and localized impacts, depending on where construction contractors choose to stay.

During quarrying and processing, it is estimated the employment of 350 workers would result in 79 indirect and induced jobs (IMPLAN 2023). It is anticipated that the indirect and induced jobs would come from a higher percentage of local people, whereas direct employment would include a higher percentage of non-local people. As anticipated during construction, non-local employees and their families would be dispersed throughout the communities within the area of analysis. The majority would likely reside in Tonopah and Hawthorne due to infrastructure, services, and proximity to the Project. However, all communities within the analysis area could expect population growth resulting from the Proposed Action. The impacts of the population increase from quarrying and processing would be major, long-term, and localized to regional. Post-quarrying, the 350 direct quarrying and processing workers would decrease to a minimal amount needed to conduct reclamation and closure. When quarrying and processing are finished, there is the potential that workers would move away from the area of analysis and find other jobs, as there are limited employment opportunities in the area of analysis; however, impacts from population increase including indirect and induced jobs may remain during reclamation and closure.

It is unknown what the race and ethnicity composition of the new population would be. It is likely that it would be similar to the current race and ethnic makeup of the region. If so, there would be no significant change in race and ethnicity in the area of analysis. Immigration into the area of analysis may increase the race and ethnic diversity, as new families become attracted by the relatively high paying jobs and economy of the region. Any changes to race and ethnicity would be a negligible, short-term, and localized impact.

The direct employment of 500 people during the construction phase (four years) would result in direct labor income of $54,141,401 per calendar year and indirect and induced labor income of $2,619,994 per calendar year The direct employment of 350 workers during quarrying and processing would result in a direct labor income of $37,898,981 per calendar year and indirect and induced labor income of $1,833,996 per calendar year. The total direct output that would be generated by employment from the construction phase (four years) is estimated to be $178,775,064 per calendar year, and total indirect and induced output is estimated to be $26,727,813 per calendar year. The total estimated direct value added from the construction phase would be $102,788,237 per calendar year, and total indirect and induced value quarrying would be $10,028,255 per calendar year. The total direct output that would be generated by employment for the quarrying and processing phase is estimated to be $125,142,545 per calendar year, and total indirect and induced output is estimated to be $18,709,469 per calendar year. Total estimated direct value added from quarrying and processing phase would be $71,951,766 per calendar year, and total indirect and induced value added would be $7,019,778 per calendar year. It is assumed that some effects from Project employment may remain post-reclamation and post-closure, impacts to the economy and employment in the area of would be moderate to major, long-term, regional.

Average annual earnings per job would likely increase, as mining provides a higher annual wage in comparison to other industries. Higher wages generated by the Project may also increase the pay expectation in the area of analysis over the long-term. The increase in income would be a major, long-term, and regional impact. Post-construction, there would a loss of 150 jobs (500 construction minus 350 operation), and at the end of quarrying and processing, the quarry would no longer be operating to support the 350 operation jobs. This may result in a long-term impact because workers would have to find another job, which may be outside of the area of analysis. Impacts from employment following closure would be moderate to major, long-term, and regional.

Construction would generate need for an estimated maximum of 328 housing units from the non-local labor (direct, indirect, and induced) from up to 574 new, non-local adults (includes single and married). Construction workers moving into the area would place a demand on temporary housing resources including motel/hotel rooms, RV sites, and campgrounds. In the area of analysis there are approximately 1,169 hotel rooms, 89 RV spaces, and three cabin units for temporary housing. Depending on the current economic conditions occurring and if there are multiple projects occurring within the area of analysis at the

same time as the Proposed Action, there is the potential for housing shortages to accommodate construction-related population. Demand for housing during construction may place strain on the housing supply to support the influx of non-local labor. It is assumed the non-local labor would be the primary driver for housing. This could shift the existing housing market in communities, including changes to housing affordability and incur housing shortages in communities with already limited housing, specifically rental vacancies. Impacts to housing from the construction phase may remain through quarrying and processing. Impacts to housing during the construction phase are anticipated to be major, long-term, and regional.

Quarrying and processing would generate demand for 230 housing units from non-local labor (direct, indirect, and induced) from up to 402 new, non-local adults (includes single and married). Rental unit vacancy rates are generally low, at 12.7 percent in Esmeralda County, 7.6 percent in Nye County, 4.9 percent in Tonopah, 4.7 percent in Mineral County, and 9.4 percent in Inyo County. Homeowner units have a higher vacancy rate (average of about 16 percent) but may not be for rent or sale. Increased demand on housing from population associated with the Proposed Action could change the housing and rental market. Changes in the housing market could include impacts to housing affordability including fair market rents and wages within the area of analysis. Due to the overall limited housing options within the areas that workers would most likely reside, such as Tonopah, Hawthorne, and Bishop, potential housing shortages are likely to occur when combined with other concurrent projects in the area of analysis, and workers may have to find housing outside of the area of analysis. Impacts to housing from quarrying and processing may remain post-closure. Increase in demand for housing would be a major, long-term, and regional impact.

Construction and quarrying and processing may impact public utilities in the area of analysis due to the anticipated increase in population in communities such as Tonopah, Hawthorne, and Bishop. Impacts could include improvements or modifications to existing systems. The majority of people would likely locate in areas with existing infrastructure, which may need to be expanded to accommodate the increase in population. Areas not served by municipal systems would be served by private wells, and additional domestic wells may be required to accommodate the increased population. The existing wastewater facilities likely have additional capacity that could support the increased populations, and areas that are not served by utilities would require individual septic systems. All counties in the area of analysis have active landfills for solid waste. Impacts to public utilities would be a moderate, long-term, and localized impact.

The increase in population could require an increase in law enforcement to maintain a similar per capita coverage of officers per residents, as construction is anticipated to bring an additional approximately 574 non-local adults and quarrying and processing is anticipated to bring an additional 402 non-local adults to the area of analysis. This increase in population would likely place increased demand on existing law enforcement and emergency services. The additional tax revenue may allow law enforcement, fire protection, and emergency medical services to increase staffing if suitable candidates are found. However, Esmeralda County would have to hire approximately four additional deputies to provide adequate patrol coverage to Fish Lake Valley and the area abutting Tonopah. The annual salary cost with benefits for a deputy in Esmeralda County is approximately $97,500. Assuming that Esmeralda County would need to hire approximately four additional deputies and additional patrol vehicles, Esmeralda County would need to spend approximately $590,000 per year, a 133 percent increase in Esmeralda County's safety budget. It is assumed that additional costs needed for public safety would not offset revenue in Year 1 and increases in sales tax revenue would be limited, concurrent with early years of the Project. An increase in property tax revenue may occur during quarrying and processing to support these services (Boland 2023). Increased population from the Proposed Action could exacerbate current conditions of the jail in Goldfield, which may necessitate construction of a new jail to accommodate additional capacity and improved inmate conditions. The Project may require an Esmeralda County hire additional fire and ambulance services facility in the north end of Fish Lake Valley to position responders and volunteers near the main access road to the OPA to adequately respond to traffic-related incidences (Boland 2024). The increased population would increase these services through reclamation and closure; thus, impacts would be a major, long-term, and localized.

Sick or injured persons would be required to seek medical care in Bishop, Hawthorne, or Tonopah; life-threatening situations would be treated in Las Vegas, Reno, or Bishop. The increase in population from construction and quarrying and processing would likely increase the demand for health care services in the area of analysis. Access to healthcare facilities is somewhat limited in the area of analysis, so any increase in demand would be a potential strain on the existing facilities. Recruitment of qualified practitioners and

service providers has historically been challenging, as individuals employed in these fields often practice in larger communities. Impacts to healthcare would be moderate to major, long-term, and regional.

School enrollment is anticipated to increase under both construction and quarrying and processing. Because of the nature of construction activities, and the short construction duration, it is not anticipated that most construction workers would permanently relocate with their families to the area of analysis. However, there is the potential for an additional 140 school-aged children to enroll in the area of analysis from construction-related population increase. During the quarrying and processing phase, there could potentially be up to 98 additional school age children enrolling in the area of analysis. If evenly distributed across 13 grade levels (kindergarten through 12), there is the potential for approximately seven new students per grade. Based on the student to teacher ratios, the school districts in the area of analysis could have the capacity to accept new students. However, a sudden influx of school-age children could put a burden on the student to teacher ratios. Over time, class sizes may decrease as the increases in enrollment may provide the tax revenues to hire additional teachers, particularly in rural schools (assuming empty classrooms can be found/built to house the additional students). While it is assumed that Esmeralda County would primarily benefit from tax revenues including net proceeds of mineral tax, Nye County, Mineral County, and Inyo County schools could experience delays in tax revenues to accommodate increased school enrollment from the Project population. Depending on where students enroll and what school districts are affected, impacts would be moderate to major, long-term, and localized.

The increases in population assumed would not be expected to change the style or system of local governments; therefore, impacts would be negligible, short-term, and localized. The local governments would be required to provide services to new residents. Esmeralda, Nye, and Mineral counties operated on deficit budgets in 2021. Per annum budget deficits may continue in these counties as a result of additional services anticipated to accommodate growing populations under the Proposed Action. Should budget deficits continue, Nevada Department of Taxation may decide to increase property taxes to balance county budgets (Boland 2023). Impacts would be moderate to major, long-term to permanent, and localized.

Several revenue streams would be realized by Esmeralda County through various taxes levied directly and indirectly by federal, state, and local governmental entities. The majority of the tax revenue to Esmeralda County would be associated with a Net Proceeds of Minerals tax (NewFields 2019b). Other nearby communities (e.g., Tonopah and Hawthorne) would also realize financial benefits through increased commerce and related tax revenues but would not receive tax revenue associated with a Net Proceeds of Minerals tax. Net proceeds from mineral tax revenues would also increase in the state of Nevada due to the increase of mineral production. Based on previous Net Proceeds of Minerals Bulletins published by the Nevada Department of Taxation, Esmeralda County would receive approximately 2.8 percent of net income of the Project. *Ad Valorem* (e.g., property) tax revenues would increase with the increase in property value from the construction of additional housing units for the new employees and their families. Sales tax revenue would also increase due to equipment and materials purchased for the Project, as well as with new employees spending money in the local economy. During the construction phase (four years), total tax generation would be $25,069,752 per calendar year (direct, indirect, and induced). This would include $11,819,628 in federal taxes per calendar year, $4,183,588 in state taxes per calendar year, $5,911,690 in county-level taxes per calendar year, and $3,154,846 in sub-county special district taxes per calendar year. During quarrying and processing, total tax generation would be $17,548,826 (direct, indirect, and induced) per calendar year. This would include $8,273,740 in federal taxes per calendar year, $2,928,511.46 in state taxes per calendar year, $4,138,183 in county-level taxes per calendar year, and $2,208,392 in sub-county special district taxes per calendar year. As some of these impacts from quarrying and processing would extend through reclamation and post-closure, changes in public finance would be a moderate to major, long-term, and localized impact.

The Project would provide stable, high paying jobs for up to 500 families during the construction phase, and 350 during the operation phase. The increase of additional direct employment in the rural area has the potential to change the social structure in the nearby communities. Dyer could expect to see increased use of the facilities (market, gas station, bar, etc.), and the public land in the area of analysis may be more utilized. Increased traffic at the only market in Dyer could impact product supply that locals depend on and overall enjoyment of the market. Water rights secured or leased from current agricultural water users in the Fish Lake Valley for the Project would reduce the level of agriculture in Fish Lake Valley, which has

historically been an active agricultural area in Esmeralda County. Changes to agricultural practices in Fish Lake Valley would affect the social and cultural landscape of the area impacting low-income populations as described in Sections 3.3 and 4.3. After reclamation, non-local Project workers may choose to stay in the area of analysis depending on future projects that would continue to provide jobs. Closure of the Project could result in housing market decline and decreased ability to maintain infrastructure that would potentially be built or expanded to accommodate increased population from the Project and could become 'ghost towns' as historically seen after mine closures (Bainton 2018). However, future projects as described in Section 4.1.2.1 could potentially maintain the housing market and infrastructure and service costs in the area of analysis. It is unknown what economic conditions would impact the area of analysis after reclamation. Overall, impacts to social conditions from the Proposed Action would be moderate to major, long-term, and localized to regional.

4.10.2 North and South OSF Alternative

Impacts to social and economic values under this alternative would be the same as described for the Proposed Action.

4.10.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed, and associated impacts to social and economic values in the area of analysis would not occur. Employment and other socioeconomic measures would not increase due to the construction and/or operation positions proposed in the area of analysis. The social and economic impacts discussed for the Proposed Action would not occur. In terms of the loss of increased employment and revenues that would be realized under the Proposed Action, the No Action Alternative would have moderate to major, long-term, and localized impacts to social and economic values.

4.11 Soil Resources

4.11.1 Proposed Action

Up to 2,306 acres of soil would be disturbed. This includes approximately 35 acres of exploration disturbance in the OPA, 30 acres of disturbance for dewatering facilities in the OPA, and 20 acres of disturbance for water supply facilities in the Plan boundary. The exploration, water supply facilities, and dewatering facilities would be constructed outside the Tiehm's buckwheat designated critical habitat. Proposed, mapped disturbance to soil map units from the Proposed Action would include up to 2,221 acres associated with the following: Blacktop-Rock outcrop-Pintwater association (139 acres), Blacktop-Rodad-Theriot association (36 acres), Zadvar-Veet-Lyda association (117 acres), Stewval-Pintwater-Rock outcrop association (460 acres), Stewval-Bellehelen-Rock outcrop association (86 acres), Stewval-Bellehelen-Gabbvally association (two acres), Gynelle-Cirac association (two acres), Zaba-Gynelle association (55 acres), Zaba-Yomba-Slaw association (16 acres), Rustigate-Kawich-Cirac association (less than one acre), Slaw-Playas complex (one acre), Slaw-Kawich-Nuyobe association (three acres), Wardenot-Izo association (159 acres), Wardenot-Stonell-Roic association (less than one acre), Cirac-Luning association (four acres), Cirac-Rustigate-Settlement association (nine acres), Cirac-Kawich association (28 acres), Stonell-Wardenot-Izo association, moist (665 acres), Luning-Sodaspring association (38 acres), and Lyda-Ardivey-Izo (401 acres). Reclamation would be conducted as soon as practical, with concurrent reclamation implemented to the maximum extent possible. There would be approximately 383 acres of permanent surface disturbance. Impacts from permanent disturbance would be minor, permanent, and localized.

Removing native soil causes the mixing of soil horizons that can result in the degradation or loss of soil function. This disturbance, as well as long-term storage in stockpiles, can alter soil productivity by affecting its permeability, structure, and microbial activity. Growth media salvage, transport and storage, and redistribution would modify existing soil structure, which would affect aeration and permeability. It is likely that some mixing of textural zones would occur, as well as mixing of saline or alkaline materials with relatively salt-free materials, which may result in chemical effects to soil quality for seedbeds. In addition, microbial populations that currently exist in the growth media would likely decrease during stockpiling and storage. Other effects include dispersion and mobilization of soils via wind and water erosion. Soil associations with higher erosion potential would be impacted the greatest. Impacts from surface disturbance would be minor to moderate, long-term to permanent, and localized.

Disturbance of topsoil would remove any biocrusts that are present, although none were documented during surveys. Damage to biocrusts would change the soil structure and reduce soil quality; however, natural processes such as wind and water transport of soil particles from surrounding areas would incidentally reintroduce microorganisms. Effects to biocrusts, if present, would be moderate, long-term to permanent, and localized.

Soils could be impacted from spills or leaks of chemicals during transportation, storage, and use. Petroleum-contaminated soils resulting from spills or leaks would be addressed immediately and removed from the spill site and stored in appropriate secondary containment areas in accordance with NDEP guidelines. Ioneer would excavate and transport any petroleum-contaminated soils to a licensed off-site disposal facility. Impacts from soil contamination would be negligible to minor, permanent, and localized.

Effects to soils would be reduced by Ioneer's commitment to reclaim Proposed Action facilities and successfully restore lands to pre-quarrying productivity and land uses. ACEPMs and BMPs would be implemented to limit erosion, trap sediment, and control stormwater from the effects of wind, precipitation, and stormwater run-off from Project facilities and on disturbed areas during construction, operation, and initial stages of reclamation. Reclamation efforts would involve soil stabilizing products. Results from soil analyses and revegetation tests conducted during quarrying would be used to determine what, if any, organic matter and nutrients will need to be added to the prepared surfaces prior to or at the time of seeding (Ioneer 2022). Additional organic matter and nutrients may increase soil water capacity and availability to plants. Soil quality on reclaimed and revegetated sites could resemble pre-quarrying conditions. Effects to soil quality from the Proposed Action would be minor to moderate, long-term to permanent, and localized. To reduce impacts of stormwater and snowmelt erosion, stormwater diversion barriers and channels would be constructed to divert water away from and downgradient of stockpiles and facilities. Some channels would remain post-reclamation. Impacts would be negligible, long-term to permanent, and localized.

The Proposed Action could result in up to 81 acres of disturbance to soil map units classified as farmland of statewide importance. The majority of the disturbance along the access road would fall within the 40- to 60-foot-wide Hot Creek Road ROW. Disturbance of these map units would be reclaimed when the Project ends. The predominant use of lands outside of the fenced SR 264 ROW is grazing land for livestock. Following successful reclamation, these lands would again be capable of producing forage for livestock. The disturbance would not irreversibly convert farmland to nonagricultural use. Impacts to farmland of statewide importance would be minor, long-term, and localized.

There are 32 spring sites within the one-mile buffer of the predicted 10-foot groundwater drawdown contour from the Proposed Action dewatering (Piteau 2023b). Twelve spring sites were dry during surveys in 2019 (HydroGeoLogica 2020b); therefore, impacts from drawdown would be negligible on soils at these springs. Most of the springs within the drawdown contour are likely perched features as suggested by their elevated, hillside locations, while some are located in wash or canyon bottoms (HydroGeoLogica 2020b). Impacts to surface water availability from groundwater drawdown would depend on the source of groundwater at the springs. If the springs are sourced from upwelling groundwater on the upgradient side of a low permeability fault zone, the dewatering of the quarry may decrease the amount of water upwelling to discharge via the springs. The amount of spring flow reduction would be dependent on the actual increase in the horizontal groundwater gradient and could result in a cessation of groundwater sourced flow unless water levels recovered over a period of approximately 200 years (Piteau 2023b). Reduced flows or cessation of flows would alter the hydrologic conditions under which the soils formed at the spring sites. This can result in impacts to the soils' nutrient cycling and microbial processes which can affect the soils' ability to support riparian or wetland vegetation. Although riparian areas and wetlands comprise a small portion of the terrestrial landscape, they provide important wildlife habitat and ecosystem services (e.g., water purification, carbon sequestration) that are mediated by soil processes. The change from a hydric soil to a non-hydric soil could slow down the soil forming process due to sink or related weathering of soil forming facts including climate, organisms, relief, parent material, and time. If impacts to spring sites are realized, then impacts to soils at these sites would be moderate, long-term to permanent, and localized.

4.11.2 North and South OSF Alternative

Effects to soil resources under the North and South OSF Alternative would be similar to the Proposed Action except there would be a total of 2,271 acres of disturbance, of which 214 acres would be permanent.

Mapped disturbance to soil map units impacted by the North and South OSF Alternative would total 2,156 acres, and would include the following: Blacktop-Rock outcrop-Pintwater association (151 acres), Blacktop-Rodad-Theriot association (54 acres), Zadyar-Veet-Lyda association (220 acres), Stewval-Pintwater-Rock outcrop association (139 acres), Stewval-Bellehen-Rock outcrop association (142 acres), Stewval-Bellehelen-Gabvally association (eight acres), Gynelle-Cirac association (two acres), Zaba-Gynelle association (55 acres), Zaba-Yomba-Slaw association (16 acres), Rustigate-Kawich-Cirac association (less than one acre), Slaw-Playas complex (one acre), Slaw-Kawich-Nuyobe association (three acres), Wardenot-Izo association (159 acres), Wardenot-Stonell-Roic association (less than one acre), Cirac-Luning association (four acres), Cirac-Rustigate-Settlement association (nine acres), Cirac-Kawich association (28 acres), Stonell-Wardenot-Izo association, moist (736 acres), Luning-Sodaspring association (38 acres), and Lyda-Ardivey-Izo association (391 acres). Additionally, 115 acres of surface disturbance could occur in any soil map unit outside the Tiehm's buckwheat designated critical habitat. Effects from surface disturbance associated with the North and South OSF Alternative would be minor to moderate, long-term to permanent, and localized.

4.11.3 No Action Alternative

Under the No Action Alternative, the Project would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. No additional surface disturbance would occur. Impacts would be localized, short-term, and negligible.

4.12 Threatened and Endangered Species

4.12.1 Proposed Action

4.12.1.1 Bi-State Sage-Grouse

Up to 1,064 acres of vegetation communities with the potential to provide habitat for BSSG would be disturbed. The surface disturbance would result in the conversion of shrub-dominated vegetation cover types to grass/forb-dominated vegetation cover types. This conversion would represent a permanent and localized impact as it may take up to 25 years following reclamation for mature shrubs to become re-established. Reclamation would be completed on approximately 785 acres of the potential BSSG habitat. Reclamation would reduce direct and indirect effects of the Proposed Action. Impacts from surface disturbance would be negligible, long-term to permanent, and localized.

There would be no impacts to leks or breeding BSSG due to the distances of these habitats from the Project. During construction, operation, and reclamation increased human presence and noise could cause those BSSG that occasionally travel through the OPA to avoid the area. Impacts would be negligible, long-term, and localized. While unlikely due to the limited use of the OPA by BSSG and established ACEPMs, vehicular traffic associated with the Project could injure or cause fatalities to individuals, but population-level impacts would not be expected. Impacts from vehicles would be minor, long-term, and localized.

The presence of the post-reclamation quarry lake is not expected to result in ecological risk to avian species. Impacts would be negligible, permanent, and localized. There is one spring located within the proposed critical habitat east of the OPA. This spring is inside the area of analysis and the maximum extent of the predicted 10-foot drawdown area for the Proposed Action. Impacts from groundwater drawdown associated with the Proposed Action are anticipated to be minor, permanent, and localized.

4.12.1.2 Monarch Butterfly

Surface disturbance would remove 2,306 acres that may provide habitat for monarch butterflies. Surface disturbance could displace monarch butterflies that use these areas, although none were documented during baseline surveys. The Project would not directly remove any identified milkweed species. However, the Project may remove other nectar producing plants utilized by monarch butterfly. The surrounding areas are anticipated to provide similar habitat that could support displaced monarch butterflies. Disturbance would be reclaimed except for 383 acres which would result in a permanent impact to potential monarch butterfly habitat. Reclamation activities would reduce effects of the Proposed Action. Impacts to monarch butterflies as a result of surface disturbance would be minor, long-term to permanent, and localized.

The quarry lake may eventually have limited vegetation establish in shallow areas along the quarry edges that may support flowering plants that could be nectar sources. Beneficial impacts from the quarry lake would be negligible to minor, permanent, and localized.

Impacts to monarch butterfly habitat include the potential establishment and spread of noxious and non-native invasive weed species during construction, operation, or reclamation. Invasive weedy species may outcompete native vegetation, reducing the quality of habitat for monarch butterfly. Implementation of the Noxious and Invasive Species Plan (Ioneer 2022) would reduce impacts from noxious and invasive weeds. Impacts to monarch butterflies as a result of the spread or establishment of noxious and non-native invasive plant species are expected to be minor, long-term, and localized.

Use of herbicides to control weeds has the potential to impact non-target vegetation such as milkweeds or other nectar producing plants that monarch butterflies might use. The Noxious and Invasive Weed Management Plan includes operational guidelines to ensure applications of herbicide are controlled and minimize impacts on non-target vegetation such as milkweed. Impacts to monarch butterflies from the use of herbicides is expected to be minor, long-term, and localized.

Impacts to monarch butterflies could occur from collisions with vehicles. The additional traffic on the access road and in the OPA would likely injure or cause fatalities to individuals, but population-level impacts would not be expected. Therefore, impacts would be minor, long-term, and localized.

Potential impacts from groundwater drawdown may include decreased plant species abundance diversity at seep and spring sites which would reduce nectar sources for monarch butterflies. The amount of spring flow reduction would be dependent on the actual increase in the horizontal groundwater gradient and could result in a cessation of groundwater sourced flow unless water levels recovered, which is predicted to occur over a period of more than 200 years (Piteau 2023b). Reduced flows or cessation of flows would limit water availability and impact monarch butterfly habitat. If impacts to spring sites are realized, then impacts to monarch butterfly would be negligible, long-term, and localized.

4.12.1.3 Tiehm's Buckwheat

The Proposed Action was designed to avoid impacts to Tiehm's buckwheat subpopulations. The Tiehm's Buckwheat Protection Plan (EM Strategies 2022b) was prepared to describe the ACEPMs intended to minimize potential impacts to Tiehm's buckwheat associated with the Proposed Action and increase the likelihood of the survival of the species. The ACEPMs consist of six elements: avoidance, education, dust management, invasive species prevention, wildfire prevention, and restoration of habitat.

Approximately 559 acres of Tiehm's buckwheat designated critical habitat would be fenced. Within the 559 acres of fenced critical habitat, 51 acres associated with six Tiehm's buckwheat subpopulations would be fenced (i.e., six subpopulations would be fenced within the fenced critical habitat) (**Figure 4-1**). The existing road between Cave Springs Road and proposed Communication Tower 4 is within a subpopulation. This road would be realigned outside of the Tiehm's buckwheat subpopulation to reduce impacts from use of the road.

The Proposed Action would avoid surface disturbance to all Tiehm's buckwheat subpopulations. The Proposed Action would disturb approximately 354 acres (39 percent) of designated critical habitat (**Figure 4-1**). Of the 910 acres of designated critical habitat, approximately 97 acres (11 percent) of surface disturbance would remain permanently in designated critical habitat (**Figure 4-2**). Reclamation activities include the reconstruction of Tiehm's buckwheat designated critical habitat with suitable soil salvaged and stockpiled during construction and operation. Surface soils suitable for Tiehm's buckwheat would be segregated and managed as a growth media resource, if appropriate, and retained for reclamation. Ongoing soils evaluations would be used to describe and refine the understanding of Tiehm's buckwheat growth media requirements (EM Strategies 2022b). However, the removal and storage of Tiehm's buckwheat preferred soils could alter the characteristics of the soils that the plant needs for survival. Reclamation seeding would occur within 15 feet of one subpopulation. Impacts to Tiehm's buckwheat and designated critical habitat from surface disturbance would be moderate to major, long-term to permanent, and localized.

The removal of this habitat may displace ground squirrels and reduce the amount of foraging habitat available. This may increase the use of the Tiehm's buckwheat subpopulation areas and designated critical habitat by potentially displaced herbivores. One herbivory event has been documented within Tiehm's buckwheat subpopulations and resulted in estimates of 60 percent of the plants being killed or damaged. Herbivory is a natural process, and it is unknown how often and at what scale it typically occurs within the subpopulations. Impacts from increased risk of herbivory as a result of the displacement from the Proposed Action would be minor to moderate, long-term to permanent, and localized.

Disturbance would reduce the amount of habitat available for pollinators. Reduced habitat for pollinators could lead to decreased Tiehm's buckwheat seed production (McClinton et al. 2020) which could lead to less recruitment. Following successful reclamation, the reclaimed areas would be expected to be similar to the pre-disturbance landscape in its ability to host a variety of pollinators. Impacts to Tiehm's buckwheat from altered pollinator relationships would be moderate to major, long-term to permanent, and localized.

Surface disturbance could lead to the establishment and spread of non-native, invasive plant species. A Noxious and Invasive Species Plan (Ioneer 2022) would be implemented to reduce the likelihood of invasive species becoming established or spreading. Chemical treatment and associated herbicide drift near Tiehm's buckwheat populations could damage or kill buckwheat plants if herbicide drift occurs. Applications of herbicide would be controlled to minimize impacts on non-target vegetation. Any invasive species treatment activities within the buckwheat exclusion areas would be limited to methods approved by BLM (EM Strategies 2022b). Impacts from the spread of non-native, invasive plant species and herbicide use would be negligible to minor, long-term, and localized.

Project activities and vehicle traffic would impact Tiehm's buckwheat if dust generated are not adequately controlled and resulting deposition rates in the subpopulations exceed tolerance levels of Tiehm's buckwheat. Increased dust deposition rates could result in lowered photosynthesis and decreased water use efficiency. Ioneer has committed to monitoring dust-related impacts to Tiehm's buckwheat and using fugitive dust controls on roads and disturbed areas, which would reduce generation of fugitive dust (EM Strategies 2022b). Measures include implementing a dust deposition monitoring program and verifying the effectiveness of dust suppressant measures on unpaved roads, construction areas, and stockpiles. Impacts to Tiehm's buckwheat from fugitive dust would be minor, long-term, and localized.

Use of chemical binding agents for dust suppression may impact Tiehm's buckwheat and designated critical habitat from potential damage to vegetation. The ability of Tiehm's buckwheat to tolerate salts is unknown but it is likely that Tiehm's buckwheat has some ability to tolerate salts. Because of the location of the Tiehm's buckwheat subpopulations in relation to roads and disturbed areas, it is not anticipated that the subpopulations would be at risk of receiving increased salts from runoff of treated areas because the subpopulations are located at elevations greater than planned facilities. All but one subpopulation are located upslope of roads and other disturbances. A portion of subpopulation 1 is situated in a wash downslope of an existing road that would be used for access to Communication Tower 4. Use of the existing road may result in some runoff, though it is not anticipated to increase substantially from existing conditions. Impacts from the use of dust suppressants would be minor to moderate, long-term, and localized.

Nitrogen and sulfur deposition from Project emissions may impact Tiehm's buckwheat by altering the growth, physiology, and community composition. Proposed Action emissions have been modeled and it is anticipated that the Project would be in compliance with primary and secondary standards. For further discussion, see the Air Quality SER. The current secondary NAAQS for nitrous oxides and sulfur oxides were set to protect against direct damage to vegetation by nitrous dioxide and sulfur dioxide (USEPA 2020). Therefore, impacts from emissions would be negligible, long-term, and localized.

Construction of the Proposed Action could alter overland flow following precipitation events. Due to existing topography, the North OSF would not alter overland flow patterns within designated critical habitat or within Tiehm's buckwheat subpopulations 1, 2, and 8. It is unlikely that there would be a noticeable increase in overland flow from the construction of the drainage collection structures at the toe of the West OSF. Because the extent to which Tiehm's buckwheat relies on overland flow is unknown, alteration of natural flow patterns could have adverse or beneficial effects by increasing or decreasing the amount of moisture reaching the subpopulations. Because Tiehm's buckwheat is adapted to dry, upland sites, subject only to

occasional saturation by rain and snow, alteration of overland flow is anticipated to have negligible to minor, long-term to permanent, and localized impacts.

Based on quarry design (Geo-Logic Associates 2022), the loss of Tiehm's buckwheat from slope failure is unlikely and not anticipated. Construction of a post-quarrying buttress would increase the factor of safety along the prior minimum failure surfaces below the Tiehm's buckwheat subpopulations and that project slope stability criteria can be readily achieved for long-term, post-reclamation quarry slopes (Geo-Logic Associates 2023). In most cases the buttressed faces would have a post-closure FOS close to or greater than 2.0 following construction of the planned final slope configuration (Geo-Logic Associates 2023). With the quarry lake, the factor of safety for the critical slip surface is reduced slightly from 1.91 to 1.72 but still within the stability criteria. (Geo-Logic Associates 2023). Based on the review of local faults and seismicity, it is anticipated that no significant infrastructure damage would occur to facilities within the Plan boundary during the life of the Project (NewFields 2019c). Impacts to Tiehm's buckwheat due to geologic hazards would be negligible, long-term to permanent, and localized.

Dewatering is not anticipated to affect Tiehm's buckwheat because it is not dependent on groundwater for water. Based on the depth to groundwater in designated critical habitat (estimated to be 140 feet or greater) (Piteau 2023b), designated critical habitat vegetation species root systems would not extend to the water table, thus they are not anticipated to utilize groundwater for their life cycle. Impacts to Tiehm's buckwheat and designated critical habitat from dewatering would be negligible, long-term, and localized.

4.12.2 North and South OSF Alternative

4.12.2.1 Bi-State Sage-Grouse

Impacts of the North and South OSF Alternative for BSSG would be same as described for the Proposed Action except that up to 782 acres of vegetation with the potential to provide habitat for BSSG would be disturbed. Reclamation would be completed on approximately 647 acres of the potential BSSG habitat; therefore, 135 acres of permanent disturbance would remain. Impacts would be negligible, long-term to permanent, and localized.

4.12.2.2 Monarch Butterfly

Impacts of the North and South OSF Alternative for monarch butterfly would be the same as described for the Proposed Action except that surface disturbance would remove 2,271 acres that may provide habitat. There would be 214 acres of permanent disturbance that would result in a permanent impact to monarch butterfly habitat. Impacts from surface disturbance would be negligible to minor, long-term to permanent, and localized.

4.12.2.3 Tiehm's Buckwheat

The North and South OSF Alternative was designed to avoid direct impacts to Tiehm's buckwheat subpopulations and minimize disturbance within designated critical habitat (WestLand 2023b). The limits of disturbance associated with the quarry and haul road to the nearest plants within subpopulations 6 and 3 are 114 feet and 44 feet, respectively. Ioneer developed the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* document which is specific to the North and South OSF Alternative (WestLand 2023b).

Approximately 714 acres of designated critical habitat would be fenced off (**Figure 4-3**). Specific treatment and design features for the fence proximate to the quarry or other features (i.e., drainage facilities and roads) would be developed at the time of construction. Coordination with the BLM, USFWS, and NDOW would occur prior to fence construction. Fencing would be regularly inspected for integrity and debris accumulation. Impacts from fencing would be minor, long-term, and localized.

The North and South OSF Alternative would disturb approximately 197 acres (22 percent) of designated critical habitat and avoid all subpopulations (**Figure 4-3**). Disturbance within designated critical habitat would be reclaimed, with the exception of 45 acres (five percent), primarily associated with the quarry lake (**Figure 4-4**). The *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b) includes specific pollinator habitat reclamation.

Pollinator habitat reclamation would consist of three phases: planning and design, implementation, and performance criteria, monitoring, and reporting. Planning and design consist of reclamation efforts inside designated critical habitat designed to accelerate the establishment of habitat suitable for the various life history stages of the pollinator ecosystem that support Tiehm's buckwheat, while limiting risk from undesirable plant species. Methods to enhance the establishment of vegetation within designated critical habitat would be evaluated during the early phases of concurrent reclamation. The validation and the effectiveness of these methods would be refined and optimized during early phase reclamation efforts. Reclamation within designated critical habitat, which would begin in Year 19 once buttresses have been constructed to provide for long-term stability of the west quarry wall. (WestLand 2023b). Further details on pollinator habitat reclamation are found in the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b). Impacts to Tiehm's buckwheat from surface disturbance in designated critical habitat would be moderate to major, long-term to permanent, and localized.

Implementation of pollinator habitat reclamation would occur on approximately 152 acres out of the 197 acres disturbed. Disturbance within designated critical habitat would occur incrementally during quarrying, starting in Year 1 with approximately 41 acres of designated critical habitat being disturbed in Year 1. In Year 5, approximately 104 acres of designated critical habitat would be disturbed. Total disturbance within designated critical habitat would not occur until Year 12. Other than incidental areas totaling less than 10 acres and some benches on the highwall, pollinator habitat reclamation within designated critical habitat is not anticipated to occur until Year 19, after the buttress is fully constructed (WestLand 2023b). Pollinator habitat reclamation would be beneficial in providing pollinator habitat similar to the pre-disturbance landscape in its ability to host a similar diversity of pollinator species within the area of analysis post-reclamation. However, potential effects to pollinators from long-term and permanent disturbance (i.e., 45 acres primarily associated with the quarry lake) of designated critical habitat located adjacent to the subpopulations is not entirely known. Impacts to Tiehm's buckwheat from altered pollinator relationships are anticipated to be moderate to major, long-term to permanent, and localized.

The *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b) provides specific details on noxious and invasive weed control regarding pollinator habitat reclamation. Herbicide and pesticide application would not occur within 50 feet of delineated Tiehm's buckwheat subpopulations. When weed removal within subpopulations is required, it would be accomplished mechanically and in a manner that minimizes disturbance to soils and desirable plants. There would be 157 acres less of disturbance in designated critical habitat, reducing the areas with potential for spread of weed species. Impacts from the spread of non-native, invasive plant species would be negligible to minor, long-term, and localized.

Quarrying activities and vehicle traffic may impact Tiehm's buckwheat if dust generation is not adequately controlled and resulting deposition rates in the subpopulations exceed tolerance levels of Tiehm's buckwheat. Increased dust deposition rates may result in lowered photosynthesis and decreased water use efficiency. The primary area for dust generation from the North and South OSF Alternative is the haul road the associated traffic, as well as the blasting and operations in the quarry. Traffic and any associated dust deposition in subpopulations 1, 2, and 8 is expected to decrease as the unpaved road between these populations would be closed to public use. However, subpopulations 3, 4, 5, 6, and 7 (and in particular subpopulations 3 and 6) are in close proximity to the quarry, haul road, and South and Quarry Infill OSF. The North and South OSF Alternative includes dust monitoring, which includes seven onsite dust monitors to manage and potentially mitigate fugitive dust (Westland 2023b). These measures include implementing a dust deposition monitoring program and verifying the effectiveness of dust suppressant measures on unpaved roads, construction areas, and stockpiles. Measures would include adaptive management designed to monitor the species and reduce the possibility of effects. With approval by the BLM and USFWS, adaptive management actions would be triggered, if the trailing 12-month average dust deposition levels are found to exceed four grams per square meter per day (WestLand 2023b). Determining the level of dust deposition at which effects to Tiehm's buckwheat would occur is difficult without species-specific studies or studies that document a no effect threshold in similar species. Because data on the effects of dust on Tiehm's buckwheat is lacking, Ioneer proposes to fund research using Tiehm's buckwheat plants it has growing in its greenhouse to provide data on the physiology and growth of Tiehm's buckwheat and would refine trigger thresholds for the implementation of the adaptive management strategy, if determined

necessary. Dust suppression activities would not occur outside of proposed disturbance areas to avoid potential impacts to Tiehm's buckwheat subpopulations and designated critical habitat. Impacts to Tiehm's buckwheat from fugitive dust are anticipated to be minor to moderate, long-term, and localized.

The North and South OSF Alternative is not expected to alter surface water hydrology or moisture supply within any of the subpopulations of Tiehm's buckwheat based on the elevations of the subpopulations being greater than planned facilities (WestLand 2023b). Minor impacts may occur to nearby plant communities that support pollinators. Alteration of overland flow is anticipated to have negligible to minor, long-term to permanent, and localized impacts.

4.12.3 No Action Alternative

4.12.3.1 Bi-State Sage-grouse

Under the No Action Alternative, the Project would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. Exploration disturbance has contributed to loss of potential habitat and may have contributed to avoidance to those areas. Direct and indirect existing impacts to BSSG would remain, such as OHV use and habitat impacts from noxious or invasive species. Impacts would be negligible, temporary to short-term, localized impacts.

4.12.3.2 Monarch Butterfly

Under the No Action Alternative, the Project would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. Exploration disturbance has contributed to loss of potential habitat and may have contributed to avoidance to those areas. Direct and indirect existing impacts to monarch butterflies would remain, such as OHV use and habitat impacts from noxious or invasive species. Impacts would be negligible, long-term, and localized.

4.12.3.3 Tiehm's Buckwheat

Under the No Action Alternative, the Project would not be approved and the associated effects to Tiehm's buckwheat would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. Subpopulations of Tiehm's buckwheat would remain vulnerable to existing threats such as OHV use, invasion of noxious or invasive species, livestock grazing, and herbivory. Impacts would be negligible, long-term, and localized.

4.13 Transportation and Access

4.13.1 Proposed Action

Up to 4.7 miles of the Cave Springs Road and 0.9 miles of the Argentite Canyon Road would be rerouted in the OPA. The reroute of the Cave Springs Road would limit public interactions with Project equipment. The Argentite Canyon Road reroute would provide space for the quarry while still providing public access south of the Project (Ioneer 2022). The rerouted locations of Cave Springs Road and Argentite Canyon Road would remain upon closure. Other Project-related roads would be reclaimed.

The rerouted Cave Springs Road would have three crossings with Project-related traffic: where the haul road enters the processing facility, where the haul road enters the North OSF, and where the service road enters the explosives storage area. Autonomous (self-driving) haul trucks would cross Cave Springs Road where the haul road enters the processing facility and where the haul road enters the North OSF. Ioneer would maintain properly calibrated autonomous trucks, segregate haul truck traffic from public traffic by use of separate roads, enable emergency stop devices, and use staffed guard stations, gates, and warning signs to separate autonomous vehicles from public traffic at the two intersections with Cave Springs Road. Two "railroad-style" crossing gates would be installed at the intersections. The gates would always be closed and all traffic on Cave Springs Road would be stopped so that the public and Project-related traffic, including autonomous haul trucks, are not co-mingled. The west gate would have a guard station that would be staffed 24 hours per day. The east gate would have a call box connected to the guard station. When traffic arrives at the gates, the traffic would be escorted by a pilot car through the OPA. Given the limited amount of public traffic on Cave Springs Road, Ioneer estimates that maximum wait times for vehicles

awaiting escort would be approximately 20 minutes. In the event of a public vehicle breakdown during escort, Ioneer would assist motorists with moving the stranded vehicle to a safe location (Ioneer 2023c). Where the service road enters the explosives storage area, a two-way stop sign would be installed on Cave Springs Road at the intersection because traffic volumes are anticipated to be low and there would be no autonomous vehicles at this intersection. Personnel would perform daily inspections of the traffic control systems, and systems would be continually evaluated and adjusted using adaptive management (NewFields 2022c). Impacts on public safety would be minor, long-term, and localized because of the proposed traffic control systems and segregation of autonomous haul truck traffic from public traffic.

The outer extent of Tiehm's buckwheat designated critical habitat would be fenced and gates locked (BLM 2024), which would restrict public access of the two existing two-track roads in the Tiehm's buckwheat designated critical habitat. Public users attempting to drive through the area would have to find other ways around, creating additional travel time and reducing overall access to public land. Impacts would be moderate, long-term, and localized.

Under the Proposed Action, traffic on SR 264 and the access road would increase by an additional 186 to 248 vehicle trips per day during the four-year construction phase and an additional 230 to 288 vehicle trips per day during the 17-year quarrying phase. Project traffic would consist of a mix of passenger buses, pickups, passenger cars, and trucks ranging in size from single- to double-axle tractor trailers. During closure, there would be about 20 trips per day. The increased traffic during the construction phase would primarily occur during daylight hours. During quarrying and processing, traffic would be spread over 24-hours (Ioneer 2022). The Proposed Action would result in a readily apparent, measurable traffic increase on paved roadways. The increased traffic on SR 264 would be a noticeable change to those already using the roadway, as the number of vehicles passing would be about double the existing condition. The increased traffic would be less noticeable as distance from the OPA increases and trucks disperse along other routes to their final destinations. The increase in traffic may cause worsening of the existing condition of SR 264 which has rough spots and areas of settling. U.S. 6 and U.S. 95 are regularly maintained and receive frequent truck traffic. In addition, recent improvements were completed to U.S. 95 including repaving and adding occasional passing lanes. It is anticipated that these highways would be able to accommodate the increase in traffic. The increase in traffic along the U.S. 95, U.S. 50/50A, and I-80 corridors is not anticipated to affect the cost of maintenance, as NDOT plans account for regular traffic volume increases throughout the life of a transportation asset (NDOT 2019). There would be minor impacts on the highways, such as increased rates of rutting and cracking due to vibration and weighted loads. This effect is anticipated to peak during the quarrying when large truck traffic is most frequent. Impacts to regional paved roadways would be moderate, long-term, and regional.

Ioneer would be responsible for implementing their proposed Transportation and Access Plan and Access Road Improvement and Maintenance Plan (Ioneer 2022). As shown in the Access Road Improvement and Maintenance Plan, Ioneer would be responsible for improving the access road from SR 264 to the processing facilities located within the OPA, and Ioneer would be responsible for maintaining the access road from SR 264 to Cave Springs. Ioneer would maintain the access road life of the Project with the purpose of facilitating continued safe passage of Project-related personnel as well as the public. The access road and rerouted portions of Cave Springs Road would also be improved and maintained per Ioneer's MOU with Esmeralda County for Road Improvement and Maintenance to accommodate the additional traffic generated by the Proposed Action (NewFields 2022d; Ioneer 2023d). Ioneer would improve the roadway surface and drainage infrastructure to prevent washouts. Maintenance would include dust control, grading, and snow removal. The access road would be maintained at a minimum width of 24 feet wide and crowned to provide for proper drainage. Additional drainage control measures could include culvert installation, culvert repair, leadoff ditches, and fords/board-based dips. A combination of techniques such as compaction, blending, cement stabilization, polymer soil stabilization, and cellular confinement would be used to stabilize the access road (NewFields 2022d). Continued maintenance and improvement of the access road for the duration of the Proposed Action would reduce the impacts from the increased amount of traffic by improving the condition of the road to meet the needs of the Project plus the existing traffic. Impacts to traffic would be moderate to major, long-term, and regional as trucks would disperse to areas outside the area of analysis.

4.13.2 North and South OSF Alternative

The rerouted Cave Springs Road would have two crossings with Project-related traffic: where the haul road enters the processing facility and where the haul road enters the North OSF. The traffic control systems used for the North and South OSF Alternative would be the same as described for the Proposed Action except the stop sign at the Cave Springs Road and two-track intersection would no longer be needed. The Argentite Canyon Road realignment would be 1.2 miles (0.3 mile longer than the Proposed Action) to accommodate (0.3 mile longer than the Proposed Action) to accommodate the South OSF. Impacts to access would be moderate, long-term to permanent, and localized, as vehicle access to certain areas within the Plan boundary would be restricted but existing public access through the Plan boundary would remain.

4.13.3 No Action Alternative

Under the No Action Alternative, Esmeralda County would continue to provide maintenance on ROW grant (case NVN 062084) (BLM 1976a). Traffic associated with the No Action Alternative is already occurring on the local road network and is being accommodated with no measurable adverse effect on the roads beyond regular maintenance and grading. Impacts would be negligible, short-term, and localized.

4.14 Vegetation Resources

4.14.1 Proposed Action

Vegetation communities disturbed by the 2,306 acres of proposed surface disturbance include: 1,133 acres of Inter-Mountain Basins Mixed Salt Desert Scrub, 1,059 acres of Great Basin Xeric Mixed Sagebrush Shrubland, 12 acres of Inter-Mountain Basins Greasewood Flat, eight acres of North American Arid West Emergent Marsh, five acres of Inter-Mountain Basins Big Sagebrush Shrubland, three acres of Inter-Mountain Basins Cliff and Canyon, one acre of Great Basin Pinyon-Juniper Woodland, and less than one acre of Agriculture. Ecological sites disturbed by the Proposed Action include: 1,067 acres of cobbly loam 5-8” P.Z., 122 acres of gravelly loam 5-8 P.Z., 662 acres of shallow calcareous loam 8-12” P.Z., 139 acres of loamy slope 3-5” P.Z., 39 acres of loamy slope 5-8 P.Z., 38 acres of loamy 5-8” P.Z., 105 acres of sodic flat, 38 acres of sandy 3-5” P.Z., nine acres of saline meadow, four acres of sodic terrace 5-8” P.Z., and less than one acre of saline bottom. An additional 65 acres of surface disturbance could occur in any vegetation community or ecological site within the OPA from exploration and dewatering facilities, and 20 acres of disturbance could occur anywhere in the Plan boundary from water supply facilities. The surface disturbance from exploration, dewatering facilities, and water supply facilities would occur outside the fenced Tiehm’s buckwheat designated critical habitat. No forested ecological sites would be impacted by surface disturbance. Impacts may occur to native shrubs, grasses, and forbs that may be utilized for seed collection, wildling transplanting, or floral and greenery collection. Impacts from surface disturbance would be minor, long-term to permanent, and localized.

Surface disturbance would result in the conversion of shrub-dominated vegetation cover types to grass/forb-dominated vegetation cover types. The loss of shrub-dominated vegetation would represent a moderate, long-term to permanent, and localized impact as it may take up to 25 years following reclamation for mature shrubs to become re-established. Reclamation would be completed on approximately 1,923 acres (approximately 83 percent) of the total proposed surface disturbance area. BLM-approved certified weed-free seed mixes would be used, and success of revegetation would be based on the guidelines described in *Attachment B: Nevada Guidelines – Successful Revegetation for the Nevada Division of Environmental Protection* (NDEP 2016). Reclamation activities would reduce direct and indirect effects of the Proposed Action. Impacts to vegetation as a result of surface disturbance would be minor, long-term to permanent, and localized.

Under the Proposed Action, approximately 383 acres of vegetation would be permanently removed from surface disturbance impacts to vegetation as a result of permanent disturbance would be minor, permanent, and localized. The potential effects from dust from the Project on vegetation would be reduced by periodic precipitation and ACEPMs to control and monitor dust (ACEPMs). Impacts would be minor, long-term, and localized.

Groundwater drawdown associated with dewatering activities may affect water availability at surface water sites (Piteau 2023b). Most springs within the drawdown contour are likely perched features as suggested

by their elevated, hillside locations, while two are located in wash or canyon bottoms (HydroGeoLogica 2020b). Impacts to surface water availability from groundwater drawdown would depend on the source of groundwater at the springs. If these springs are perched features, then groundwater drawdown from the Proposed Action would not affect discharge flows. If the springs are sourced from upwelling groundwater, the dewatering may decrease the amount of water discharged to the springs. Cessation of groundwater sourced flow may occur unless water levels recover for a period of approximately 200 years (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for vegetation. Potential impacts from groundwater drawdown include decreased resilience of native vegetation communities at seep and spring sites, and increased susceptibility to invasion by noxious and invasive species. If impacts to spring sites occur, impacts to vegetation communities would be moderate, long-term to permanent, and localized. Impacts to riparian vegetation communities are described in Section 4.17.

The proposed groundwater drawdown may result in impacts to upland vegetation in the area of analysis. Herbaceous upland plant species have shallow root systems and predominantly rely on soil moisture from precipitation. Juniper trees have deep root systems, extending up to 15 feet deep (Zlatnik 1999); however, these trees occur at elevations in the area of analysis well above the potentially affected aquifer. Sagebrush and other shrubs have both deep taproots that can extend three to seven feet vertically and shallow, lateral roots that collect surface precipitation (Innes 2019). Phreatophytes, such as greasewood (*Sarcobatus* sp.), rubber rabbitbrush (*Ericameria nauseosa*), and saltgrass (*Distichlis spicata*), occur within the area of analysis and have the potential to be impacted by groundwater drawdown (USGS 1958). Reduced water availability could lead to reduced production and vigor, or changes in diversity or composition of phreatophyte communities. Impacts would remain unless water levels recovered over a period of approximately 200 years (Piteau 2023b). These species are common in areas adjacent to the Proposed Action and throughout this area of Nevada. Impacts to upland vegetation communities from groundwater drawdown are expected to be minor to moderate, long-term to permanent, and localized.

Impacts from invasive, non-native plant species, and noxious weeds include the potential establishment and spread of these species during construction, operation, or reclamation. Impacts from the spread and establishment of these species are expected to be minor, long-term, and localized, given the implementation of the Noxious and Invasive Weed Management Plan during construction, operation, and reclamation (NewFields 2022e).

Potential impacts from groundwater drawdown include decreased resilience of native vegetation communities at seep and spring sites, and increased susceptibility to invasion by noxious and invasive, non-native species. If impacts to spring sites are realized, then impacts to noxious and invasive, non-native weed species would be minor, long-term, and localized.

Candelaria blazingstar would not be directly impacted by surface disturbance, as none were identified in the Plan boundary. Candelaria blazingstar is adapted to dry, upland sites; therefore, impacts to Candelaria blazingstar and associated potential habitat from dewatering would be negligible, long-term, and localized.

Tecopa birdbeak would not be directly impacted by surface disturbance, as none were identified in the Plan boundary. Fugitive dust or sedimentation from the additional traffic on the access road could impact the plants by reducing their ability to photosynthesize. ACEPMs would reduce impacts from fugitive dust and sedimentation; therefore, impacts would be negligible to minor, long-term, and localized. Dewatering is not anticipated to impact Tecopa birdbeak because the known locations are located outside of the one-mile buffer of the predicted groundwater drawdown contour (Piteau 2023b). Impacts to Tecopa birdbeak and associated potential habitat from dewatering would be negligible, long-term, and localized.

The sagebrush cholla would not be directly impacted by surface disturbance. The sagebrush cholla located south of and outside of the Access Road and Infrastructure Corridor and the sagebrush cholla located south of the quarry could be impacted by fugitive dust or sedimentation from the Proposed Action. Dust could cover the sagebrush chollas and interfere with their ability to photosynthesize. ACEPMs established and periodic precipitation would reduce this impact; therefore, impacts would be negligible to minor, long-term, and localized. The Proposed Action could result in impacts to potential habitat in the area of analysis, as potential habitat is available in the proximity of the area of analysis. Impacts to the sagebrush cholla from the loss of potential habitat are considered negligible to minor, long-term, and localized. One sagebrush

cholla is located within the one-mile buffer of the predicted 10-foot groundwater drawdown contour (Piteau 2023b). Roots of small cacti such as sagebrush cholla are shallow (Pinkava 1999) and rely on precipitation for soil moisture; therefore, impacts to sagebrush cholla from dewatering would be negligible, long-term, and localized.

The exact location and abundance of Mojave fishhook cactus individuals in the area of analysis is unknown; therefore, individuals may be directly removed from surface disturbance associated with the Proposed Action. This species is likely to occur within the Inter-Mountain Basins Mixed Salt Desert Scrub vegetation community; therefore, 1,133 acres of potential habitat could be impacted. This vegetation community is common in areas adjacent to the Proposed Action and throughout this area of Nevada. After reclamation, 102 acres of potential habitat would remain permanently disturbed. Impacts from surface disturbance would be minor, long-term to permanent, and localized. Fugitive dust or sedimentation from the additional traffic on the access road could impact Mojave fishhook cactus. ACEPMs and periodic precipitation would reduce impacts from fugitive dust and sedimentation; therefore, impacts would be negligible to minor, long-term, and localized. The Mojave fishhook cactus could be located within the one-mile buffer of the predicted 10-foot groundwater drawdown contour (Piteau 2023b). Roots of small cacti such as Mojave fishhook cactus are shallow (FNAA 2023) and rely on precipitation for soil moisture; therefore, impacts from dewatering would be negligible, long-term, and localized.

The Proposed Action would disturb plant communities with plant species of ethnobotanical importance to area Tribes. Reclamation would reduce impacts by seeding reclaimed areas with species of ethnobotanical importance and recreating stable plant communities that would provide potential habitat for other species to reestablish naturally. Plant species of ethnobotanical importance are common within the area of analysis and surrounding areas (Stoffle et al. 1990). Therefore, impacts to ethnobotanical plant species and associated potential habitat from the Proposed Action would be negligible to minor, long-term to permanent, and localized.

4.14.2 North and South OSF Alternative

Effects to vegetation resources would be similar to the Proposed Action except the placement of facilities would be shifted and less total acreage would be disturbed. A total of 2,271 acres would be disturbed with 214 acres of permanent disturbance. Impacts from invasive, non-native species on vegetation resources would be the same as the Proposed Action. Impacts to ethnobotanical plant species would be the same as described for the Proposed Action.

One sagebrush cholla occurrence would be within the North and South OSF Alternative disturbance footprint; therefore, would be required to be relocated outside of the disturbance. Sagebrush cholla is not protected under NRS 527.270 as they are not fully protected species declared to be threatened with extinction. A Desert Flora Harvest Registration Form and Desert Flora tags would be needed for relocation of individuals if more than seven were present, as per NRS 527.500. Direct effects to sagebrush cholla include stress from the relocation of the plants, and removal of soil and growth media from suitable habitat. Impacts from the Proposed Action on sagebrush cholla would be negligible to minor, long-term to permanent, and localized. This species is widespread in Nevada and impacts are not anticipated to contribute to the listing of the species as threatened or endangered. All other impacts to special status plant species are the same as described for the Proposed Action.

4.14.3 No Action Alternative

Under the No Action Alternative, the Project would not be approved. The existing 15 acres of exploration disturbance has occurred on public lands administered by the BLM and would be reclaimed. No additional surface disturbance would occur. Impacts would be negligible, short-term, and localized.

4.15 Visual Resources

4.15.1 Proposed Action

From KOP 1, the SOSF would be slightly visible in the background against the existing mountains as a dark brownish gray angular form with angular lines and uniform texture. The SOSF would blend in with the existing mountainside and would be barely perceptible to the casual viewer. The processing facility would

have similar colors as the surrounding area and blend in with the existing landscape also due to its distance from the KOP and mountains blocking most of the direct view. When temperatures are below approximately 45 degrees Fahrenheit (ºF) and on clear days, a steam plume from the processing facility may be visible as a low, white cloud. Project-related traffic would be visible at varying times throughout the day on the roadways. Impacts to the viewshed from KOP 1 would be negligible to minor, long-term, and localized.

From KOP 2, the OSFs and quarry highwall would be visible in the far middleground to background (NewFields 2023). A steam plume from the processing facility may be visible. The OSFs would have similar materials and colors as the surrounding area; however, they would be trapezoidal and unvegetated and may contrast in texture compared to the surrounding landscape. The quarry would have repeating horizontal lines as each layback progresses. As the west-bound traveler approaches the Project on Cave Spring Road, the quarry and OSFs would become more noticeable and appear as a moderate contrast. The quarry would present a moderate contrast with the surrounding area due to the changed color, form, and line of the landscape. Views of the quarry would be limited to a few sections of the rerouted Cave Springs Road. The color, shape, and form of the existing landscape would change with development of the OSFs, and the change would likely be noticeable to most travelers, though overall contrast would be weak due to the highly varied geology of the area. Impacts would be moderate, long-term, and localized.

From KOP 3, the processing facility and OSFs would be barely perceptible in the far background and the pipeline would be barely perceptible in the middleground (NewFields 2023). A steam plume from the processing facility may be visible. Because the processing facility and the OSFs would be approximately 12.5 miles away and would have similar colors as the surrounding area, these features would create a weak contrast. OPA project components would be too far from the KOP to be visible by the casual observer. The at-grade pipeline would be partially visible to the southeast. Project-related traffic would be visible at varying times throughout the day on the roadways. The form, line, color, and texture of the at-grade horizontal pipeline would create a weak contrast. Impacts would be minor, long-term, and localized.

From KOP 4, the SOSF, booster station, and processing facility would be visible in the far background while the at-grade pipeline for water supply would be visible in the middleground (NewFields 2023). A steam plume from the processing facility may be visible. The SOSF, processing facility, and booster station would be in the distance and partially hidden by hills presenting a weak contrast with the surrounding area. Though color, shape, and form would change with development of the SOSF to patchy areas void of vegetation, the change would be minor to most viewers due to the variable geology of the area and the distance to those areas from the KOP. The processing facilities angled shapes may contrast the existing landscape. Most features would be blocked from the casual observer's view, with a small portion visible above the existing hillsides yet backdropped by the Silver Peak range. These features are not anticipated to dominate the view along Hot Ditch Road and Cave Spring Road. Project-related traffic would be visible at varying times throughout the day on the roadways. Impacts would be minor, long-term, and localized.

The at-grade pipeline for water supply from Fish Lake Valley, booster station, and transmission line to the booster station from the OPA would be widely visible from KOP 1 as these features would be placed directly south of Cave Springs Road, and the at-grade pipeline would be visible from KOP 4. The form, line, color, and texture of the at-grade pipeline would create a moderate to strong contrast. Earthen mounds on the pipeline every approximately 50 feet would create repetitive and repeating humps of exposed soil along the length of the access road. The pipeline would appear smooth and linear, which would contrast against the rough background. The booster station would result in a new, cubed shaped structure on the landscape. The flat, smooth surfaces of the structure would contrast against the rough background. The exact amount of visual contrast from the booster station would be dependent on the final materials used to construct it. The transmission line would add new, repeating vertical structures that would dot the landscape every 200 feet from the KOP into the far background. They would extend prominently into the skyline in several areas. The thin horizontal powerlines connecting the poles would be visible as black lines in the foreground but would not discernable as they move to the middle and far background. These facilities would result in a strong degree of contrast compared to the existing environment. Impacts from KOP 1 and KOP 4 would be moderate, long-term, and localized.

Approximately 35 acres of exploration would occur anywhere within the OPA, 30 acres of disturbance could occur anywhere within the OPA for dewatering facilities, and 20 acres of disturbance for water supply

facilities could occur anywhere within the Plan boundary. Due to the existing topography depending on where these activities occur, these activities are likely to be slightly visible from KOP 1, visible from KOP 2, not be visible from KOP 3, and not be visible from KOP 4. Impacts are anticipated to be negligible, short- to long-term, and localized as they would not create a perceptible change to the existing landscape.

Once operations cease, facilities and disturbance areas would be reclaimed. Once reclamation is complete, impacts to visual resources would be negligible to minor as they would be removed or blended into the existing landscape. The quarry would remain as a permanent feature and impacts from the viewshed of KOP 2 from the quarry are anticipated to be moderate, permanent, and localized.

The Project would change the form, line, texture, and color of the viewshed from KOPs 1, 2, and 4, which have been designated as a BLM VRM Class IV, and KOP 3 which has been designated as VRM Class III. From KOP 1, the Project would have a weak to strong level of contrast to the existing landscape. From KOP 2, the Project would have a moderate level of change to the existing landscape. From KOP 3, the Project facilities would have a weak level of change to the existing landscape. From KOP 4, the Project would have a weak to moderate level of change to the existing landscape. The Proposed Action from KOPs 1, 2, 3, and 4 would not conflict with the established BLM VRM Class III and Class IV objectives. Impacts on visual resources from KOP 1 would be moderate, long-term, and localized, from KOP 2 would be moderate, long-term to permanent, and localized, from KOP 3 would be negligible to minor, long-term, and localized, and from KOP 4 would be minor to moderate, long-term, and localized.

Project components would be visible from portions of the Silver Peak WSA, particularly from ridgetops and mountain peaks in the far northern part of the WSA. Views of the Project components would be blocked in most areas by trees, and ACEPMs, the facilities would not stand out in appearance or color. Impacts on visual resources from the Silver Peak WSA are anticipated to be minor, long-term, and localized.

Implementation of the Proposed Action would add additional nighttime lighting, required for operations, to the dark skies and would cause a sky glow over the OPA. Lights would be used on equipment and vehicles, as well as stationary lights for operations. During nighttime hours, the Project lights would be viewed against the otherwise unlit black or nearly black backdrop of the landscape. The brightness of the lights and darkness of the black or nearly black background would create a strong contrast, and thus make the lights readily visible. Headlights from vehicles would be a temporary illumination while traveling at night and would be focused on the roadways. Motorists traveling on SR 264 and those in Dyer would constitute the majority of the users in the area during the night hours and those who may notice the illuminated night sky lighting or glow over the OPA. For passing motorists, the duration would be few minutes. For those in Dyer and Fish Lake Valley, the glow may be visible for the duration of the Proposed Action during nighttime hours. The Proposed Action impacts on dark sky resources are anticipated to be moderate, long-term, and regional.

4.15.2 North and South OSF Alternative

Visual impacts at KOP 1 and KOP 4 would be the same as those described for the Proposed Action. The North and South OSF Alternative contrast from KOP 1 and KOP 4 would be compatible with the management objectives for Class IV areas. Impacts to the viewshed from KOP 1 would be localized, moderate, and long-term. Impacts to the viewshed from KOP 4 would be minor to moderate, long-term, and localized. Visual impacts at KOP 2 and KOP 3 would be the same as those described for the Proposed Action, except the West OSF would not be constructed. The South OSF would be visible from KOP 2, but not visible from KOP 3. From KOP 2, it would add a trapezoidal form with horizontal lines where the benches are created. The texture would appear uniform, and the color would blend in with the existing mountainside in hues of brown and brownish gray. The North and South OSF Alternative contrast from KOP 2 and KOP 3 would not conflict with VRM Class IV or Class III objectives. Impacts on visual resources from KOP 2 would be moderate, long-term to permanent, and localized. Impacts on visual resources from KOP 3 would be negligible to minor, long-term, and localized.

Impacts on views from the Silver Peak WSA would be the same as those described for the Proposed Action, except the West OSF would not be constructed. The South OSF may be visible from the Silver Peak WSA but with implementation of ACEPMs, it would not stand out in appearance. Impacts on visual resources from the Silver Peak WSA would be minor, long-term, and localized.

4.15.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated effects to visual resources would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. Impacts would be negligible, short-term, and localized.

4.16 Water Resources

4.16.1 Proposed Action

4.16.1.1 Water Quantity

The quarry would extend below the water table requiring a system to capture and remove groundwater that flows toward or into the quarry as quarrying progresses. Water demands for ore processing would necessitate the installation of production wells, in addition to the dewatering system. Under predevelopment conditions, the majority of groundwater discharge occurs as ET and a minor amount of discharge occurs as spring discharge. Modeling predicts that dewatering requirements for the open quarry would range up to approximately 50 gpm in the first seven years of quarrying and peak at approximately 650 gpm in Year 10 of operation with an average rate of 280 gpm over that 17-year period (Piteau 2023b). The groundwater inflow into the quarry would be pumped out for dewatering purposes by dewatering wells near the quarry and/or collection sumps within the quarry.

The area predicted to experience a change in groundwater elevation of 10 feet or more is used for quantification and comparison of Project effects and baseline conditions. Groundwater modeling indicate that the projected drawdown during operations and post-closure induced by the Proposed Action is around the production wellfield and quarry pumping areas. The extent of the 10-foot drawdown contour associated with the quarry would extend up to a maximum of approximately five miles from the quarry in a westerly direction and four miles in a northerly direction. Drawdown around the quarry area would extend two to three miles in southerly and easterly directions along the strike direction of faults that intersect the quarry lake and into the mountain block south and east of the quarry. The 10-foot drawdown around the production well field would extend approximately one-half mile from the pumping wells in the surrounding alluvium. Based on predicted drawdown, impacts to groundwater levels would spatially occur throughout the OPA, the alluvial fan immediately adjacent to the west and northwest, and the areas immediately around the quarry. The OPA wells would experience drawdown of up to 300 feet during the operating period followed subsequently by groundwater recovery over a period of approximately 60 years (Piteau 2023b). Drawdown in the groundwater resource would be moderate, permanent, and localized impact.

Lowering of a water table by dewatering or water production has the potential to result in subsidence in water-bearing lithologies when the hydrostatic pressure that partially supports the lithologic matrix is removed. Little subsidence would be expected to occur in the consolidated, highly silicified bedrock units, but minor subsidence may occur in the interbedded epiclastic ash-flows, air-fall tuffs, and sedimentary units of the Cave Spring Formation or in any unconsolidated fill present below the groundwater table. Because the saturated thickness of the lithologies in the OPA exceed 600 feet, this subsidence would have a negligible, long-term, localized impact on the groundwater storage properties of the lithologies.

There are 12 surface water resources (SP-01 [Cave Spring], SP-02, SP-03, SP-03A, SP-04, SP-05, SP-05A, SP-06, SP-07, SP-08, SP-25, and SP-25a) within the projected 10-foot drawdown area and four surface stock water rights. There are an additional 20 surface water resources and one surface stock water right within the one-mile buffer of the predicted 10-foot drawdown. In total, there are 32 spring sites and five water rights within the predicted 10-foot maximum extent of drawdown and one-mile buffer (**Figures 4-5**, **4-6**, and **4-7**). There are no surface water locations or water rights within the predicted 10-foot drawdown around the water supply wells; there are nine irrigation water rights within the one-mile buffer area around that predicted 10-foot drawdown.

The discharges from Cave Spring and SP-02 through SP-05 are likely related to a fault zone at the base of the exposed Rhyolite Ridge Tuff formation. Likewise, SP-06 and SP-07 are likely related to a fault zone along the southern edge of the OPA. SP-08 is located uphill from Cave Spring along the Cave Spring Drainage where a spring has been developed for stock use. If these springs are perched features as suggested by their elevated, hillside locations (HydroGeoLogica 2020b), then groundwater drawdown from

the Proposed Action may not affect discharge flows. However, if the springs are sourced from upwelling groundwater on the upgradient side of a low permeability fault zone, decreased water levels on the downgradient side of the fault zone could result in an increased horizontal groundwater gradient. The increased gradient would increase groundwater movement across the fault zone, decreasing the amount of water upwelling to discharge via the springs. The amount of spring flow reduction would be dependent on the actual increase in the horizontal groundwater gradient and could result in reduction or cessation of groundwater sourced flow unless water levels recovered, which is predicted to occur over a period of more than 200 years. Although not anticipated, if drawdown effects on surface waters occur, impacts would be major, permanent, localized. The effects of drawdown related to the water supply wells on surface water resources are similar to the No Action Alternative.

The analysis of effects on water rights assumes that existing consumptive uses in Fish Lake Valley would continue at their current rate which are near the Fish Lake Vally basin's perennial yield. Ioneer has secured water rights for the Proposed Action from other water rights owners in the Fish Lake Valley hydrologic basin, through leases or options to purchase (Ioneer 2022). Therefore, analysis of pumping for mine water supply assumes the use of active water rights. The BLM has no jurisdiction over State Engineer permitted water rights and regulations applicable to those water rights. Groundwater production from existing groundwater wells would be conveyed to the OPA via a 19-mile pipeline as a new point of use compared to the existing agricultural use. There are four surface water stock rights, and one groundwater stock water right located within the predicted 10-foot drawdown contour associated with the long-term maximal drawdown prediction for the Proposed Action. Within the one-mile buffer around the predicted 10-foot drawdown, there is one surface stock water right and one groundwater stock water right in the quarry buffer area and nine groundwater irrigation rights within the supply wells buffer area (**Figure 4-7**). The ability to pump water associated with these water rights may be impacted by groundwater drawdown.

The quarry would begin filling with water in the first year after the cessation of dewatering activities and would continue for approximately 60 years until the lake reaches near steady-state at an elevation of approximately 5,650 feet AMSL, resulting in a maximum quarry lake depth of approximately 170 feet (Piteau 2023b). The recovered quarry lake would have a 113 acre-ponded surface area (Piteau 2022b), providing sufficient surface area for evaporative losses (i.e., 347 acre-feet at equilibrium) to balance groundwater inflows at a lake surface elevation below the local groundwater elevation. Therefore, the quarry lake is predicted to act as a terminal sink where quarry lake water does not outflow into groundwater as the recovered quarry lake elevation of 5,650 feet AMSL would be approximately 100 feet lower than the adjacent recovered groundwater, resulting in hydraulic gradients inward toward the quarry lake (Piteau 2023b, 2024). The quarry lake evaporation's effect on the groundwater balance in HA 117 would be a minor, permanent, and regional impact.

No springs or seeps would be covered by the proposed facilities. Therefore, impacts to springs and seeps from Project surface disturbance would not occur. Drainage areas in the OPA would be affected by Project components. Stormwater that would have run onto the Project facilities area would be routed to a location downgradient of quarry facilities and into a natural drainage. These local impacts to watershed areas would be relatively minor compared to the overall contributing watershed and would occur in ephemeral Cave Spring wash. The quarry would continue to capture approximately 32 acre-feet of runoff annually from the watershed. Overall, impacts to the ephemeral watershed areas associated with the construction, operation, and closure are expected to be minor, long-term, and localized.

Impacts associated with dust emissions, erosion, and sedimentation could occur in watersheds along the Project access route due to increased traffic. Engineering controls, such as road grading, gravelling, drainage installations, soil stabilization, snow removal, and dust control, plus administrative controls, such as speed limits, would limit potential impacts. Impacts to watersheds due to dust, erosion, and sedimentation would be minor, long-term, and regional.

4.16.1.2 Water Quality

As a terminal lake in a lithology that is primarily acid-neutralizing, evapoconcentration would be the dominant geochemical influence on the quarry lake water chemistry. Although the geochemical modeling predicts the water quality out to 200 years after dewatering stops, the salinity of the quarry lake would

continue to increase over time in response to evaporation. Solute concentrations in lake water would not affect future groundwater quality.

The quarry lake is predicted to be a groundwater sink with concentrations of arsenic, boron, fluoride, and molybdenum expected to exceed secondary enforceable and non-enforceable standards as well as NDEP Profile III reference values (Piteau 2024b). NDEP Profile III reference values in the quarry lake would be in exceedance for arsenic from 50 to 200 years post-closure, boron from five to 200 years post-closure, fluoride from five to 200 years post-closure, and molybdenum from five to 200 years post-closure.

The quarry lake would be accessible by terrestrial and avian wildlife; therefore, quarry water solute concentrations are compared to the NDEP Profile III reference values to assess the need to consider the ecological risk of wildlife exposure to quarry lake water (NDEP 2018). An ERA was conducted to evaluate the risk of potential exposure of terrestrial wildlife and avian wildlife to quarry lake water. The constituents of potential concern for the assessment were arsenic, boron, fluoride, and molybdenum based on the results of the quarry lake chemistry predictions. The potential risk associated with elevated TDS was also considered based on the long-term evaporative nature of the quarry lake. None of the calculated doses exceeded the Lowest Adverse Effect Level for arsenic, boron, fluoride, or molybdenum. In the case of a mature quarry lake where constituent concentrations have had an opportunity to evapoconcentrate for more than 100 years, calculated doses exceeded the arsenic No Adverse Effect Level (NOAEL) for cliff swallows, deer mice, and little brown bats, boron NOAEL for cliff swallows and mule deer, fluoride NOAEL for mallard ducks, and molybdenum NOAEL for cliff swallows and little brown bats at levels that were well below the low-effect thresholds. Actual wildlife exposure that would be less than daily year-round and the low magnitude by which the calculated doses exceeded the NOAELs are interpreted to indicate a low probability that risks to wildlife would occur based on the predicted water quality in the quarry lake (Cedar Creek 2022).

The evaluation of elevated quarry lake TDS concentrations effects on wildlife concluded that the individual constituents that compose TDS were not predicted to have an adverse effect on wildlife, and that laboratory testing and ecological studies indicated that animals had a tolerance to similar TDS. Combined with the ability to obtain water from alternative nearby sources, animals are unlikely to be affected by TDS concentrations in the quarry lake (Piteau 2022b, 2024b). As such, water quality impacts of the quarry lake are expected to be negligible, long-term, and localized.

The results of the geochemical characterization indicate that about 80 percent of the overburden is classified as non-PAG and presents a low risk of acid rock drainage. Portions of the Mixed Lacustrine, Gritstone, and Rhyolite Ridge Tuff materials were determined to be PAG. In aggregate, the overburden material to be placed the OSFs is net acid-neutralizing. While uncovered, overburden would be subject to leaching by meteoric waters with the potential for neutral pH mobilization of some metals and metalloid oxyanions. Humidity cell testing results indicate that mobilized concentrations of metals and metalloid oxyanions decrease rapidly with successive leaching with the exception of arsenic. Therefore, leaching of most metals and metalloid oxyanions from the material would be short-lived. For arsenic, potential receiving waters exhibit arsenic concentrations in excess of NDEP water quality standards in their baseline condition, limiting the potential for leachate to further degrade water quality by introducing dissolved arsenic into the groundwater. The underdrain and contact water collection systems would minimize the volume of leachate contacting the environment. Therefore, potential for degradation of water quality by overburden leaching is limited, and monitoring of quarried materials placed in the facility and nearby water chemistry would be established per NDEP WPCP requirements to verify that the facility is not contributing to water quality degradation. As such, water quality impacts from placement of quarried materials in the OSFs would be minor, short-term, and localized.

The SOSF would be designed as a zero discharge facility that incorporates liners and leak detection systems to prevent leakage during operations, and leachate would not contact the environment under design conditions either during operations or in closure. A lined underdrain pond would be installed to collect draindown and contact water. Any draindown collected would be pumped to a water truck for transport to the processing plant where it would be used consumptively during ore processing. At closure, a 48-inch cover including six inches of growth media would be placed over the facility and revegetated to form an ET cover to inhibit infiltration of meteoric waters. Drainage is expected to cease shortly after the ET cover is established. The facility operations and nearby waters would be monitored in accordance with NDEP WPCP

requirements to verify that the facility is not contributing to water quality degradation. Impacts from placement of residual materials in the SOSF would be negligible, long-term, and localized.

4.16.2 North and South OSF Alternative

Under the North and South OSF Alternative, impacts to surface water and groundwater quantity would be the same as the Proposed Action because the same Project dewatering and water management practices would be applied. The Overburden Management Plan applied to the modified configuration would result in similar effects on surface water quality. The quarry lake would be about 110 surface acres and would remain a terminal lake that would not outflow to local groundwater. Quantitative predictions of quarry lake analyte concentrations based the modified backfill configuration would not be expected to match those associated with the Proposed Action, but the same analytes would be expected to exceed the secondary enforceable and non-enforceable standards, as well as NDEP Profile III reference values.

4.16.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated effects to water resources would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. Existing groundwater rights and pumping wells associated with agricultural usage in Fish Lake Valley would not be used for quarrying and agricultural use of these water rights would continue. Cumulative drawdown assessed for the Project detailing changes that may occur due to ongoing pumping stresses as well as quarrying related activities showed the maximum differential drawdown between the Proposed Action and the No Action Alternative 200 years after the end of quarrying would be less than 20 feet (Piteau 2023b). As a result, impacts to water use in Fish Lake Valley would be similar to the Proposed Action.

4.17 Wetland and Riparian Resources

4.17.1 Proposed Action

Associated surface disturbance could impact 0.16 acre of Wetland 3 within the Access Road and Infrastructure Corridor due to widening of the road, replacement of the culvert below Fish Lake Valley Hot Springs (NewFields 2022d), and placement of the water supply pipeline. Placement of the water supply pipeline along SR 264 may impact the riparian community on Chiatovich Creek within the Access Road and Infrastructure Corridor. Surface disturbance would impact 54.46 acres of NWI mapped wetlands (54.04 acres of riverine, 0.40 acres of freshwater emergent wetland, and 0.02 acres of freshwater pond). Disturbance would be limited to access road improvements and placement of the water supply pipeline. Of the 54.46 acres of total surface disturbance, 54.04 are associated with riverine NWI-mapped wetlands, the majority of which are likely ephemeral drainages that lack wetland characteristics. Impacts from surface disturbance would be minor, long-term, and localized.

Increased traffic and maintenance on the access road could result in increased fugitive dust, erosion, and sedimentation that could impact the adjacent wetlands and riparian areas. ACEPMs would reduce or negate these impacts. Impacts to wetland and riparian areas would be negligible, long-term, and localized.

The three wetlands identified during baseline surveys are outside the one-mile buffer of the predicted maximum extent of the 10-foot drawdown contour; therefore, proposed dewatering activities would have negligible, long-term, localized effects on wetlands. There are 32 seep and spring sites within the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour. Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). Most of the springs within the drawdown contour are likely perched features as suggested by their elevated, hillside locations, while two are located in wash or canyon bottoms (HydroGeoLogica 2020b). Impacts to surface water availability from groundwater drawdown would depend on the source of groundwater at the springs. If these springs are perched features, then groundwater drawdown from the Proposed Action would not affect discharge flows. If the springs are sourced from upwelling groundwater, the dewatering may decrease the amount of water discharged to the springs. Cessation of groundwater sourced flow may occur unless water levels recover for a period of approximately 200 years (Piteau 2023b). Reduced flows or cessation of flows would limit water to the surface, which could reduce wetlands, if present, by reducing or removing the hydrology required to support hydrophytic vegetation and hydric soils.

If drawdown effects on surface waters occur, impacts to wetlands from the loss of a water source would be major, long-term, localized.

4.17.2 North and South OSF Alternative

The North and South OSF Alternative impacts to wetlands and riparian resources would be the same as those described for the Proposed Action except 54.87 acres of NWI mapped wetlands would be disturbed (0.42 acres more of riverine than under the Proposed Action). Impacts to wetlands and riparian resources from surface disturbance would be minor, long-term, and localized.

4.17.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated effects to wetland and riparian resources would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. Impacts would be negligible, short-term, and localized.

4.18 Wildlife Resources

4.18.1 Proposed Action

4.18.1.1 General Wildlife

Aquatic Species

No non-special status aquatic species have been previously identified in the area of analysis; however, potential habitat does occur. If present, aquatic species could be impacted by fugitive dust and potential sedimentation from runoff associated with the Proposed Action. There would be no impact from the proposed surface disturbance. Aquatic species are often identified near areas of water. It is unlikely that any runoff from the Proposed Action would impact the spring sites or surface water features where aquatic species are located. Additionally, ACEPMs would reduce any impacts from fugitive dust; therefore, impacts to aquatic species, if present, would be negligible, long-term, and localized. Dewatering from the Proposed Action may impact surface water features where aquatic species are located (Piteau 2023b). Therefore, if impacts are realized at surface water sites with aquatic species present, impacts to habitat would be negligible, long-term, and localized.

Avian Species

Approximately 2,306 acres of avian nesting and foraging habitat would be removed. Some of this habitat may remain available through interim reclamation, but most of this habitat would be unavailable until completion of reclamation. Approximately 383 acres would be permanently disturbed. Disturbance could result in increased competition in adjacent habitat that could potentially reduce clutch size and/or survival of young. Impacts from increased competition would be negligible to minor, long-term, and localized. Annual raptor surveys would occur during construction, which would survey for undocumented nests and document nest status (Ioneer 2023b). Vegetation removal during the migratory bird breeding season could result in crushing or destruction of nests; however, the BBCS commits to preconstruction clearance surveys during the breeding season (March 1 through July 31). Work would occur outside of spatial buffers of active nests (WestLand 2023d). Impacts from the loss of nesting and foraging habitat would be minor, long-term to permanent, and localized.

The processing facility vats and contact water ponds would present hazards to avian species. ACEPMs described in the BBCS would reduce impacts. These include using textured pond liners to facilitate wildlife egress, chain-link fencing to prevent wildlife access, using avian exclusion measures such as bird balls, and constructing the contact water pond so there are no shallow areas that would allow birds to wade, forage, or nest. Ioneer would obtain NDOW Industrial Artificial Pond Permits and comply with requirements. Avian exclusion measures would be monitored by Ioneer personnel (WestLand 2023d). Impacts from exposure to contact water ponds and leaching vats would be negligible to minor, long-term, and localized.

Powerlines may pose electrocution and collision hazards to migratory bird and raptor species. Ioneer has committed to design and construct powerlines in accordance with the Avian Power Line Interaction Committee (APLIC 2006, 2012) guidelines to minimize risk. Bird-safe power poles would be used or

exposed parts would be covered to reduce electrocution risk. Areas of powerlines with the greatest risk of collision, if any, would be identified in consultation with NDOW and the BLM, and wire markings used to reduce potential for collision (WestLand 2023d). The powerlines would be reclaimed; therefore, impacts to avian species from the powerlines within the area of analysis would be minor, long-term, and localized.

Avian species could collide with vertical facilities, including the Tiehm's buckwheat designated critical habitat fencing, resulting in injuries or fatalities to individuals. Collision risk would be reduced by ACEPMs in the BBCS and design features of the facilities. The USFWS guidelines for tower siting, tower height, and lighting would be incorporated in tower construction and maintenance (WestLand 2023d). The five communication towers would be un-guyed, 30 to 40 feet in height, and free-standing monopoles to reduce collision risks. The use of hooded lights and dark sky lighting best practices would reduce collision potential for nocturnal avian species. The ancillary buildings and processing facilities would be no more than 200 feet high with few windows. Impacts would be negligible, long-term to permanent, and localized.

Constructed facilities would provide avian species with additional areas to perch and nest and could potentially increase predation by raptors on other avian species. Avian species may become entrapped in buildings which could lead to mortality from starvation and dehydration if they are unable to exit. Some species, such as sparrows and swallows, prefer to construct nests in covered areas and may be attracted to buildings. These impacts to avian species are anticipated to be minor, long-term, and localized.

Increased human presence and noise in the area of analysis could cause avian species avoidance. Over time, some species may become habituated to the Proposed Action. Impacts would be minor, long-term, and localized.

There would be an increase in traffic on the access road. Speed limits would be posted at 35 mph on haul roads, 45 mph on access roads, and 25 mph in the OPA (WestLand 2023d). Vehicle traffic associated with the Proposed Action could collide with avian species or other wildlife species. If fatalities occur, carcasses along the roadside could attract scavenging avian species such as common ravens. Ioneer would remove rabbit-sized or larger carcasses from roadways within the Plan boundary to reduce collision risks (WestLand 2023d). Impacts from vehicular traffic would be minor, long-term, and localized.

Ioneer would implement a reporting system for bird and bat mortalities and obtain appropriate permits and authorizations before removing carcasses. A quarterly mortality report would be submitted to NDOW, USFWS, and BLM. There would be annual training for personnel that includes the reasons, needs, and methods for reporting bird and bat injuries and mortalities, how to implement nest management protocols, standard operating procedures for the disposition of carcasses, the importance of complying with applicable regulations, and the potential consequences of noncompliance. Trainees would be instructed to immediately report injured wildlife and/or mortalities to Ioneer's Environmental Department. The instruction would include information on how to fill out mortality forms (WestLand 2023d).

An ERA was completed for the quarry lake once the quarry lake reaches its final elevation. The purpose of the ERA was to evaluate the potential for chemical risk to wildlife from exposure or ingestion of the water in the quarry lake. The ERA evaluated two scenarios: a base case scenario (Proposed Action) and twelve sensitivity analyses in which climatic input, groundwater inflow rate, and quarry wall runoff was manipulated within the model (Cedar Creek 2022). Quarry lake chemical concentrations were predicted for two stages in the base case scenario, including the quarry lake infilling stage (up to 50 years after closure) and the mature quarry lake (after 50 years post-closure) (Cedar Creek 2022). The quarry lake is predicted to be a groundwater sink with concentrations of arsenic, boron, fluoride, and molybdenum expected to exceed secondary enforceable and non-enforceable standards as well as NDEP Profile III reference values (Piteau 2024b).. The quarry lake would be available for use as a stopover site during migrations and as a foraging and watering site. If vegetation becomes established along the quarry edges or in areas of shallow water, additional nesting habitat may become present in the area of analysis. The value of the quarry lake as a stopover site would be dependent on the establishment of shallow water areas, aquatic/emergent vegetation, and a multi-level trophic food chain. Therefore, impacts would be negligible to minor, permanent, and localized.

Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). SP-01 (Cave Spring), SP-03A, SP-06, SP-07, SP-08, SP-09 (North Spring), SP-09A, SP-09B, SP-09C, SP-09E, SP-10 (Mamie Spring), SP-16, SP-17, SP-17A, SP-21, SP-21A, SP-21B, SP-22, SP-25, and SP-26 had surface water present during surveys (Piteau 2023b) and could be used by wildlife. Most of the springs within the drawdown contour are likely perched features as suggested by their elevated, hillside locations, while two are located in wash or canyon bottoms (HydroGeoLogica 2020b). Impacts to surface water availability from groundwater drawdown would depend on the source of groundwater at the springs. If these springs are perched features, then groundwater drawdown from the Proposed Action would not affect discharge flows. If the springs are sourced from upwelling groundwater, the dewatering may decrease the amount of water discharged to the springs. Cessation of groundwater sourced flow may occur unless water levels recover for a period of approximately 200 years (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for wildlife. If impacts to spring sites are realized, then impacts to avian species would be moderate, long-term, and localized.

Insect Species

The majority of the habitat removed would be reclaimed, but 383 acres would be permanently removed. Impacts from loss of forage would be minor, long-term to permanent, and localized because the area surrounding the Project would continue to provide habitat. The quarry lake may eventually have limited vegetation establish in shallow areas along the quarry edges that support the common checkered skipper, which would be dependent on the extent of recovery in the quarry lake. Beneficial impacts from the quarry lake would be negligible to minor, permanent, and localized. The additional traffic on the access road and in the OPA would likely injure or cause fatalities to individuals, but no populations would be impacted. Therefore, impacts would be minor, long-term, and localized. Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for wildlife. If drawdown effects on surface waters occur, impacts to insect species from the loss of a water source, foraging, and reproductive habitat would be moderate, long-term, localized.

Mammal Species

Approximately 2,306 acres of mammal habitat would be disturbed. Some may remain available through interim reclamation, but most would be unavailable for use until successful reclamation. Approximately 383 acres would be permanent. Competition for food and water resources could increase among individuals displaced. Increased competition may result in lower recruitment rates. Impacts from increased competition would be negligible to minor, long-term, and localized. Impacts from the loss of habitat would be minor, long-term to permanent, and localized.

The processing facility vats and contact water ponds would be fenced to exclude wildlife access. As such, impacts would be negligible, long-term, and localized. Even with fencing, there would be potential for small mammals to access contact water ponds and or the processing facility as they can typically go through, dig under, or climb over fencing. ACEPMs and NDOW Industrial Pond Permit requirements would reduce potential risk of exposure to contact water ponds. There would be a limited amount of leaching solution in the vats. The vats would contain the ore and there would be no solution at the surface. Therefore, leaching solution is not anticipated to be accessible to mammal species, but there could be limited potential for exposure. Impacts would be negligible to minor, long-term, and localized.

All sub-populations of Tiehm’s buckwheat and designated critical habitat would be fenced to prevent disturbance, encompassing 559 acres. The areas fenced may provide forage for mammal species. The proposed fencing would be four strand, wildlife-friendly fencing with the top and bottom strands barbless. The fencing would result in avoidance to the area temporarily during construction; however, mammal species would be able to continue to use the area as needed once construction is complete. Large mammals attempting to cross the fence may become entangled and individuals may be injured. Fencing would remain in place until successful reclamation; therefore, impacts to mammal species from fencing would be negligible to minor, long-term, and localized.

Construction of the proposed facilities would provide raptors with additional hunting perches where none currently exist which could result in increased predation on small mammals although no population level impacts are anticipated. These impacts to mammals are anticipated to be minor, long-term, and localized.

Increased human presence and noise could cause mammal species avoidance. Over time, some species may become somewhat habituated. Impacts would be minor, long-term, and localized.

There would be increased traffic on the access road with posted speed limits. Vehicle traffic associated with the Proposed Action could collide with mammal species (e.g., black-tailed jackrabbit, mule deer, etc.), injuring or fatally wounding mammals. If fatalities occur, roadside carcasses could attract scavenging mammal species such as coyotes. Ioneer would remove carcasses from roadways within the Plan boundary which would reduce collision risks with scavengers (Ioneer 2023b). Impacts from vehicular traffic associated with the Proposed Action would be minor, long-term, and localized.

Approximately 2,136 acres of year-round mule deer habitat would be disturbed, with 383 acres removed permanently. Pronghorn have also been observed in the area of analysis, but no habitat occurs. Construction of the North OSF would result in surface disturbance and increased human activity within approximately 695 feet (212 meters) of NDOW Silver Peak 04 (Cave Springs) Guzzler. Increased human activity may cause big game avoidance of the guzzler, limiting big game access to water. Ioneer would relocate and rebuild the guzzler based on recommendations from NDOW. The relocated guzzler would provide a source of water away from the OPA (WestLand 2023d). Impacts would be minor, long-term to permanent, and localized.

To understand chemical risk to mammal species, deer mouse, little brown bat, and mule deer were assessed in the ERA, which demonstrated that predicted constituent concentrations in the quarry lake would not cause adverse effects to terrestrial or avian life (Cedar Creek 2022). The quarry lake is not expected to result in ecological risk to mammals. Impacts would be negligible, permanent, and localized.

Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for wildlife. If drawdown effects on surface waters occur, reduced watering locations may result in increased competition for water at remaining sites, particularly in drought years. The increased competition may result in lower recruitment rates. Impacts would be moderate, permanent, and localized.

Reptile and Amphibian Species

Approximately 2,306 acres of habitat would be removed, of which 383 acres would be permanently removed. Reptile species and any eggs within soil or underground burrows could be injured, crushed, and/or killed, by equipment during the construction, maintenance, operation, and reclamation, and vehicular collisions could occur from the additional traffic. Equipment and vehicles would cause individual reptiles to perish but no populations would be removed. Impacts would be minor, long-term to permanent, and localized.

Facilities would allow for additional raptor perching opportunities which could lead to increased predation of reptile species. Impacts would be minor, long-term to permanent, and localized.

The quarry lake was not predicted to have adverse impacts to wildlife (Cedar Creek 2022). Impacts from the quarry lake would be negligible, permanent, and localized.

Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for wildlife. If drawdown effects on surface waters occur, impacts to reptile and amphibian species from the loss of a water source, foraging, and reproductive habitat would be moderate, long-term, localized.

4.18.1.2 Special Status Species

Aquatic Species

Fish Lake Valley Tui Chub: There would be no additional impacts beyond what is described for general wildlife aquatic species.

Fish Lake Valley Pyrg: There would be no additional impacts beyond what is described for general wildlife aquatic species.

Wong's Springsnail: If dewatering impacts are realized at Cave Spring, then depending on the amount of water reduction and habitat lost, fatalities to individual Wong's springsnails or the population may occur. Impacts to Wong's springsnails would be moderate to major, long-term, and localized. All other impacts to Wong's springsnail would be the same as those described for non-special status aquatic species.

Avian Species

Black-throated Gray Warbler: Approximately one acre of pinyon-juniper woodland habitat would be removed and permanently disturbed. Impacts would be negligible, permanent, and localized. No other impacts beyond those described for general wildlife avian species are anticipated.

Brewer's Sparrow: Approximately 2,209 acres of habitat (sagebrush and mixed shrub vegetation communities) would be removed, with 381 acres permanently disturbed. Impacts would be minor, long-term to permanent, and localized. No other impacts beyond those described for general wildlife avian species are anticipated.

Pinyon Jay: Approximately 1,065 acres of habitat (sagebrush and pinyon-juniper vegetation communities) would be removed, with 281 acres permanently disturbed. Impacts would be minor, long-term to permanent, and localized. No other impacts beyond those described for general wildlife avian species are anticipated.

Golden Eagle: Two nesting territories (Territories 9 and 10) contain nests within the recommended disturbance buffers from Project facilities. No nests within Territory 7-B were identified to be located within the one-mile buffer of surface disturbance or two-mile buffer for blasting activities (Ioneer 2023b). Within Territory 9, nests 77 and 23-129 are approximately 0.6 miles outside of the OPA and 1.18 miles from the edge of the quarry where blasting may occur. Nests 4-A and 4-B are approximately two miles from the OPA. Nests 77 and 23-129 are topographically shielded from the Project (Ioneer 2023b). There are no proposed facilities that are visible within one mile of the nest sites. Both nests face west to northwest and are on the north side of a ridgeline that runs east-west between the nest site and the proposed quarry. The topographic position of the nests, shielded by the ridge, may reduce the view and noise the proposed facilities. Nests 77 and 23-129 have a limited view of the eastern OPA where exploration activities could occur. Within Territory 10, nest 29 is approximately 0.9 miles from the West OSF, and approximately 1.34 miles from the quarry where blasting would occur. Nests 31-A and 31-B are approximately 1.2 miles outside the OPA and 1.79 miles from the edge of the quarry. All three nests are topographically shielded from the Project. The proposed facilities within one mile of the nest sites are not within line-of-sight. Nest 29 faces west and northwest away from quarry facilities and is separated from the Project by a ridge that runs north-south. Nests 31-A and 31-B also face west and northwest away from proposed facilities and are separated from the Project by the same ridgeline, as well as a smaller ridge (Ioneer 2023b). The topographic position of the nests, shielded by the ridge, may reduce the view and noise the proposed facilities. Nests 31-A and 31-B, being further from the OPA, may be alternate nests for nest 29.

Minimal blasting would be required during the initial quarry development near the original ground surface (WestLand 2023d). Blasting noise and vibration could disturb nesting golden eagles in the area, which may disrupt nesting success and productivity, as well as foraging. If nests are in-use, impacts would be moderate, long-term, and localized.

Ioneer would implement its Eagle Conservation Plan (ECP) to reduce impacts to golden eagles and is continuing to coordinate with the USFWS to refine its ECP based upon their comments and input. The ECP includes ACEPMs to reduce impacts from powerlines and to reduce the risk of vehicle collisions with eagles. The ECP contains annual training requirements for personnel that would include eagle recognition,

identification, and ecology awareness to encourage proper operational conduct, response, and reporting if an eagle is observed or encountered onsite. The ECP describes reporting procedures for injured eagles or fatalities. Powerlines would be designed with a five-foot separation between phases which would make it unlikely that a perching eagle would create a circuit by touching conductors (Ioneer 2023b). Impacts to eagles from collisions or electrocution are anticipated to be negligible, long-term, and localized.

Surface disturbance would impact less than one percent of available golden eagle foraging habitat within the area of analysis (Ioneer 2023e). Although a small percentage of foraging habitat loss, the disturbance may still impact adults tending their nests, young in the nests, adults perched on nearby associated perches and roosts, adults foraging or defending their territories, or adults traveling between nests and foraging areas. Additionally, habitat loss from the Proposed Action may reduce the size of the home range for each golden eagle, as well as the foraging areas and opportunities. Prey currently in the area may also relocate further away from the Proposed Action, causing golden eagles to travel further for prey. Any reduction in prey base could impact golden eagles. Impacts from surface disturbance are anticipated to be moderate, long-term to permanent, and localized. All other impacts to golden eagles would be the same as those described for general wildlife avian species.

Cassin's Finch, Common Nighthawk, Loggerhead Shrike, Ferruginous Hawk, and Western Burrowing Owl: Impacts to these species would be the same as those described for general wildlife avian species.

Mammal Species

Botta's Pocket Gopher: Approximately 980 acres of soil types suitable for burrowing would be disturbed, of which 96 acres would be permanent. Impacts would be negligible to minor, long-term to permanent, and localized. All other impacts would be the same as those described for general wildlife mammal species.

Desert Kangaroo Rat: Approximately 980 acres of soil types suitable for burrowing would be disturbed, of which 96 acres would be permanent. Impacts would be negligible to minor, long-term to permanent, and localized. All other impacts would be the same as those described for general wildlife mammal species.

Pale Kangaroo Mouse: Approximately 1,039 acres of suitable habitat would be disturbed within the Access Road and Infrastructure Corridor, of which, 104 acres would be permanent. The improvements to the access road and construction of the pipeline in habitat could result in direct injuries or mortalities. Impacts would be minor, long-term, and localized. All other impacts would be the same as those described for general wildlife mammal species.

Desert Bighorn Sheep: Approximately 2,129 acres of year-round desert bighorn sheep habitat would be removed, of which 383 acres would be permanent. Beneficial impacts may occur post-reclamation if disturbance results in creation of escape terrain such as steep slopes or rugged terrain or if reduced vegetation density or height results in improved visibility. Impacts would be minor to moderate, long-term to permanent, and localized. The Proposed Action would reduce the potential for the area of analysis to be used as lambing areas, and bighorn sheep would have to go into another area in the Silver Peak Range to lamb; potentially stressing ewes and lambs during the lambing season. Noise and increased human activity could have an adverse effect on desert bighorn sheep and cause them to avoid the area. This would be an added stressor to desert bighorn sheep, which may affect future recruitment. Impacts would be moderate, long-term, and localized. All other impacts would be the same as those described for general wildlife mammal species.

Bats: One acre (all permanent) of pinyon-juniper vegetation and three acres (one permanent) of cliff and canyon would be disturbed that may provide roosting habitat. This loss of potential habitat would be a negligible to minor, long-term to permanent, and localized impact. The haul road would overlap the OPA and would no longer be available to provide roosting habitat for bat species. No population impacts are anticipated. Depending on the extent that the adit is used, impacts would be negligible to minor, long-term, and localized. The quarry walls could be used as roosting habitat. The total area of steep cliff-like habitat created in the quarry would be reduced by the buttress for the long-term quarry wall stability and the extent of recovery at the quarry lake. Impacts would be negligible to minor, permanent, and localized. The quarry lake may provide a foraging area, as the water would likely attract insects, from which bats would feed. Beneficial impacts from additional roosting and foraging habitat would be negligible to minor, permanent,

and localized. The quarry lake was not predicted to have an ecological risk to bats (Cedar Creek 2022). The Proposed Action would create a source of light in the Silver Peak Range that would attract insects and, thus, foraging bats. Foraging in close proximity to facilities may result in collisions with associated infrastructure, causing injuries or fatalities. ACEPMs, such as utilizing hooded stationary lights and lighting plants and applying the BBCS would reduce impacts. Impacts would be negligible to minor, long-term, and localized. All other impacts would be the same as those described for general wildlife mammal species.

Reptile and Amphibian Species

California Toad and Western Toad: Improvements to the access road and construction of the pipeline could remove up to eight acres of potential habitat and could result in direct injuries or mortalities to toads, if present. Potential impacts could occur from sedimentation from periodic flooding on the access road or fugitive dust. Traffic on the access road would increase, but ACEPMs would reduce any impacts to California toads and western toads from fugitive dust. Therefore, impacts would be minor, long-term, and localized. The surface water features that have been identified as habitat for California toads and western toads are located outside of the groundwater drawdown contour (Piteau 2023b). Therefore, impacts from dewatering would be negligible, long-term, and localized. No special status reptile species were observed within the area of analysis.

4.18.2 North and South OSF Alternative

4.18.2.1 General Wildlife

The North and South OSF Alternative would have the same impacts to general wildlife species as the Proposed Action except there would be a shift in the location of some facilities and less surface disturbance. Total surface disturbance would be 2,271 acres. Permanent surface disturbance would be 214 acres. Disturbance to mule deer habitat would be 2,100 acres and surface disturbance would be 722 feet (220 meters) from the NDOW Silver Peak 04 (Cave Springs) Guzzler. Impacts to general wildlife species from surface disturbance, fugitive dust, quarry lake water quality, and dewatering associated with the North and South OSF Alternative would be negligible to minor, long-term to permanent, and localized.

4.18.2.2 Special Status Species

Aquatic Species

Impacts to the Fish Lake Valley tui chub, Fish Lake Valley Pyrg, and Wong's springsnail would be the same as those described for the Proposed Action.

Avian Species

Black-Throated Gray Warbler: Approximately 120 acres of habitat (pinyon-juniper vegetation community) would be removed, with eight acres permanently disturbed. Impacts would be minor, long-term to permanent, and localized. No other impacts beyond those described for general wildlife are anticipated.

Brewer's Sparrow: Approximately 2,019 acres of habitat (sagebrush and mixed shrub vegetation communities) would be removed, with 206 acres permanently disturbed. Impacts would be minor, long-term to permanent, and localized. No other impacts beyond those described for general wildlife are anticipated.

Golden Eagle: Impacts to golden eagles would be the same as those described for the Proposed Action except nest 29 would be approximately 0.53 miles from the South OSF. The South OSF would not be in line of sight of nest 29 (Ioneer 2023b). Impacts would be minor to moderate, long-term to permanent, and localized. No other impacts beyond those described for general wildlife species under the Proposed Action are anticipated.

Pinyon Jay: Approximately 902 acres of habitat (sagebrush and pinyon-juniper vegetation communities) would be removed, with 143 acres permanently disturbed. Impacts would be minor, long-term to permanent, and localized. No other impacts beyond those described for general wildlife avian species are anticipated.

Cassin's Finch, Common Nighthawk, Loggerhead Shrike, Ferruginous Hawk, and Western Burrowing Owl: Surface disturbance to 2,271 aces (214 permanent) of potential habitat. Other impacts to these species would be the same as those described for the Proposed Action.

Mammal Species

Botta's Pocket Gopher: Approximately 1,051 acres of soil types suitable for burrowing would be impacted, of which, 99 acres would be permanently disturbed. Impacts would be negligible to minor, long-term to permanent, and localized. All other impacts would be the same as those described for general wildlife.

Desert Kangaroo Rat: Impacts to desert kangaroo rat would be the same as those described for the Proposed Action, except that the North and South OSF Alternative would disturb 1,051 acres (99 permanent) that contain soils with suitable texture.

Pale Kangaroo Mouse: Impacts to pale kangaroo mouse would be the same as those described for the Proposed Action, except that the North and South OSF Alternative would disturb 1,113 acres of habitat, of which 62 acres would be permanent.

Desert Bighorn Sheep: Approximately 2,093 acres of year-round desert bighorn sheep habitat would be removed, of which 214 acres would be permanent. All other impacts would be the same as those described for the Proposed Action.

Bats: Impacts to bats would be the same as described for the Proposed Action except 120 acres of pinyon-juniper habitat and 10 acres of cliff and canyon habitat would be removed. Permanent disturbance would occur to eight acres of pinyon-juniper and less than one acre of cliff and canyon habitat.

Reptile and Amphibian Species

California Toad and Western Toad: Impacts to California toad and western toad would be the same as those described for the Proposed Action.

4.18.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated effects to wildlife resources would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM have already occurred and have contributed to loss of forage, habitat, and wildlife avoidance to those areas. These areas would be reclaimed. Impacts to wildlife, including migratory birds and special status species would be negligible, temporary to short-term, and localized.

4.19 Wild Horses and Burros

4.19.1 Proposed Action

Although the AML is set to zero for the portion of the Silver Peak HMA where the Proposed Action would take place, impacts to wild horses and burros could still occur. Approximately 2,286 acres of surface disturbance, including the conceptual dewatering and exploration disturbance, would occur in the 242,462-acre HMA which would be less than one percent of the HMA. Additionally, a portion of the water supply facility disturbance may occur in the Silver Peak HMA. All but 383 acres in the HMA would be reclaimed. Disturbance would reduce forage available to wild horses and burros. The wild horses and burros that are present in the Silver Peak HMA would be able to continue to forage outside of the areas disturbed. Impacts to wild horses and burros from habitat disturbance would be minor, long-term to permanent, and localized.

Fencing would be constructed around the processing facility, the quarry, explosives storage area, contact water ponds, Tiehm's buckwheat exclusion areas, and Tiehm's buckwheat designated critical habitat, excluding wild horses and burros. The fencing would prevent wild horses and burros from accessing areas that could have process solutions or be toxic for consumption. Impacts from fencing would be negligible to minor, long-term, and localized. There would be increased traffic on the access road which could lead to fatalities or injuries from collisions. The constant steady-flow of traffic on the access road would increase

noise and may displace wild horses and burros in the area. Impacts from the additional traffic on the access road would be minor, long-term, and localized.

Increased noise and human presence would occur in the area of analysis. Wild horses and burros typically respond to noise and human presence by avoidance or habituation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. Effects to wild horses and burros from human disturbance and noise could cause them to reduce or eliminate use of a larger land area than the Plan boundary itself; therefore, increasing use of other portions of the HMA over the life of the Proposed Action. The total extent of habitat loss from avoidance response is unable to be determined since the degree of this response varies between individual animals. Also, after initial avoidance of human activity and noise-producing areas, certain individuals may acclimate to the activity and begin to reoccupy areas initially avoided. Impacts from noise and human presence is anticipated to be minor, long-term, and localized.

The Proposed Action may result in the introduction or spread of noxious weeds and invasive species potentially resulting in the reduction of available forage quality and quantity within the HMA. Implementation of the Noxious and Invasive Weed Management Plan (NewFields 2022e) would reduce the potential for noxious weeds, invasive, and non-native species to become introduced or spread within the HMA. Impacts from noxious weeds, invasive, and non-native species would be negligible, long-term, and localized.

Following reclamation, an approximately 113-acre quarry lake would remain (Piteau 2022b). An ERA indicates that the predicted constituent concentrations in the quarry lake would not cause an adverse effect to terrestrial wildlife (e.g., wild horses or burros) (Cedar Creek 2022). Impacts from the quarry lake would be negligible to minor, permanent, and localized.

SP-1 (Cave Spring) and SP-6, have both been documented as having surface water present (HydroGeoLogica 2020b) and are located within the OPA. Increased activity near these two sites may cause wild horses and burros to avoid watering at these springs. Over time, wild horses and burros may become habituated to the increased activity. Impacts would be minor, long-term, and localized because there are multiple nearby springs outside of the OPA that provide water. There are 32 springs within the one-mile buffer of the predicted 10-foot groundwater drawdown contour from the Proposed Action dewatering and all are within the Silver Peak HMA. Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). Reduced flows or cessation of flows would limit water availability for wild horses and burros. Wild horses and burros would be required to travel to other locations for water. If impacts to spring sites are realized, then impacts to wild horses and burros within the Silver Peak HMA would be moderate, long-term, and localized.

4.19.2 North and South OSF Alternative

Impacts to wild horses and burros would be the same as those described for the Proposed Action, except there would be approximately 2,171 acres of disturbance in the Silver Peak HMA and Tiehm's buckwheat designated critical habitat would be fenced. Additionally, a portion of the water supply facility disturbance may occur in the Silver Peak HMA. There would be 214 acres of permanent disturbance. Impacts to wild horses and burros from habitat disturbance would be minor, localized, and long-term to permanent. Designated critical habitat fencing would exclude wild horse and burro use on 714 acres within the Silver Peak HMA which is less than one percent of the HMA. Impacts from fencing would be negligible to minor, long-term, and localized.

4.19.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated effects to wild horse and burrow would not occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed. Impacts to wild horses and burros would be negligible, temporary to short-term, and localized.

4.20 Cumulative Effects Analysis

This section analyzes potential impacts from past, present, and reasonably foreseeable future actions (RFFAs) combined with the Proposed Action and alternatives within the cumulative effects study area (CESA) specific to the resources for which impacts may be anticipated.

This analysis focuses on cumulative impacts of the Proposed Action, North and South OSF Alternative, and No Action Alternative, and other actions within the CESA. Major past and present land uses and disturbances within the resource CESAs that are projected to continue into the future include mineral development and exploration, utilities, infrastructure, roads, and other public purpose projects, geothermal exploration and development, solar energy development, wildland fires, livestock grazing, and agriculture. Dispersed recreation (including hunting, fishing, and OHV use) also occurs and is expected to continue. Past and present actions are included in the affected environment descriptions as they are part of the existing environment. Although geothermal leases exist within many of the CESAs, leased properties are not included under this analysis unless a detailed plan has been submitted to BLM.

The CESA boundaries vary in size and shape to reflect each evaluated resource. Cumulative effects should be evaluated in terms of the specific resource, ecosystem, and human community being impacted. To determine the size of each CESA, each resource was analyzed to determine the extent to which the environmental effect from the Proposed Action and alternatives could be reasonably detected and the geographic area impacted was defined. The geographical areas considered for the analysis of cumulative effects are illustrated on the CESA figures for each resource (**Figures 4-8**, **4-9**, **4-10**, and **4-11**). Descriptions, acreages, and corresponding figures for each CESA are detailed in **Table 4-5**.

Table 4-5 Cumulative Effects Study Area by Resource

Resource	Cumulative Effects Study Area	Size (acres)	Figure
Air Quality and Climate Change	Includes the local airshed, which is a 50-km buffer of the OPA.	2,227,749	Figure 4-10
Cultural Resources	Includes the direct, visual, auditory, and vibrational ZoAs.	138,575	Figure 4-8
Environmental Justice	Includes Census Block Groups overlapping portions of Esmeralda, Mineral, and Nye counties, Nevada and Inyo and Mono counties, California.	22,888,952	Figure 4-11
Geology and Minerals	Includes the Plan boundary.	7,166	Figure 4-8
Hazardous Materials and Solid Waste	Includes the Plan boundary and main routes on which hazardous materials would be transported, including the routes from the Project north on SR 264, SR 773, U.S. 6, and U.S. 95 to Reno; and from the Project south on SR 264, SR 266, and U.S. 95 to Las Vegas.	7,166[1]	Figure 4-8
Land Use and Realty	Includes the Plan boundary.	7,166	Figure 4-8
Livestock Grazing	Includes the Ice House, Red Spring, Silver Peak, and Fish Lake Valley allotments.	481,299	Figure 4-9
Native American Traditional Values	Includes the Plan boundary and a larger regional area that encompasses Fish Lake Valley and Clayton Valley.	810,519	Figure 4-10
Recreation	Includes the Plan boundary and hunt unit 211.	620,928	Figure 4-10
Social and Economic Values	Includes Esmeralda, Nye, and Mineral counties in Nevada and Inyo County in California.	22,929,628	Figure 4-11
Soil Resources	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	53,790	Figure 4-8
Threatened and Endangered Species – BSSG	Includes the Plan boundary and White Mountain PMU.	1,753,885	Figure 4-10
Threatened and Endangered Species – Monarch Butterfly	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	53,790	Figure 4-8

Resource	Cumulative Effects Study Area	Size (acres)	Figure
Threatened and Endangered Species – Tiehm's buckwheat	Includes the Plan boundary.	7,166	Figure 4-8
Transportation and Access	Includes the Plan boundary and main routes which Project traffic would utilize, including from the Project north on SR 264, SR 773, U.S. 6, and U.S. 95 to Reno; and from the Project south on SR 264, SR 266, and U.S. 95 to Las Vegas.	7,166 (Plan boundary)	Figure 4-11
Vegetation Including Noxious Weeds and Special Status Species	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	53,790	Figure 4-8
Visual Resources	Includes the Plan boundary and the range of possible viewpoints as seen from the KOPs associated with the Project.	99,929	Figure 4-9
Water Resources	Includes the model domain boundary, which includes Fish Lake Valley HA 117 and portions of Big Smoky Valley and Clayton Valley.	845,428	Figure 4-10
Wetland and Riparian Resources	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	53,790	Figure 4-8
Wildlife Resources - General Wildlife, Special Status Species, and Migratory Birds	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	53,790	Figure 4-8
Wildlife Resources – Golden Eagles	Includes a 10-mile buffer of the Plan boundary.	506,241	Figure 4-10
Wildlife Resources – Bighorn Sheep and Mule Deer	Includes hunt unit 211.	620,928	Figure 4-9
Wild Horses and Burros	Includes the Plan boundary and a one-mile buffer of the maximum extent of the predicted 10-foot groundwater drawdown contour related to dewatering.	242,868	Figure 4-9

Past, present, and RFFAs were identified within each CESA as projects that could potentially interact or have a close causal relationship with the Proposed Action or alternatives. These actions were identified using BLM's LR2000 records and aerial imagery. Present actions that are considered include those that have existing and/or ongoing disturbance. RFFAs are those actions where a permit application has been submitted but an action has not yet been authorized.

Within each CESA, projects have been grouped as past, present, and RFFAs, as well as identified by resource group in the sections below. Surface disturbance characteristics were selected to describe the projects for most resources because it allows the combined surface disturbance impacts of all projects to be totaled; these surface disturbances are shown in **Table 4-6**. Acres of disturbance are not applicable to air quality, environmental justice, hazardous materials and solid waste, social and economic values, and transportation and access; thus, impacts to those resources are discussed qualitatively.

Table 4-6 Past, Present, and RFFAs

Past, Present, and RFFAs, Disturbances and Projects	Cultural Resources CESA	Geology and Minerals; Land Use and Realty; and Threatened and Endangered Species – Tiehm's Buckwheat CESA	Livestock Grazing CESA	Native American Traditional Values CESA	Recreation; and Bighorn Sheep and Mule Deer CESA	Soils; Threatened and Endangered Species – Monarch Butterfly; Vegetation; Wetlands; and General Wildlife CESA	Threatened and Endangered Species – BSSG CESA	Visual Resources CESA	Water Resources CESA	Golden Eagle CESA	Wild Horses and Burros CESA
CESA Acres	138,575	7,166	481,299	810,519	620,928	53,790	1,753,885	99,929	845,428	283,429	242,868
Past Actions											
Mineral and Mining Development and Exploration											
Sand and Gravel Operations, Materials Sites and Community Sand and Gravel Pits	80	40	332	421	340	40	279	0	464	0	215
Notices	62	26	990	339	1,001	45	62	22	244	166	850
Mining and Exploration Projects	0	0	6	31	6	0	0	0	31	6	0
Utilities, Infrastructure, and Public Purpose											
Powerlines	194	194	279	292	0	199	4,307	85	632	0	12
Water Infrastructure	0	0	3	32	0	0	2,047	0	33	12	0
Telephone and Fiber Optic Lines	0	0	1,987	113	0	0	1	0	146	1,655	113
Communication Facilities	0	0	148	0	0	0	64	0	0	11	0
Public Purpose	83	0	253	901	1,345	0	89	0	901	521	0
Solar Energy											
Solar Facilities	0	0	16,560	0	0	0	0	0	0	0	0
Geothermal											
Geothermal Infrastructure	0	0	7	15	0	0	5	0	0	0	0
Oil and Gas											
Oil and Gas Pipeline	0	0	0	631	0	0	0	0	631	0	0
Past Actions Total Disturbance Acres	**419**	**260**	**20,564**	**2,775**	**2,692**	**284**	**6,853**	**107**	**3,082**	**2,371**	**1,190**
Present Actions											
Mineral and Mining Development and Exploration											
Sand and Gravel Operations, Materials Sites and Community Sand and Gravel Pits	81	41	899	417	989	41	200	40	774	779	14
Clayton Valley Mine	0	0	0	620	620	0	0	0	620	620	620
Mineral Ridge Mine	0	0	0	250	250	0	620	0	250	250	0
Silver Peak Mine	0	0	0	40	40	0	40	0	40	40	40
Grefco Mine	0	0	0	0	220	0	0	0	0	0	0
Notices	<1	0	29	56	7	<1	16	0	21	0	0
Utilities, Infrastructure, and Public Purpose											
Powerlines	24	1	964	1,617	1,137	43	1,401	116	1,518	397	2,605
Communication Facilities	<1	0	13	15	13	0	5	0	9	5	0
Telephone and Fiber Optic Lines	15	14	53	24	43	14	73	0	24	20	<1
Water Pipelines and Water Infrastructure	0	0	34	50	28	0	56	0	68	47	28
Public Purpose	340	0	0	360	360	10	30	0	360	350	30
Airports	0	0	0	160	160	0	0	0	160	160	0
Agricultural											
Agricultural Areas	2	0	1,785	7,658	7,658	1,687	11,710	2,751	11,481	6,210	4,662
Geothermal											
Geothermal Development	0	0	0	0	100	0	0	0	100	0	0
Geothermal Exploration	0	0	100	0	0	58	100	0	0	100	1
Roads and Railroads											
State Routes	9	9	250	374	374	36	1,509	81	719	319	9
US Highway	0	0	128	333	333	0	1,921	0	0	0	0

Past, Present, and RFFAs, Disturbances and Projects	Cultural Resources CESA	Geology and Minerals; Land Use and Realty; and Threatened and Endangered Species – Tiehm's Buckwheat CESA	Livestock Grazing CESA	Native American Traditional Values CESA	Recreation; and Bighorn Sheep and Mule Deer CESA	Soils; Threatened and Endangered Species – Monarch Butterfly; Vegetation; Wetlands; and General Wildlife CESA	Threatened and Endangered Species – BSSG CESA	Visual Resources CESA	Water Resources CESA	Golden Eagle CESA	Wild Horses and Burros CESA
Local Roads	297	134	2,967	4,106	4,106	418	13,715	732	5,374	2,997	1,343
Present Actions Total Disturbance Acres	**767**	**200**	**7,221**	**16,082**	**16,438**	**2,307**	**31,396**	**3,720**	**21,519**	**12,294**	**9,352**
RFFAs											
Mineral and Mining Development and Exploration											
Sand and Gravel Operations, Materials Sites and Community Sand and Gravel Pits	0	0	0	0	0	0	0	0	5	0	3
Silver Sun Mine	0	0	10	10	10	0	10	0	10	10	10
Neolith CV Project	0	0	1,280	1,280	1,280	0	624	0	1,280	0	1,280
Notices	<1	0	0	6	0	0	0	0	0	<1	0
Clayton Ridge North Mine	0	0	1,295	1,295	0	0	1,295	0	0	0	0
Clayton Ridge Exploration	0	0	0	200	0	0	0	0	0	0	0
Montezuma Exploration Project	0	0	0	7,673	0	0	0	0	0	0	0
Clayton Valley Lithium Exploration	0	0	1,280	1,280	0	0	0	0	0	0	0
Teels Marsh Exploration	0	0	0	0	0	0	64	0	0	0	0
Utilities, Infrastructure, and Public Purpose											
Powerlines	156	0	3,278	929	1,879	188	1,955	0	0	3,404	643
Solar Energy											
Solar Energy Facilities	0	0	70,463	6,922	65,335	0	49,848	0	65,335	70,463	20,099
Geothermal											
Geothermal Exploration	57	<1	57	104	57	0	312	57	57	57	57
Geothermal Utilization	311	311	311	311	311	311	311	311	311	311	311
RFFAs Total Disturbance Acres	**524**	**311**	**77,974**	**20,024**	**68,872**	**500**	**54,419**	**368**	**70,480**	**74,245**	**22,403**
Past, Present, and RFFAs Total Disturbance Acres	**1,711**	**771**	**105,759**	**38,881**	**88,002**	**3,091**	**92,668**	**4,196**	**95,080**	**88,911**	**32,945**
Percent of CESA	**1**	**11**	**22**	**5**	**14**	**6**	**5**	**4**	**11**	**31**	**14**
Fires	**0**	**0**	**<1**	**0**	**<1**	**0**	**0**	**0**	**0**	**0**	**0**

Source: BLM 2023d

4.20.1 Air Quality

The CESA for air quality is a 50-km buffer of the OPA which encompasses 2,227,749 acres. Existing air quality within the CESA is currently in Attainment or Unclassified for all criteria pollutants. Development in the CESA has included: mining and mineral exploration activity; utility and infrastructure construction (e.g., water pipelines, fiber optic lines, powerlines, etc.); range improvements; road construction; limited urban development; and agriculture areas. These uses would continue in the future. Projects have accounted for short-term to long-term surface disturbance generating varying levels of PM, gaseous emissions, and GHG emissions. Smoke generated during past wildland fires have had intermittent impacts on local air quality and wildland fires are likely to occur in the future.

Effects to air quality in the CESA from past, present, and RFFAs is largely from airborne dust released during construction, vehicle travel on unpaved roads, and smoke from wildland fires. Mine development and exploration operations can also affect air quality through emissions from vehicles and process equipment, as can utility development during construction. Grazing and agricultural operations can produce fugitive dust, but the quantities are minimal and are expected to remain approximately equal to present conditions. They also generate gaseous pollutants from vehicle emissions used for these activities.

There are several past and present sand and gravel operations, including the authorized mineral materials that hold Surface Area Disturbance permits from NDEP or Class II Change or Location permits throughout the CESA. There are no pending sand and gravel authorizations. Sand and gravel operations generate dust from grading and generate vehicle emissions from equipment used for extraction.

There is a pending geothermal utilization site within the CESA for the Open Mountain Energy Fish Lake Geothermal Project. There is also a geothermal exploration site for the Lone Mountain Geothermal Exploration Project. Particulate and gaseous emissions would be generated during construction and operation of these RFFAs. However, these authorizations typically include ACEPMs that reduce fugitive dust emissions as well as equipment emissions, and the authorizations would need to comply with applicable NDEP air permitting requirements.

Travel on unpaved roads in the CESA can affect air quality from vehicle emissions and fugitive dust, but this type of use has not affected air quality measurably in the past and is considered a negligible in terms of overall air quality impacts within the CESA. Two mining projects are reasonably foreseeable within the CESA. The Clayton Valley Mine is currently authorized under a small pilot plant, with a full project assessment in development with an estimated disturbance area of 3,700 acres. The Silver Sun Mine is a possible future project with an expected disturbance area of 10 acres.

4.20.1.1 Proposed Action

The cumulative effects assessment evaluates whether the combined effects of the Proposed Action, alternatives, and other significant permitted or pending air pollutant emissions from adjacent sources, plus background levels of applicable air pollutants, have the potential to create any exceedances of NAAQS. A recent renewal of the Class II NDEP Operating Permit (AP1041-2733) was completed for Mineral Ridge Gold, LLC (Mineral Ridge Mine). Air emissions from the facility consist of PM, $PM_{2.5}$, PM_{10}, NO_x, CO, SO_2, VOC, HAPs, and GHGs. This consists of process and insignificant emission sources (ASI 2020). Albemarle U.S., Inc. operates a Lithium Carbonate manufacturing facility associated with the Silver Peak Mine currently operating under NDEP Permit AP2819-005.04 (Trinity 2022b).

It is not anticipated that the cumulative increase in emissions, when combined with emissions from the Proposed Action, would result in NAAQS compliance issues. The total estimated cumulative HAP emissions are less than 10 tpy for a single HAP and 25 tpy for all HAP emissions in aggregate. The cumulative GHG emissions resulting from the Proposed Action and other major sources would represent approximately one percent of the gross GHG emissions for the state of Nevada (46.3 million metric tons) (NDEP 2021). The GHG emissions associated with the Proposed Action would generate a cumulative increase of approximately 1.01 percent of the total state of Nevada emissions.

Data was gathered for all sources within the 50-km radius which included Esmeralda, Mineral, Nye, and Mono counties. The inventory included 11 sources, which were screened based on an emissions (Q) over

distance (D) technique identified as “20D” (Trinity 2023). **Table 4-7** illustrates the results of the Q/D assessment, all of which are below 20. Therefore, increment and cumulative modeling was determined to not be required.

Table 4-7 Regional Inventory Q/D Analysis

Facility Name	Emissions Q (tons)	Distance from Project D (km)	Q/D	Q/D<20
Argentum Mill[1]	130	37.0	3.52	Yes
Silver Peak Operations[1]	97.8	25.3	3.86	Yes
Grefco Minerals, Inc.[1]	145	36.7	3.96	Yes
Mineral Ridge Mine[1]	116.6	14.3	8.15	Yes
Circle L ranch Airport[2]	9.12	21.9	0.42	Yes
Dyer Airport[2]	4.50	26.5	0.15	Yes
North Valley Airport[2]	1.88	21.2	0.09	Yes
Heart of Nature[1]	16.5	21.4	0.77	Yes
Coaldale Junction Cell Tower[2]	0.04	23.0	1.91E-03	Yes
Fisher Sand & Gravel[2]	53.7	28.5	1.89	Yes
Jim Wilkin Trucking, LLC[2]	68.6	40.8	1.68	Yes

[1] Emissions are derived from most recent NDEP Permit or Technical Review
[2] Emissions are derived from the USEPA 2017 NEI database

4.20.1.2 North and South OSF Alternative

The authorized emissions would be similar to the Proposed Action, but some impacts would be geographically different. The geographic differences in disturbance are not anticipated to result in different emissions from the Proposed Action. As a result, cumulative impacts are anticipated to be the same as the Proposed Action.

4.20.1.3 No Action Alternative

Under the No Action Alternative, cumulative emissions would occur within the CESA. No emissions inventory has been prepared for the previously authorized explorations operations. However, it is reasonable to assume that the No Action Alternative would have less emission generation levels than the Proposed Action; thus, cumulative emissions would be less than discussed for the Proposed Action, and this alternative, when combined with past, present, and RFFAs would be compliant with all NAAQS.

4.20.2 Cultural Resources

The CESA for cultural resources includes the PAPE and visual, auditory, and vibrational ZoAs. The total area of the CESA encompasses 138,575 acres. Past and present actions affecting cultural resources include mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads and railroads; agricultural areas; dispersed recreation; and livestock grazing. There have been no wildfires in the CESA. The past and present land uses in the CESA may have resulted, or may result, in the loss, disturbance, theft, and burial of cultural artifacts, as well as the modification and alteration of the setting of cultural resources. The incremental degradation of cultural resources reduces the information and interpretive potential of historic properties.

Development on state and federal lands requires that cultural resource surveys be conducted to determine the presence of cultural resources eligible for listing on the NRHP; however, there is no such requirement for disturbance on private lands unless there is a federal or state nexus. As directed by Section 106 of the NHPA, NRHP-eligible cultural resources are generally avoided or mitigated if avoidance is not feasible for projects with a federal or state nexus. Disturbances conducted prior to 1966 and the NHPA, and/or those without a federal or state nexus generally did not identify/quantify cultural resources or impacts to them.

The RFFAs within the CESA would include a mineral notice and geothermal exploration/development. Wildland fires could occur in the future, as would restoration projects, agriculture, livestock grazing, and

dispersed recreation. These activities would lead to similar impacts as stated for past and present actions. Of the 138,575 acres covered by the CESA, 1,711 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately one percent of the CESA.

4.20.2.1 Proposed Action

The Proposed Action would increase the disturbance within the CESA by 2,306 acres to approximately 4,017 acres or approximately three percent of the CESA. Development of the Proposed Action may contribute to the loss of site integrity of NRHP-eligible historic properties if they cannot be avoided by Project design. The implementation of an MOA and HPTP would adequately mitigate adverse impacts. Data recovery of NRHP-eligible cultural resources that could not be avoided would expand the regional database and knowledge of prehistoric and historic contexts. Mitigation measures developed to avoid or minimize direct and indirect impacts would also minimize contributions to cumulative effects. Cumulative effects to cultural resources from past, present, and reasonably foreseeable future activities combined with the Proposed Action would be adverse, permanent, and localized.

Historic properties located in the CESA on federal land or if there is a federal nexus, would be mitigated in accordance with applicable Section 106 consultation requirements. In addition, any previously unknown NRHP-eligible cultural resources discovered during construction activities would be treated in accordance with the MOA and ACEPMs. Compliance with Section 106 of the NHPA has minimized adverse effects to historic properties; however, past and present disturbances in the CESA have resulted in cumulative impacts to these properties. Cumulative effects to historic properties from past, present, and reasonably foreseeable future activities combined with the Proposed Action would be adverse, permanent, and localized; an MOA and HPTP would be implemented to mitigate these adverse impacts.

4.20.2.2 North and South OSF Alternative

The North and South OSF Alternative would increase the disturbance within the CESA by 2,271 acres to approximately 3,982 acres or approximately three percent of the CESA. Cumulative impacts under North and South OSF Alternative would be similar to the Proposed Action.

4.20.2.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. The alternative would not contribute to cumulative effects to cultural resources.

4.20.3 Environmental Justice

The CESA for environmental justice includes Esmeralda, Nye, and Mineral counties in Nevada and Inyo County in California and encompasses 22,888,952 acres.

Past and present actions within the CESA include mineral exploration and development, oil and gas development, geothermal exploration and development, agricultural operations, solar facility development, and utilities and infrastructure development. Utilities and infrastructure development would typically have impacts during construction but may also have impacts during operations and maintenance, especially if these facilities are disproportionately located in areas where communities with environmental justice concerns exist.

Agricultural activities occur throughout the CESA and have potential impacts to water quantity from ground water or surface water pumping needed for irrigation and stormwater runoff. Agriculture may also impact ground water quality from stormwater runoff and ground water pumping. Agricultural activities impact the socioeconomic conditions of the CESA, including employment and income, but impacts to population increases, housing availability, and community facilities and services are more limited than other industries, such as mining. These activities may increase traffic and the use of and transportation of hazardous materials, though generally to a lesser extent than large projects.

Mining is an existing activity in the CESA. Past and present mining include the Mineral Ridge Gold Mine, Albemarle Silver Peak Lithium Operation, Blanco Mine, Basalt Mine, and Lone Mountain Turquoise Mine in Esmeralda County; Denton-Rawhide Mine and Isabella Pearl Mine in Mineral County; and Premier

Chemicals, LLC Mine and Round Mountain Mine in Nye County (NBMG 2022). Impacts from mining and exploration may include increased traffic, air, noise, and light pollution, transportation of hazardous material, socioeconomics, and potential water resource conflicts through water quality impacts from operations, and water quantity impacts from dewatering operations and consumptive water use. All of these projects have resulted in the existing socioeconomic conditions of the CESA, which include impacts from increased population, housing availability, community facilities and services, local government finances, social and cultural landscape, employment, and income.

Authorized geothermal exploration includes the Lone Mountain and Pearl Geothermal Exploration Projects. Geothermal leases occur throughout the CESA, and geothermal lease holders have a right to exploration activities, so the possibility of future exploration is likely. Geothermal exploration may impact existing socioeconomic conditions, as well as air quality, visual resources, water quality and quantity, traffic generation, and transportation of petroleum products and hazardous materials. Impacts from geothermal exploration are typically short-term due to the nature of exploration and employment levels are low. However, if multiple geothermal exploration projects occur at the same time, the impacts would occur to a greater extent. The Don A Campbell I and II Geothermal Projects are two existing 25-megawatt geothermal power generating facilities located in Mineral County (SCPPA 2023), and part of the existing condition in terms of air quality, visual impacts, water quality and quantity, traffic and hazardous material transportation, and the socioeconomic conditions of the CESA.

RFFAs include mineral exploration and new and continuing mining operations, such as the Clayton Valley and Neolith Projects, Silver Sun Mine, Clayton Ridge North Mine, and Kinross Montezuma Exploration Project. Impacts would be the same as discussed for past and present mining actions. Other developments would include utilities and infrastructure construction, solar facility development, and wind energy developments. Primary impacts to environmental justice populations from these actions would be during construction, including noise, air, and light pollution, traffic generation, water quality from erosion or sedimentation, and water use; however, lasting impacts may remain on the landscape after construction. Pending geothermal development and exploration projects include the Fish Lake Geothermal Project. Geothermal development and exploration operations have similar impacts as discussed for other actions, including increased traffic, air quality impacts, increased night lighting, noise increases, water use, and increased job opportunities. The NV Energy Greenlink West Project is proposed throughout portions of the CESA, which would include a system of new 525-kV, 345-kV, 230-kV, and 120-kV electric transmission facilities between northern and southern Nevada (BLM 2022). Due to the extent of this project, socioeconomic impacts would occur regionally throughout the CESA, primarily during construction of the power facilities, but impacts would also occur during operations and maintenance, and the project may allow for further development of the areas due to increased potential for power connectivity.

Six applicants have requested ROW grants to construct, operate, and decommission seven solar projects in Esmeralda County that would tie into the NV Energy Greenlink West Project. The solar projects would likely contribute to the same impacts as discussed above. This would include visual impacts during and after construction, water use and potential water quality impacts from grading operations (e.g., sedimentation and erosion), increased population during construction which may result in potential housing shortages, increased use of public services and facilities during construction, impacts to county budgets, impacts to employment and income, increased traffic, air quality impacts during construction, and potential increases in transportation of hazardous materials during construction. The RFFAs would have impacts to the social and cultural landscape of the CESA, which primarily has a rural character.

4.20.3.1 Proposed Action

The Project would result in a cumulative increase in surface disturbance, mining and ancillary facility construction, transportation of hazardous materials, traffic generation, air quality impacts, and increased water use within the CESA. Air, noise, and visual impacts from the Project would reduce further from the Project. However, it would be an overall increase in air emissions, noise, and viewshed impacts when combined with present and RFFAs, so impacts may be more noticeable with simultaneous projects.

The Project would represent a cumulative increase in hazardous material transportation within the CESA. The probability of release of hazardous material was determined to be low, with diesel being the highest probability of release. When combined with present or RFFAs, there would be more hazardous material

shipments occurring on the hazardous material transportation route, which may have a potential to increase some of the probability of release with multiple projects transporting hazardous material concurrently.

Impacts to water quality and quantity would be cumulatively increased under the Proposed Action. It is not anticipated that the Proposed Action would result in water quality issues due to the design and requirements from the WPCP that would be secured for the Project through the NDEP, Bureau of Mining Regulation and Reclamation. Water pumping from the agricultural areas would be equal to the agricultural pumping, less the NDWR adjustment, Therefore, analysis of pumping for mine water supply assumes the use of active water rights. The analysis of effects on water rights assumes that existing consumptive uses in Fish Lake Valley would continue at their current rate which are near the Fish Lake Vally basin's perennial yield. If present and RFFAs include concurrent groundwater pumping from new or existing water rights, this would cumulatively impact the groundwater resources in the area, which may include cumulative impacts to water rights and spring sites. Due to the presence of low-income, minority, and Native American communities identified in the CESA, impacts from drawdown associated with present and RFFAs would disproportionately impact environmental justice populations of concern.

The Proposed Action would cumulatively increase traffic on the CESA roadways when combined with present and RFFAs. The Proposed Action would increase traffic on area roadways from bus traffic, truck traffic, and light vehicle traffic. When combined with present and RFFAs that add additional vehicle traffic on the roads, there would be a cumulative impact to traffic conditions. This may include motorist delays as the roadways become more congested or increased accident rates as more vehicles are on the road. Given there are low-income, minority and Native American populations that meet the environmental justice screening requirements within Census Block Groups along the transportation route within the CESA, transportation-related impacts from present and RFFAs would disproportionately affect populations with environmental justice concerns.

The Proposed Action, when combined with present and RFFAs would increase the population of the CESA through construction and operations employment. This would also increase income and employment levels, and cumulatively add to tax revenues. When combined with present and RFFAs, the increased population would potentially have impacts on housing availability within the CESA, which already has low vacancy rates for rental and long-term housing. Other cumulative impacts may occur to county revenues if counties need to hire additional staff, or account for increasing public services/capacity to accommodate the Proposed Action population, in addition to concurrent present or RFFAs. Impacts to county finances may affect capacity to increase services and infrastructure to accommodate population increase from present and RFFAs in the CESA. This would disproportionately and adversely impact environmental justice populations in the area of analysis by potentially decreasing access to public social services. Whereas there would be additional tax revenue received from the Proposed Action, present actions and RFFAs, it is uncertain if the additional cumulative tax revenue would completely offset increased spending required by the counties to accommodate population increases and use of public services, particularly since the timing of receiving tax revenue may not coincide with when impacts occur.

The Proposed Action Alternative would contribute to cumulative effects on low-income, minority, and Native American populations in the CESA. The cumulative effects on communities with environmental justice concerns from the past, present, and RFFAs, including the Proposed Action, would be moderate to major, long-term, and regional.

4.20.3.2 North and South OSF Alternative

Cumulative impacts would be similar to the impacts from the Proposed Action.

4.20.3.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur contributing to potential impacts to communities with environmental justice concerns. Cumulative impacts would be moderate, long-term, and regional.

4.20.4 Geology and Minerals

The CESA for geology and minerals includes the Plan boundary and encompasses 7,166 acres. Within this CESA, past actions resulted in 259 acres disturbance, including sand and gravel mining, minerals exploration notices, and powerlines. Present actions have resulted in 200 acres of disturbance, including sand and gravel mining; power, telephone, and fiber optic lines; and state and local roads. RFFAs would result in 311 acres of disturbance, consisting of geothermal exploration and use.

Mineral development and exploration activities typically have the largest impacts on geology and mineral resources because they can contribute to mineral resource depletion, removal of mineral resources from availability for development, topographic changes, and affect geotechnical stability. Other past and present actions may impact access to mining claims, or access to areas for mineral exploration and development. Geothermal exploration and development would have similar impacts. Other actions with potential effects include utility lines and roads. While these activities also disturb surface acreage, they typically conform closely to the local topography and have negligible, if any, impacts on geology and mineral resources. RFFAs within the CESA would include wildland fires, restoration projects, livestock grazing, and dispersed recreation. While these activities also disturb surface acreage, they would have negligible, if any, impacts on geology and mineral resources. Of the 7,166 acres covered by the CESA, 771 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately 11 percent of the CESA.

4.20.4.1 Proposed Action

The Proposed Action would add approximately 2,306 acres of surface disturbance resulting in a cumulative surface disturbance in the CESA of 3,077 acres, or approximately 43 percent of the CESA. Not all these acres would result in major permanent impacts to geology and mineral resources as they would be reclaimed and accessible for future mineral exploration and development. Cumulative impacts to geology and mineral resources would be moderate, localized, and long-term to permanent.

4.20.4.2 North and South OSF Alternative

Cumulative effects to geology resources under the North and South OSF Alternative would be similar to those described for the Proposed Action. The alternative would result in 2,271 acres of surface disturbance. Combined with 711 acres of disturbance associated with past, present, and RFFAs, this would be about 42 percent of the CESA. Cumulative impacts to geology and minerals would be minor, long-term, and localized.

4.20.4.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. Impacts to geology and minerals from past, present, and RFFAs in the CESA have resulted in minor, long-term to permanent, and localized cumulative effects. No additional cumulative impacts beyond the past, present, and RFFAs would occur.

4.20.5 Hazardous Materials and Solid Waste

The CESA for hazardous materials and solid waste includes the Plan boundary and main transportation access routes on which hazardous materials would be transported. Within this CESA, past and present actions using the transportation routes within the CESA occurs from mineral development and exploration projects; utilities, infrastructure and public purpose activities; oil, gas, and geothermal exploration and development; road and railroads; dispersed recreation; agricultural operations; and livestock grazing.

The transportation routes have been used in the past, and currently are being used to transport hazardous materials, including reagents and petroleum, to nearby users. Vehicles using these routes also contain petroleum fuels. Increased traffic on these routes increases the potential for vehicle collisions, including those transporting hazardous materials. Utilities such as telephone lines would use petroleum-based products during construction and operation. Recreation and public purpose sites may require transportation and use of chemicals and hazardous material, including petroleum products, as well as disposal of material in permitted landfills. All existing projects would need to comply with federal, state, and local regulations relevant to the transport, handling, and disposal of wastes. RFFAs within the CESA would continue to include restoration projects, livestock grazing, agricultural operations, and dispersed recreation. These actions would have similar impacts as stated for past and present actions. Wildland fires may also occur in

the future. These actions would have similar impacts as stated for past and present actions. Transportation to proposed geothermal development projects would increase the amount of vehicles in the CESA and transport of hazardous materials, including petroleum products.

4.20.5.1 Proposed Action

The Proposed Action and other past, present, and RFFAs would transport and utilize hazardous materials throughout the CESA. Past, present, and RFFAs have used, or are currently using off site permitted landfills to dispose of solid waste and must comply with all federal, state, and local regulations relevant to the transport, handling, and disposal of wastes. With BMPs and management plans in place for these authorizations, a release to the environment during transportation and use is low, though possible. The Project would cumulatively increase the amount of bulk process chemicals, fuels, and supplies transported on roadways within the CESA, potentially increasing the chances of accidents during transportation or inadvertent spills of hazardous material or petroleum products during use on site. Hazardous materials would be transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR, and carriers would be licensed and inspected as required by the NDOT and USDOT. Tanker trucks would be inspected and have a Certificate of Compliance issued by the Nevada Motor Vehicle Division. These requirements would also apply to other present and RFFA authorizations.

The Proposed Action would increase the disposal of solid waste transported off site to an authorized landfill. This would increase the transportation and disposal of solid waste within the CESA, but the Project would be required to comply with all applicable regulations and requirements for solid waste disposal. Potential cumulative effects associated with the transportation and use of hazardous materials and solid waste from past, present, and RFFAs including the Proposed Action, are expected to be negligible to moderate, long-term, and localized to the CESA.

4.20.5.2 North and South OSF Alternative

Under the North and South OSF Alternative, the cumulative environmental impacts for hazardous materials and solid waste would be the same as the Proposed Action.

4.20.5.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. Impacts associated with the transportation and use of hazardous materials from past, present, and RFFAs in the CESA have resulted in negligible, long-term, and localized cumulative effects. No additional cumulative impacts beyond the past, present, and RFFAs would occur.

4.20.6 Land Use and Realty

The CESA for land use and realty includes the Plan boundary and encompasses 7,166 acres. Past and present disturbance has resulted from: sand and gravel operations, mineral and mining exploration projects; utilities and infrastructure; roads and railroads; dispersed recreation; livestock grazing, and agricultural operations. RFFAs would include geothermal exploration and development. Dispersed recreation, livestock grazing, and agricultural operations would continue in the future within the CESA. Utilities and infrastructure represent the majority of land disturbing activities within the CESA, primarily from powerlines and roads. Public infrastructure, such as utilities and roads, often have long-term impacts to lands and may facilitate other land uses. These authorizations can increase access for other types of activities (e.g., recreational activities), while easements or ROWs can limit the types of land use that can occur in these areas. Traffic is expected to increase during construction of utilities and other infrastructure, but traffic is often negligible during operation. These facilities often require routine maintenance which may also increase traffic in the CESA, but they typically do not generate the same impacts as construction. It is possible that operators of the Mineral Ridge Mine may utilize Cave Springs Road through the OPA as detailed in the Transportation and Access Plan (Ioneer 2022).

Present mining activities within the CESA consist of exploration and sand and gravel operations. These activities remove the areas that are being utilized for mineral exploration and sand and gravel operations from other multiple use activities. Though exploration disturbance is often reclaimed, if there are any permanent features left after closure of sand and gravel operations, this can result in permanent removal

of areas from other multiple use authorizations. Mineral exploration and sand and gravel operations also result in increased traffic on the surrounding road network, including from large vehicles. Overall traffic generation depends on the intensity of operations. Roads often allow improved access to land uses and may alter current or future traffic patterns, livestock grazing, agricultural operations and recreational land uses are other important land categories that can occur throughout the CESA. Other types of land uses may be compatible and even facilitate these activities (e.g., rural roads). In addition, some authorizations may conflict with these activities, such as mining and mineral development and sand and gravel operations which generally restricts these activities during the life of operations. Agricultural operations, depending on the intensity of use, may remove areas from other multiple use authorizations for the life of agricultural operations. Livestock grazing is more dispersed than some of the more intensive uses; however, depending on fencing and other rangeland improvements, can restrict other land use activities that are not compatible with grazing.

RFFAs in the CESA would include geothermal exploration and utilization projects, including the pending Fish Lake Valley Geothermal Development Project and Emigrant Mountain Exploration Project. Overall, impacts to land use and access are similar to those discussed for past and present actions, including restricted or delayed access to areas of active operations. Wildland fires in this CESA may occur in the future, as would livestock grazing, continued agricultural operations, and dispersed recreation. These activities would have similar impacts as stated for past and present actions.

Of the 7,166 acres covered by the CESA, 711 acres of disturbance are associated with past, present, and RFFA disturbances, which is a disturbance of approximately 11 percent of the CESA.

4.20.6.1 Proposed Action

Approval of the Project would increase disturbance within the CESA by 2,306 acres in addition to disturbance associated with past, present, and RFFAs for a total disturbance of 3,077 acres, which is approximately 43 percent of the CESA. The Proposed Action would result in a large increase in disturbance and would be a significant land use authorization in the CESA. However, the areas surrounding the CESA have similar potential for multiple use authorizations that may be restricted within the CESA as a result of the Proposed Action. Impacts from loss of multiple use authorizations within the CESA would be moderate, short-term, and localized. Ioneer would need to coordinate with any ROW holders or companies with mining claims or geothermal leases that may be impacted to ensure continued access to these authorizations. Other present and RFFAs within the CESA that operate on public land would be required to do the same. Cumulative impacts to land use authorizations and ROWs would be minor, short-term, and localized.

It is anticipated that all surface disturbance within the CESA would be reclaimed except for a total of 383 acres of disturbance remaining post-reclamation. This may be a cumulative increase in permanent disturbance if currently authorized and RFFAs also have permanent features. Cumulative impacts from permanent features would be minor to moderate, permanent, and localized.

4.20.6.2 North and South OSF Alternative

Cumulative impacts would be the same as described under the Proposed Action.

4.20.6.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Cumulative impacts to land use and realty from past, present, and RFFAs in the CESA, when combined with the No Action Alternative would be minor, short-term, and localized.

4.20.7 Livestock and Grazing Resources

The CESA for livestock and grazing resources includes the Ice House, Red Spring, Silver Peak, and Fish Lake Valley allotments. The CESA encompasses 481,299 acres. Within this CESA, past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; solar development; geothermal exploration and infrastructure; agriculture; dispersed recreation; livestock grazing, and wildland fire.

Mineral exploration and development, as well as sand and gravel operations directly remove land from livestock grazing use and increases the likelihood of spreading non-native, invasive species, and noxious weeds. Establishment and spread of invasive, non-native species and noxious weeds further reduce the amount of usable range and available forage. While disturbance from utilities and infrastructure construction does not typically reduce access to range resources, vegetation clearing occurs. Impacts from roads also includes clearing of vegetation. Clearing vegetation decreases available forage and provides opportunity for spread of invasive, non-native species and noxious weeds, which reduces the available forage. Vehicles traveling on the roads may serve as a vector to spread noxious weeds and non-native invasive species. Agriculture in the CESA includes crop production on irrigated private lands primarily for hay. Because it occurs on private lands, there is no impact on public lands grazing. Development of wind, solar, and geothermal infrastructure directly removes land from livestock grazing use and results in surface disturbance that increases the likelihood of spreading non-native, invasive species, and noxious weeds and reduced the amount of usable range and available forage. RFFAs include the same type of disturbance that are already occurring within the CESA. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation.

Of the 481,299 acres covered by the CESA, 105,759 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately 22 percent of the CESA.

4.20.7.1 Proposed Action

The Proposed Action would impact 76 BLM-permitted AUMs and incrementally increase disturbance by an additional 2,306 acres (less than one percent of the CESA) resulting in a total cumulative disturbance of approximately 108,061 acres (approximately 22 percent of the CESA). Pending completion of successful reclamation, the incremental loss of AUMs as a result of the Project would be long-term for the majority of the disturbance area. The reclaimed areas would be capable of supporting livestock use; however, forage production may change in the long-term but is anticipated to be minor and localized. Groundwater drawdown associated with proposed dewatering operations is not anticipated to result in a long-term reduction in the amount and extent of available surface water within the groundwater drawdown contour (Piteau 2023b). The contribution of the Proposed Action to effects on livestock grazing resources in the CESA would be minor, long-term to permanent, and localized and would be reduced following reclamation.

4.20.7.2 North and South OSF Alternative

Cumulative effects to livestock and grazing resources would be similar to the Proposed Action, except that total disturbance would be 2,271 acres and additional fencing would result in impacts to 104 BLM-permitted AUMs. The North and South OSF Alternative would result in disturbance to 2,271 acres (less than one percent of the CESA) resulting in a total cumulative disturbance of approximately 108,018 acres (approximately 22 percent of the CESA). Cumulative impacts to livestock and grazing resources would be minor, long-term to permanent, and localized.

4.20.7.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to livestock and grazing resources would be negligible, temporary, and localized.

4.20.8 Native American Traditional Values

The CESA for Native American Traditional Values includes Fish Lake Valley and Clayton Valley in Nevada and encompasses 810,519 acres. Past and present actions affecting Native American Traditional Values include mineral and mining development and exploration projects; utilities, infrastructure, and public purpose activities; geothermal projects; agricultural activities; roads and railroads; potential vandalism and looting of prehistoric sites; potential unauthorized excavation of prehistoric sites; dispersed recreation; and livestock grazing. RFFAs within the CESA would include mineral and mining development and exploration activities; utilities, infrastructure, and public purpose activities; geothermal activities; solar energy facilities; and wind energy facilities. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation.

Federal statutes, regulations, and executive orders require consultation with recognized Tribes when a federal action is taken. Past and present actions on public land would need to have gone through consultation with the Tribes to determine potential impacts to areas of Native American Traditional Values. If human remains, funerary objects, or items of cultural patrimony are encountered on BLM-administered land, procedures spelled out in the Discovery Plan, HPTP, and/or MOA would be followed.

Past and present actions may have resulted, or may result, in illegal collecting and/or inadvertent damage to areas of tribal concern. As stated above, items or areas of tribal concern that may have been, or may be, discovered during environmental analysis of past or present projects, or during construction of projects, would be addressed through consultation between the proponent, BLM, Tribes, and the SHPO, as appropriate. The RFFAs within the CESA would have similar impacts as stated for past and present actions.

Of the 810,519 acres within the CESA, 38,881 acres of disturbance has been associated with past, present, and RFFAs. This disturbance is approximately five percent of the CESA.

4.20.8.1 Proposed Action

The Proposed Action would increase disturbance in the CESA by 2,306 acres to approximately 41,187 acres, or five percent of the CESA. Tribal concerns regarding mining and other developments can include access restrictions to traditional resource areas, degradation of cultural and biotic landscapes within traditional territory, potential effects to cultural properties from development and data recovery, increased visibility and accessibility of cultural properties, inadvertent discovery of human remains, and impacts to wildlife and plant resources (BLM 2019). Within the context of Native American Traditional Values, disturbance of cultural sites as a result of mining and other developments, either through destruction of those sites without further management (i.e., those not eligible for the NRHP) or through excavation as mitigation under NHPA, is an adverse impact. Landmarks can be associated with traditional uses or cultural stories. Changes in or disturbance to the landscape affect the role of the landscape within sacred and historical tribal traditions, and potentially change how tribes use the landscape. The visual effects may diminish the spiritual and religious experiences of tribal members who use these areas.

The Big Pine Band of Owens Valley Paiute Shoshone Indians, Bishop Paiute, Benton (Utu Utu Gwaitu) Paiute, Te-Moak Tribe of Western Shoshone Indians, Ely Shoshone, Shoshone-Paiute of the Duck Valley Indian Reservation, Duckwater Shoshone, Yomba Shoshone, and Timbisha Shoshone have been consulted with by the BLM and informed of the Proposed Action (Section 5.2). Cumulative effects on cultural resource sites would be the same as those described in Sections 4.2 and 4.20.2. Impacts to cultural resources, including those not eligible for the NRHP, can cumulatively impact the cultural landscape. The Proposed Action would contribute to the cumulative effects. Minimization of cumulative effects would be addressed through avoidance of identified eligible and unevaluated sites. If avoidance is not possible, eligible and unevaluated sites would be mitigated as agreed upon by BLM and SHPO through the development and implementation of a MOA and HPTP. The intensity and duration of the cumulative effects would vary depending on the cultural resource and sensitive areas impacted; however, these impacts would be localized.

4.20.8.2 North and South OSF Alternative

The North and South OSF Alternative would increase the disturbance within the CESA by 2,271 acres to approximately 41,140 acres, or five percent of the CESA. Cumulative effects to Native American Traditional Values would be the same as those described for the Proposed Action.

4.20.8.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. The 38,881 acres or five percent of the CESA would remain effected by the past, present, and RFFAs. The intensity and duration of the effects would continue to vary depending on the cultural resource and sensitive areas impacted by past, present, and RFFAs. These cumulative effects would be localized.

4.20.9 Recreation

The CESA for recreation is hunt unit 211 and encompasses 620,928 acres. Past and present disturbance has resulted from: mineral development and exploration; utilities, infrastructure, and public purpose activities; roads and railroads; geothermal development; agricultural areas; dispersed recreation; and livestock grazing.

Mineral development and exploration operations can limit public access to areas previously used for dispersed recreation. They may reduce the recreational value and modify the recreational setting when vegetation and/or wildlife are affected and may result in visual and noise impacts for those recreation users seeking experiences of isolation and solitude. These actions also may displace recreationists to surrounding areas. Impacts may be long-term if left permanently (such as open pits); however, impacts are typically short-term until reclamation is complete and access and use of the area is restored to pre-project conditions. Mining activities may increase the population of an area by bringing in employees and workers, which may increase the use of recreation areas within the CESA. Past and present disturbance associated with utilities, infrastructure, and public purpose projects include transmission lines, telephone and fiber optic lines, and water and sewer infrastructure. Lands occupied by utilities and infrastructure generally remain available for dispersed recreation activities, but the recreation setting may have changed due to the presence of human-caused features. These facilities often include maintenance roads that may increase OHV use and allow access to areas that previously had little, if any, OHV traffic. Public purpose sites have resulted in these areas no longer being available for dispersed recreation. Road disturbance provides access to recreation areas and also can become a form of recreation. For those seeking solitude and a primitive outdoor experience, development of roads can impact the recreation experience by modifying the recreation setting with the visual appearance and noise of road traffic, and the increased vehicular traffic. Wildland fires may affect recreation resources as they would temporarily affect the area available for dispersed recreation and would impact the recreation setting until revegetation and/or reclamation occurs on the burned area. However, wildland fires do not typically restrict access for recreation activities. Livestock grazing has limited impact on most recreational uses. Some recreationists may perceive grazed areas as having lower recreational value for some uses such as dispersed camping.

RFFAs in the CESA include mineral development and exploration projects; utilities, infrastructure, and public purpose activities; geothermal projects; and solar energy facilities. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. Impacts would be similar to those described for past and present actions. Of the 620,928 acres in the recreation CESA, approximately 88,002 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately 14 percent of the CESA.

4.20.9.1 Proposed Action

The Proposed Action would increase disturbance in the CESA by an additional 2,306 acres (approximately one percent of the CESA) resulting in a total cumulative disturbance of approximately 90,308 acres (approximately 15 percent of the CESA). Although the cumulative surface disturbance would be considerably greater than the direct disturbance from the Proposed Action, the vast acreage of public lands in the CESA would be sufficient to accommodate dispersed recreation activities. Much of the past, present, and RFFA surface disturbance would be reclaimed, thereby decreasing the potential impacts to recreation. The cumulative un-reclaimed disturbance area that would remain after completion of the interrelated actions, including the Proposed Action, would be a small percentage of the total land area in the CESA, and would have a minor, long-term to permanent, and localized impact to recreation.

4.20.9.2 North and South OSF Alternative

Cumulative effects to recreation would be the same as described for the Proposed Action except that the total disturbance would be 35 acres less than the Proposed Action. The North and South OSF Alternative would result in disturbance to 2,271 acres (less than one percent of the CESA) resulting in a total cumulative disturbance of approximately 90,273 acres (approximately 15 percent of the CESA). Cumulative impacts to recreation would be minor, long-term to permanent, and localized.

4.20.9.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to recreation would be negligible, temporary to short-term, and localized.

4.20.10 Social and Economic Values

The CESA for social and economic values includes Esmeralda, Nye, and Mineral counties in Nevada and Inyo County in California and encompasses 22,929,628 acres. All data on socioeconomic conditions, fiscal conditions, public services, and utilities discussed in Section 3.10 apply to the CESA analysis. Approximately 11 percent of all employment in the CESA is within the natural resources and mining sectors. Most of these employees work in the mining sector.

Past and present actions within the CESA include mineral exploration and development, oil and gas development, geothermal exploration and development, solar facility development, and utilities and infrastructure development. Utilities and infrastructure development would typically have potential impacts to social and economic values during construction but may also have impacts from operations and maintenance, if the utility infrastructure increases potential development opportunities or increases public facility capacities. Agricultural activities occur throughout the CESA and are an important industry to the communities within the CESA. Agricultural activities impact the socioeconomic conditions of the CESA, including employment and income, but impacts to population increases, housing availability, and community facilities and services are more limited than other projects, such as mining. Mining is a major industry throughout the CESA. The major mines in the CESA include the Aurora Mine, Borealis Mine, Denton-Rawhide Mine, Isabella Pearl, Basalt Diatomite Mine, Mineral Ridge Mine, Blanco Mine, Albemarle Silver Peak Lithium Operations, Amargosa Clay Operation, Manhattan Gulch, New Discovery Mine, Premier Magnesia, and Round Mountain Mine (NBMG 2021). Sand and gravel operations and community pits also occur. These projects have resulted in the existing socioeconomic conditions of the CESA, which include impacts from increased population, housing, community facilities and services, local government finances, social and cultural landscape, employment, and income. Geothermal exploration and leases occur throughout the CESA and include Sierra Geothermal Power's Silver Peak exploration, Chemetall Foote's geothermal exploration, Lone Mountain, and Pearl Geothermal exploration. Geothermal lease holders have a right to exploration activities. Geothermal exploration results in similar impacts as discussed for mining, though to a lesser degree as operations typically do not require the same level of employment and occur for shorter periods of time. If multiple geothermal exploration projects occur at the same time, the impacts to housing, population increases, community facilities and services, income, and the social and cultural landscape would be impacted at a greater extent due to simultaneous operations. For example, the Don A Campbell I and II Geothermal Projects are two 25-megawatt geothermal power facilities located in Mineral County (SCPPA 2023). These facilities have had impacts resulting in increased population, housing, community facilities and services, local government finances, social and cultural landscape, employment, and income.

Past and present actions have increased employment levels within the CESA, which may be positive, potentially drawing on the local and regional workforce. However, if the demand for labor cannot be met by the region's labor pool, the activities may have led to an influx of non-local workers, resulting in socioeconomic impacts from the increased need to accommodate from a housing and community facilities and services perspective, since these workers need housing accommodations and increase the use of public services. This potentially affects public sector revenues and/or expenditures and infrastructure to accommodate this population increase. Increased demand for housing from employment may increase housing shortages in communities within the CESA.

RFFAs are expected to be a continuation and potential expansion of the past and present actions. This may include mining and exploration projects, sand and gravel operations, and utilities and infrastructure. RFFAs include the Clayton Valley and Neolith Projects, Silver Sun Mine, Clayton Ridge North Mine, Kinross Montezuma Exploration Project, and North Bullfrog Mine. Other developments would include solar facility development and associated infrastructure, and wind energy developments. Pending future geothermal development and exploration projects include the Fish Lake Geothermal Project, Lone Mountain, and Pearl Exploration Project which could eventually transition to geothermal development, increasing socioeconomic

impacts. Geothermal development and exploration operations have similar impacts as discussed for past and present actions. The NV Energy Greenlink West Project is proposed in portions of the CESA, (BLM 2022). Due to the extent of this project, socioeconomic impacts would occur regionally primarily during construction, but impacts would also occur during operations and maintenance of the power facilities.

Six applicants have requested ROW grants to construct, operate, and decommission seven solar projects on public lands in Esmeralda County that would tie into the NV Energy Greenlink West Project. Potential solar projects in Esmeralda County include the Esmeralda Energy Center, Esmeralda North Solar, and Nivloc Solar in Silver Peak. The projects have completed the variance request process as required by the Solar Energy Development Programmatic EIS ROD, which provides the opportunity for developers to propose applications outside of identified solar energy zones (BLM 2022). The proposed solar projects would likely contribute to additional socioeconomic impacts including increased population which may result in potential housing shortages, increased use of public services and facilities, impacts to county budgets, and impacts to employment and income. RFFAs would have impacts to the social and cultural landscape of the CESA, which primarily has a rural character.

The past, present, and RFFA land uses in the CESA have had a direct and indirect/induced effect on social and economic values through changes to employment, income, housing availability, population and demographic changes, public finance, public facility use, and social values.

4.20.10.1 Proposed Action

The Proposed Action would contribute to the cumulative effects for the social and economic values in the CESA. This would include providing employment, generating income for residents through direct employment or through indirect and induced employment, increased tax revenues, increasing demand for housing, and increased demand for community facilities and services. Tonopah, Hawthorne, and Bishop would likely experience the greatest impacts from RFFA-related population due to greater existing services and infrastructure than other communities in the CESA. The ability and capacity for these communities to keep up with increased population and demand for services and infrastructure depends on which counties would receive tax revenues including net proceeds of mineral taxes, from RFFAs. Increased tax revenues would potentially assist with some of these demands, although there would likely be a time lag between demand and supply for long lead items, and tax revenues resulting from the Project are unlikely to provide all the funding necessary to increase public service capacity when multiple other projects are occurring or may occur at the same time as the Project. The Proposed Action would cumulatively contribute to changes in the social and economic landscape of the CESA due to limited emergency services, community facilities and services, available housing, grocery stores, and other convenience needs that may not be able to accommodate the anticipated influx of population, particularly when combined with other projects that are similarly resulting in demands for these services.

The past, present, and RFFAs including the Proposed Action would have a cumulative increase in employment opportunities and tax revenue throughout the CESA. Depending on the areas that employees locate to, the increase in employment opportunities may present inadequate housing availability and increased use of public utilities such as sewage, water, and other services. Due to the limited services and housing opportunities in Esmeralda County, more workers would likely reside in and commute from other areas in Nye and Mineral counties and Inyo County, which have more housing options and available services. However, overall housing options and public services are also limited in these areas under current conditions and projects in operation, so similar shortages of services and housing would also likely result in these counties, particularly when potential future projects start creating the same demand. Cumulative increases of demand for these services may result in socioeconomic impacts to these communities if the demand for the services exceeds the ability for the communities to provide these services, and tax revenues generated from the Project and other present and RFFAs are not fully sufficient to cover the needs to increase capacity of the services. Currently, authorized activities and reasonably foreseeable actions in the CESA, including the Proposed Action would cumulatively place increased demand on Esmeralda County housing and public services, as well as the other counties within the CESA. Due to the limited services within Esmeralda County, some of the indirect and induced employment, income generation, and tax revenue would likely go to other counties within the CESA that have more services, so Esmeralda County may not realize all of the indirect and induced tax revenue, indirect and induced purchasing, and income generation relative to the other counties in the CESA. As some of the county budgets within the CESA

already are operating on deficit budgets, cumulative impacts from the Proposed Action, combined with present and RFFAs may aggravate this due to the need to hire additional staff, including emergency services and deputies, and to accommodate increases in use of public services. Should budget deficits continue, Nevada Department of Taxation may decide to increase property taxes to balance County budgets in the area of analysis, which may be a permanent cumulative impact (Boland 2023). The socioeconomic impacts from the Proposed Action and present and RFFAs would modify the social and cultural landscape of the CESA by increasing population, demand for services that may require public investment for additional infrastructure and increasing the development in areas primarily defined by a rural character. This may permanently shift the social and cultural landscape. Socioeconomic impacts would likely be felt after operations at the Project and other projects in the CESA cease, as long-term public investment is required to increase public services capacity, which would affect county budgets long after operations at the Project and other present and RFFA projects cease. Closure of projects could result in housing market decline and decreased tax revenues to support infrastructure and services that may have resulted from present and RFFAs. However, due to uncertainty of future economic conditions, it is unknown exactly how closure of present and RFFAs may impact nearby communities. The cumulative effects on social and economic values from the past, present and RFFAs including the Proposed Action would be long-term to permanent, regional, and major.

4.20.10.2 North and South OSF Alternative

The socioeconomic environmental consequences of this alternative would not be substantively different than the Proposed Action and cumulative impacts would be the same as those discussed under the Proposed Action.

4.20.10.3 No Action Alternative

Under the No Action Alternative, the Project would not be developed and the associated social and economic values would not occur, including the additional employment and tax revenue that may result from the Proposed Action. No additional impacts beyond the past, present, and RFFAs would occur, but other present and RFFAs would continue or may occur in the future, generating potential socioeconomic impacts within the CESA. Impacts to social and economic values from past, present, and RFFAs in the CESA would result in moderate to major, long-term, and regional cumulative effects.

4.20.11 Soil Resources

The CESA for soil resources includes the Plan boundary and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour. The CESA encompasses 53,790 acres.

Within this CESA, past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; geothermal exploration; agriculture; dispersed recreation; and livestock grazing. Each past and present disturbance may have impacted soil resources in a variety of ways. Heavy equipment could have resulted in soil compaction, increasing the density to the point where vegetation cannot grow and support the ecosystem. Disturbance of soil and biocrusts can increase vulnerability to wind and water erosion. Paved roads reduce the infiltration of water into the soil and concentrate erosive forces down embankments. Fine particulates can contaminate the water or air and are difficult to recapture once they are disturbed from the environment. Natural soil profiles are lost during ground disturbance. Contamination can occur by exposing naturally occurring geochemical process or through inadvertent releases of pollutants. Recreation and livestock grazing may have resulted in impacts to the soil. These uses can increase erosion, particularly along waterways where activities are concentrated. Trails can serve as new sources of erosion, combining disturbance of the vegetation with breaking apart the soil surface, which can channel precipitation into new areas.

RFFAs in the CESA would include utilities projects, geothermal utilization projects, restoration projects, livestock grazing, and dispersed recreation. These activities would have the same impacts as discussed for past and present disturbances. Wildland fires could also occur in the future. Fire can alter soil infiltration and remove or change the vegetation, which prevents erosion. Particularly hot fires also can sterilize the soil, eliminating the seed bank, and preventing vegetative regrowth. Occurrences of fire within appropriate fire return intervals for a vegetative community are a natural component of the landscape, returning nutrients to the soil and triggering succession of different communities in the CESA.

Of the 53,790 acres covered by the CESA, 3,090 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately six percent of the CESA.

4.20.11.1 Proposed Action

The Proposed Action would incrementally increase disturbance to soils by an additional 2,306 acres (four percent of the CESA) resulting in a total cumulative disturbance of approximately 5,396 acres (approximately 10 percent of the CESA). Measures include completing concurrent reclamation to the maximum extent possible and implementing BMPs to limit erosion, trap sediment, and control stormwater from the effects of wind, precipitation, and stormwater run-off. Pending completion of successful reclamation, the incremental additional effects to soils as a result of the Proposed Action would not be permanent in nature for the majority of the disturbance area. Impacts to soil resources in combination with past, present, and RFFAs in the CESA would be moderate, long-term to permanent, and localized. Groundwater drawdown associated with proposed dewatering is not anticipated to result in a long-term reduction in the amount and extent of available surface water (e.g., springs) within the groundwater drawdown contour (Piteau 2023b). The contribution of the Proposed Action to these effects would be negligible, long-term, and localized.

4.20.11.2 North and South OSF Alternative

Cumulative effects to soil resources would be similar to those described for the Proposed Action except that total disturbance from the Project would be 35 acres less than the Proposed Action. The Tiehm's buckwheat designated critical habitat would be fenced for the duration of the Project, reducing any other non-Project related activities that may occur there and result in cumulative impacts (e.g., unauthorized off-highway vehicle use, livestock grazing, etc.). The North and South OSF Alternative would result in disturbance to 2,271 acres resulting in a total cumulative disturbance of approximately 5,361 acres (approximately 10 percent of the CESA). Cumulative impacts to soil resources would be moderate, long-term to permanent, and localized.

4.20.11.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to soil resources would be negligible, temporary, and localized.

4.20.12 Threatened and Endangered Species

4.20.12.1 Bi-State Sage-Grouse

The CESA for BSSG includes the White Mountain PMU and encompasses 1,753,885 acres. Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; geothermal; agriculture; roads; dispersed recreation; and livestock grazing. Past and present disturbances from mineral and geothermal development and exploration can result in fragmentation and displacement of BSSG populations and fragmentation of their habitats. Direct mortalities and further habitat fragmentation from roads associated with these activities may have also occurred. Disturbed areas also create opportunities for the spread and establishment of nonnative invasive plants that may degrade the quality of remaining habitat. Effects from past and present mineral and geothermal development and exploration activities can cause increased ambient noise levels, which may disturb BSSG breeding, nesting, and brood rearing behavior. Past and present disturbances from utilities, infrastructure, and public purpose activities have resulted in disruption of BSSG populations and their habitats. In addition, past and present construction of powerlines have potentially increased areas for predator perching which may have impacts on prey species such as BSSG. Powerlines and other infrastructure provide nesting and perching opportunities for common ravens which may increase BSSG nest predation and reduce productivity. Road construction and use in the CESA tends to fragment habitat and leads to increased mortalities for BSSG from vehicle collisions or indirect from habitat fragmentation effects. Other effects include increased ambient noise levels, which may lead to habitat avoidance. There is OHV traffic associated with hunting and dispersed recreational activities in the CESA. Vehicle and OHV use may increase the risk of nonnative invasive species introduction or spread. BSSG can be affected by livestock grazing due to competition for forage, water, and habitat removal/conversion. Proper rotation and stocking rates can minimize impacts to wildlife. Agricultural fields in the CESA may provide habitat. The

BLM records show no past wildfires in the CESA. Wildfire leads to conversion of sagebrush dominated habitats to invasive annual grassland monocultures, which have little or no value to BSSG. Wildfire fragments habitat and leads to reduced survival and productivity and has negative effects on multiple life stages. Reseeding and restoration activities after wildland fires occur may mitigate negative effects on BSSG habitats although the effects from these activities are often not realized for many years until desirable plants have had an opportunity to become established.

RFFAs include solar development projects. These types of projects may fragment habitat and increase noise levels resulting in similar impacts as described for past and present activities.

Proposed Action

The Proposed Action would increase disturbance within the CESA by an additional 2,306 acres (approximately 0.1 percent of the CESA), which includes the existing exploration disturbance incorporated into the Project, resulting in total cumulative disturbance of approximately 94,974 acres (approximately five percent of the CESA). The Proposed Action would cumulatively contribute additional vehicle trips per day which may potentially lead to vehicle collisions with BSSG. However, cumulative impacts resulting from vehicle collision is unlikely due to the limited use of the Plan boundary by BSSG. If other present or RFFA's within the CESA include dewatering or groundwater pumping, cumulative groundwater drawdown impacts may occur depending on location and if the dewatering impacts surface water sites used by BSSG. The Proposed Action would cumulatively disturb approximately 1,064 acres of sagebrush dominated vegetation communities that may provide habitat for BSSG.

The disturbance associated with the Proposed Action would be reclaimed following completion of quarrying operations, except for 383 acres in potential BSSG habitat. Approximately 279 acres of the permanent acreage would occur within the Great Basin Xeric Mixed Sagebrush Shrubland and Inter-Mountain Basins Big Sagebrush Shrubland resulting in a cumulative permanent loss of potential sagebrush dominated vegetation communities within the CESA. Other present or RFFAs occurring within the CESA on public land would also be required to reclaim disturbance, but some permanent disturbance from past and RFFAs may remain depending on if they occur on private or public land, as well as reclamation requirements. Overall, cumulative impacts would be negligible to minor, long-term to permanent, and localized.

North and South OSF Alternative

The North and South OSF Alternative would incrementally increase disturbance within the CESA by an additional 2,271 acres, resulting in total cumulative disturbance of approximately 94,939 acres (approximately five percent of the CESA). The North and South OSF Alternative when combined with past, present and RFFAs would be similar to cumulative impacts as described for the Proposed Action, with approximately 35 acres less of cumulative disturbance. The North and South OSF Alternative would cumulatively disturb approximately 782 acres of Great Basin Xeric Mixed Sagebrush Shrubland and Inter-Mountain Basins Big Sagebrush Shrubland that may provide habitat for BSSG. Approximately 135 acres of Great Basin Xeric Mixed Sagebrush Shrubland would not be reclaimed under the Proposed Action, resulting in a cumulative, permanent impact to potential BSSG habitat. Cumulative impacts on BSSG would be negligible to minor, long-term to permanent, and localized.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Cumulative impacts to BSSG would be negligible to minor, long-term, and localized.

4.20.12.2 Monarch Butterfly

The CESA for monarch butterfly includes the Plan boundary and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour and encompasses 53,790 acres.

Within this CESA, past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; dispersed recreation; and livestock grazing. No wildland fires have been documented in the CESA. Surface disturbance can remove milkweed

species, as well as crush or destroy monarch butterfly eggs and larvae on milkweed, if present during surface disturbance. The majority of present and RFFAs would be reclaimed, potentially restoring monarch butterfly habitat. Of the 53,790 acres covered by the CESA, 3,033 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately six percent of the CESA.

Proposed Action

The Proposed Action would incrementally increase disturbance within the CESA by an additional 2,306 acres (approximately four percent of the CESA), resulting in a total cumulative disturbance of approximately 5,339 acres (approximately 10 percent of the CESA). Cumulative impacts from the Proposed Action and past, present, and RFFAs may affect monarch butterfly habitat in the CESA including removal of nectar and milkweed resources. Additional impacts to monarch butterfly habitat may include establishment and spread of noxious and non-native invasive weed species. Increased vehicular traffic within the CESA from past, present, and RFFAs may result in injuries or fatalities to individual monarch butterflies but population-level impacts would not be expected. The disturbance associated with the Proposed Action would be reclaimed following completion of quarrying operations, except for 383 acres, which would be permanently removed from monarch butterfly use. Cumulative impacts from the Proposed Action on monarch butterflies would be minor, long-term to permanent, and localized.

North and South OSF Alternative

Cumulative impacts to monarch butterfly under the North and South OSF Alternative would be the same as discussed for the Proposed Action, with approximately 35 acres less disturbance.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Cumulative impacts to the monarch butterfly would be negligible to minor, long-term, and localized.

4.20.12.3 Tiehm's Buckwheat

The CESA for Tiehm's buckwheat includes the Plan boundary and encompasses 7,166 acres. Past and present disturbances in the CESA may have impacted Tiehm's' buckwheat in a variety of ways. Five of the subpopulations have been impacted by disturbance from past mineral exploration activities. Tiehm's buckwheat has colonized several soil sample trenches that are estimated to be between 40 and 80 years old in subpopulations 1, 2, 3, 4, and 6 (EM Strategies 2020b). There is OHV traffic associated with hunting and dispersed recreational activities in the CESA. OHV use has been documented in several subpopulations. Cave Springs Road separates subpopulations 1, 2, and 8 from subpopulations 3, 4, 5, 6, and 7. Subpopulations 1, 2, 5, and 8 are directly adjacent to secondary dirt roads. Fences have been constructed to limit OHV access to these subpopulations. Mineral exploration and development activities in the area have created, reopened, or improved roads in the area, allowing easier and greater access to OHV use. In addition to impacts on individual plants, OHV may increase the risk of nonnative invasive species introduction or spread, as well as increase the risk of fire in the CESA. Traffic along roads in the CESA may generate fugitive dust that can affect the photosynthesis ability of Tiehm's buckwheat and plants that support pollinator species. Surface disturbance can lead to the introduction or spread of non-native invasive species. Invasive species have not formed monocultures in the CESA and are not a significant component of the existing vegetation communities (EM Strategies 2020b, 2022a). However, saltlover has become established in all subpopulations of Tiehm's buckwheat (WestLand 2021). Activities that remove vegetation in areas near Tiehm's buckwheat subpopulations, have the potential to reduce habitat for pollinators that Tiehm's buckwheat relies upon. The BLM records show no past wildfires in Tiehm's buckwheat subpopulations. Tiehm's buckwheat occurs on sparsely vegetated, rocky habitat, and would likely only be impacted by a high-severity wildfire. A high-severity wildland fire could result in a loss of Tiehm's buckwheat individuals and seedbanks, resulting in reduced likelihood of regeneration and recruitment in affected subpopulations. Fuel load accumulations in the area are low, reducing the chance of a high-severity fire (EM Strategies 2020b). Tiehm's buckwheat subpopulations are accessible to livestock grazing and livestock could trample or graze individual Tiehm's buckwheat. Tiehm's buckwheat have been previously impacted by ground squirrel herbivory, which would likely continue in the future.

RFFAs include geothermal exploration and utilization projects. Impacts from geothermal projects would be similar to other projects that create surface disturbance and increase the likelihood of noxious and non-native weed spread.

Proposed Action

The Proposed Action would incrementally increase disturbance within the CESA by an additional 2,306 acres (approximately 32 percent of the CESA) resulting in a total cumulative disturbance of approximately 3,077 acres (approximately 43 percent of the CESA). Of this, the Proposed Action would disturb approximately 354 acres (39 percent) of designated critical habitat for Tiehm's buckwheat. The disturbance associated with the Proposed Action would be reclaimed following completion of quarrying operations, except for 97 acres in designated critical habitat (10 percent of designated critical habitat) associated with the quarry, drainage controls, solution management facilities, and re-aligned roads. Implementation of the Tiehm's Buckwheat Protection Plan (Ioneer 2022) would limit effects from fugitive dust, invasive non-native species, and reduce the chances of catastrophic events in Tiehm's buckwheat designated critical habitat. Reclamation would further reduce impacts, but there would be cumulative impacts from loss of designated critical habitat that may affect the species. Cumulative impacts to Tiehm's buckwheat would be moderate to major, long-term to permanent, and localized.

North and South OSF Alternative

Cumulative impacts would be similar to those described for the Proposed Action except there would be 35 acres less overall cumulative disturbance. Approximately 197 acres of designated critical habitat for Tiehm's buckwheat would be disturbed, of which 45 acres would be permanent (about five percent of designated critical habitat). The North and South OSF Alternative would implement the *Buckwheat Protection Plan: Applicant Proposed Conservation Measures for Tiehm's Buckwheat and its Critical Habitat* (WestLand 2023b) that would reduce cumulative impacts to Tiehm's buckwheat and its designated critical habitat. This would include pollinator habitat reclamation to promote a diversity of pollinators that are important to Tiehm's buckwheat which would cumulatively add to pollinator habitat post-reclamation. All designated critical habitat would be fenced, which would reduce other cumulative impacts such as livestock grazing and OHV use. As there would still be a cumulative loss of designated critical habitat that may affect the species, cumulative impacts would be less than the Proposed Action, but still moderate to major, long-term to permanent, and localized.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. The remaining exploration disturbance at Rhyolite Ridge would be reclaimed, and the majority of other present and RFFAs on public land would also have to be reclaimed. Subpopulations of Tiehm's buckwheat would remain vulnerable to existing threats such as OHV use, invasion of noxious or invasive species, livestock grazing, and herbivory. Any projects that may propose disturbance within Tiehm's buckwheat designated critical habitat would need to go through the NEPA process. Past, present, and RFFA impacts to Tiehm's buckwheat would be variable due to the unknown extent of future OHV use, noxious or invasive species establishment, livestock grazing, and herbivory activities; therefore, would range from negligible to major, temporary to permanent, and localized.

4.20.13 Transportation and Access

The CESA for transportation includes the Plan boundary and main transportation routes to Reno and Las Vegas. Mining and exploration activities in the vicinity of the CESA often have impacts to the transportation system by increasing traffic on the surrounding road network. Traffic generation depends on the size and intensity of operations. Transportation and access impacts from utilities and infrastructure are generally short-term, with impacts mainly occurring during construction. However, easements or ROWs associated with the utility lines and other infrastructure can limit non-compatible land uses within the area of the easement or ROW. Utility lines often require routine maintenance, which could increase traffic within the CESA. Impacts to transportation and access resulting from roads are long-term. Construction of roads allows improved access to land uses surrounding the CESA. Additional and improved roads are a result of needs for improved access. Impacts may alter current and future traffic patterns. Localized urban development includes the towns of Dyer and Silver Peak. Urban development has minimally increased

traffic on the transportation system and road network within rural areas of the CESA, while in larger population centers of Las Vegas, Reno, and Sparks development has had a larger effect on traffic. Transportation increases depend on the overall size and density of the urban development, but these areas generally have a more concentrated population, which increases traffic levels when compared to more rural, undeveloped areas.

RFFAs include geothermal development (Fish Lake Project), geothermal exploration (Lone Mountain Geothermal Exploration Project), and mining development (Silver Sun Mine). Geothermal development projects could result in long-term impacts through the construction of roads, limiting access to developed areas, and increased traffic on the existing road network. Impacts depend on the size of the projects. Wildland fire may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. These actions would have similar impacts as stated for past and present actions. Future restoration projects also could occur in and surrounding this CESA, which may restrict access to land uses during and after treatments and may increase traffic on roadways during treatments.

The existing access road has two overlapping ROWs granted by the BLM. One for Esmeralda County and the other for Mineral Ridge Resources. The improvements proposed would remain for future use of all permit holders, should this route be used.

4.20.13.1 Proposed Action

Cumulative effects from Proposed Action and other interrelated past, present, and RFFAs would occur to accommodate safe public access through the Plan boundary. There would be intermittent stops at intersections by users accessing the area, which would be an inconvenience. The outer extent of Tiehm's buckwheat designated critical habitat would be fenced and gates locked (BLM 2024), which would restrict public access of the two existing two-track roads in the Tiehm's buckwheat designated critical habitat. Therefore, cumulative impacts on access are anticipated to be minor, long-term to permanent, and localized. The Proposed Action would increase traffic within the CESA particularly during the construction and operation. The Proposed Action would result in a readily apparent, measurable traffic increase on paved roadways within the CESA. The increased traffic would be less noticeable as distance from the OPA increases and trucks disperse along other routes to their final destinations. It is not anticipated that there would be discernible impacts to traffic along major roadways near metropolitan areas from the Proposed Action. During the closure and post-closure, Ioneer estimates that Project-related traffic counts would drop considerably, and these cumulative impacts would no longer be realized. Cumulative impacts to transportation in the CESA would be moderate to major, long-term, and regional.

4.20.13.2 North and South OSF Alternative

Cumulative impacts would be the same as described for the Proposed Action. Existing public access through the Plan boundary would be maintained. Cumulative effects to access would be minor, long-term to permanent, and localized and cumulative effects to transportation would be moderate to major, long-term, and regional.

4.20.13.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Cumulative impacts to access or transportation would be negligible, short-term, and localized.

4.20.14 Vegetation Resources

The CESA for vegetation resources is the Plan boundary and the one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour. The CESA was defined to include the maximum geographic extent of possible effects from the proposed Project disturbance and dewatering activities and past, present, and RFFAs. The total area of the CESA encompasses 53,790 acres.

Surface disturbance associated with mineral development and exploration, utilities, infrastructure, public purpose projects, and roads directly removes vegetation and increases the likelihood of spreading non-native, invasive species, and noxious weeds. Noxious weeds and non-native invasive species are often the

first species to establish in disturbed areas. Vehicles serve as a vector to spread noxious weeds and non-native invasive species along roads as well as off road into areas that might not otherwise have been accessible. Livestock and recreationists can also spread noxious weeds and non-native invasive species. Reclamation and revegetation required for projects on public land would minimize long-term impacts to vegetation. Noxious weeds and non-native invasive species are more likely to establish in disturbed areas; therefore, successful reclamation assists to limit the spread of these species.

Indirect impacts from past and present disturbances includes impacts from fugitive dust, which can cover leaves, thereby reducing photosynthesis. Erosion can be increased due to disturbance of the vegetative layer, including from off-road recreation and livestock trampling.

RFFAs in the CESA include utilities projects (188 acres), geothermal utilization projects (311 acres), restoration projects, livestock grazing, and dispersed recreation. These activities would have the same impacts as discussed for past and present disturbances. Wildland fires in this CESA could also occur in the future. Occurrences of fire within appropriate fire return intervals for a vegetative community are a natural component of the landscape, returning nutrients to the soil and triggering succession of different communities in the CESA. Wildland fire can alter vegetation communities, often changing them from shrublands to grasslands and increasing the potential for spread and establishment of noxious weeds and non-native invasive plants. Of the 53,790 acres covered by the CESA, 3,090 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately six percent of the CESA.

4.20.14.1 Proposed Action

The Proposed Action would increase disturbance to vegetation by an additional 2,306 acres (four percent of the CESA) resulting in a total cumulative disturbance of approximately 5,396 acres (approximately 10 percent of the CESA). Pending completion of successful reclamation, the incremental additional effects to vegetation as a result of the Proposed Action would not be permanent in nature for the majority of the disturbance area. The reclaimed areas would continue to provide wildlife habitat and support livestock use; however, species composition and forage production may change in the long term. Groundwater drawdown associated with proposed dewatering operations may result in impacts to vegetation communities or the spread of noxious or invasive species. No impacts to special status plant species within the groundwater drawdown contour are anticipated. Cumulative effects from noxious weed and non-native invasive plant species would be minor since Ioneer's Noxious and Invasive Weed Management Plan (NewFields 2022e) would reduce the potential for noxious and invasive non-native species to establish or spread. Additionally, the only deep-rooted noxious weed species identified in the CESA is saltcedar, which can be treated prior to becoming an infestation. Due to these factors, impacts to vegetation resources in combination with past, present, and RFFAs in the CESA would be minor to moderate, long-term to permanent, and localized.

4.20.14.2 North and South OSF Alternative

Cumulative effects to vegetation resources, including noxious weeds and non-native invasive plant species from the North and South OSF Alternative would be the same as described for the Proposed Action except that the North and South OSF Alternative would result in disturbance to 2,271 acres (approximately four percent of the CESA) resulting in a total cumulative disturbance of approximately 5,361 acres (approximately 10 percent of the CESA). Cumulative effects would be minor to moderate, long-term to permanent, and localized.

4.20.14.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be developed and associated impacts to vegetation would not occur. Under this alternative, the existing 15 acres of exploration disturbance (i.e., drill sites, monitoring sites, and access roads) on public lands administered by the BLM would be reclaimed and impacts to vegetation would be negligible, short-term, and localized.

4.20.15 Visual Resources

The CESA for visual resources includes the Plan boundary and the range of possible viewpoints as seen from the KOPs associated with the Project. The CESA encompasses 99,929 acres. Past and present

disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; agriculture; dispersed recreation; and livestock grazing.

Mining for minerals and sand and gravel have concentrated impacts on visual resources. These often include large-scale topographic changes with associated changes in vegetation and alternations in linear features (e.g., drainage patterns, skylines). Effects are often long-term, with permanent changes in topography and un-reclaimed features such as pits, ponds, and cliff faces. Rehabilitation can contour topography to blend into the surrounding landscape and promote re-establishment of vegetation communities. Utilities, roads, and other public purpose activities disrupt the visual landscape with form and line elements. These can be aboveground (e.g., powerlines and roads) with visible infrastructure interrupting the landscape. Belowground utilities also can cause disturbances with linear changes in vegetation caused by ground disturbance or support infrastructure (e.g., access roads). Reclamation can re-establish vegetation, which can be in different successional stages than the surrounding habitat. Wildland fire can impact visual resources primarily through changes in texture and color elements. Cover vegetation is often eliminated, shrubs are converted to grasslands, and the landscape is darkened with carbon. Fire is also patchy, altering the visual landscape in apparently random paths. This can be recognized in the long term, with different neighboring successional stages of vegetation communities visible throughout the CESA. Recreation can have impacts on visual resources, often through the introduction of linear features. Trails can be visible from great distances and are easily formed from disturbance of the soil with relatively low levels of activity. Trails take long time periods to restore, and often attract use from their visual signature. Concentrated recreational areas, such as campgrounds and interpretive sites, also disrupt the visual landscape.

The RFFAs within the CESA would include geothermal exploration and development projects. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. These activities would lead to similar impacts as stated for past and present actions. Of the 99,929 acres covered by the CESA, 4,195 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately four percent of the CESA.

4.20.15.1 Proposed Action

Cumulative effects to visual resources in the CESA from the Proposed Action in combination with past, present, and RFFAs would include changes in line, form, color, and texture elements that would contrast with the existing landscape. The Proposed Action would increase the direct effects of contrast with the existing landscape by increasing visual impacts in the CESA. This increase would blend with the existing landscape and have a negligible to moderate additional impact to visual resources depending on observation point. ACEPMs would lessen the degree of contrast of facilities on the landscape. Concurrent reclamation would further reduce the visual impacts of the proposed Project over time through regrading of the slopes of the OSFs and revegetation. Once reclamation is complete, impacts from the OSFs, SOSF, booster station, pipeline, transmission line, and processing facility to visual resources would be negligible to minor as they would be removed or blended into the existing landscape. Reclaimed and remaining features from the Proposed Action in combination with the other past, present, and RFFAs within the CESA would continue to have long-term cumulative impacts to visual resources in the CESA that would be negligible to moderate depending on the viewpoint.

4.20.15.2 North and South OSF Alternative

Cumulative effects to visual resources would be the same as described for the Proposed Action. Cumulative impacts to visual resources would be negligible to moderate, long-term to permanent, and localized.

4.20.15.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. The existing 15 acres of exploration disturbance on public lands administered by the BLM would be reclaimed and impacts to visual resources would be negligible, temporary, and localized.

4.20.16 Water Resources

The CESA for water resources includes model domain boundary, which includes Fish Lake Valley HA 117 and portions of Big Smoky Valley and Clayton Valley. The CESA encompasses 845,428 acres. Past and present actions affecting water resources include: mineral and mining development and exploration projects; utilities, infrastructure, and public purpose activities; oil and gas pipelines; geothermal exploration and development projects; agricultural activities; roads; dispersed recreation; and livestock grazing. Approximately less than one acre within the CESA has been affected by recent and past wildfires. Mining, including sand and gravel operations, has the potential for cumulative impacts to water quality and quantity. These operations likely have used or are currently using water (typically groundwater) as part of their operations, either for dust control, processing, or dewatering. Surface disturbance can cause sediment loading, channel rerouting that results in erosion/sedimentation, and inadvertent spills of process water, drilling fluids, or other hazardous substances that can contaminate surface water or shallow groundwater. Individually insignificant dewatering of numerous mine pits or underground facilities can cause CESA-wide changes in both groundwater and surface water quantity. Exposure of naturally occurring geochemical conditions can cause harmful constituents to enter the watershed through inadvertent release. Overburden material poses a potential for erosion and sedimentation to the watershed if not properly designed and maintained. Previous construction associated with utilities, infrastructure projects, and roads may have used water during construction, and the largest potential post-construction effect likely is related to erosion and sedimentation associated with access roads or reclaimed disturbances. All roads can present water quality impacts due to inadvertent spills or releases during vehicular accidents. Unpaved roads, such as those crossing public lands and those within recreation sites in the CESA, also can be a source of increased erosion and sedimentation. Paved roads may cause water quality issues resulting from increased stormwater run-off. Rangeland management also is an important disturbance to, and utilizer of, water resources in the CESA. Rangeland management relies on predictable subsurface and surface water quantity and quality to sustain activities. This source can contribute to changes in water quality through the additions of nitrogen and other constituents. Livestock also can trample vegetation around water sources, degrading surface water quality through the subsequent erosion. Agricultural operations have potential consequences to water quality and quantity because these activities use water that may impact groundwater levels in the CESA, and it involves surface disturbance that may result in erosion and sedimentation. Wildland fires are a major disturbance to water resources and can impact surface water quality by removing the vegetation layer increasing erosion and downstream turbidity. Storms can cause mass losses of sediment along eroded embankments, altering the course of hydrological systems. Wildland fires also can change the ecosystem, replacing shrub habitat with grasslands. Shrubs are more resistant to erosion, but grasslands are more adaptable to changing environmental conditions.

RFFAs include mineral and mining development and exploration activities; utilities, infrastructure, and public purpose activities; geothermal activities; and solar energy facilities. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. Of the 845,428 acres covered by the CESA, 95,079 acres of disturbance are associated with past, present, and RFFA disturbances, which is a disturbance of approximately 11 percent of the CESA.

4.20.16.1 Proposed Action

The Proposed Action would increase disturbance in the CESA by 2,306 acres in addition to past, present, and RFFAs for a total cumulative disturbance of 97,385 acres, which is approximately 12 percent of the CESA. Cumulative impacts may include increased sedimentation and erosion associated with ground disturbance operations. Additional exposure of naturally occurring geochemical conditions that may result from the Project may add a cumulative impact from constituents entering the watershed through inadvertent release. The additional overburden potentially poses a cumulative impact for erosion and sedimentation to the watershed if not properly designed and maintained. Additional roads may also result in a cumulative source of increased erosion and sedimentation affecting water quality, as would potential inadvertent spills or releases during vehicular accidents associated with the Project. However, currently authorized activities and RFFAs would be required to comply with necessary regulations to prevent sedimentation and erosion, as well as appropriately maintaining vehicles and having a plan in place to clean up spills or inadvertent releases. This would be accomplished through facility design and ACEPMs. As such, cumulative water quality impacts would be negligible to minor, short-term, and localized.

The Proposed Action would result in a cumulative drawdown within the CESA from dewatering operations affecting water quantity in the CESA, including at potential spring sites. If these springs are perched features as suggested by their elevated, hillside locations (HydroGeoLogica 2020b), then groundwater drawdown from the Proposed Action, present, and RFFAs would not affect discharge flows from groundwater use. However, if the springs are sourced from upwelling groundwater on the upgradient side of a low permeability fault zone, decreased water levels on the downgradient side of the fault zone could result in an increased horizontal groundwater gradient, which may result in cumulative impacts. Cumulative drawdown was assessed from simulated heads at certain periods of time relative to the Steady-State Model (simulating hydrologic conditions prior to groundwater development in the area). This assessed changes that may occur due to ongoing pumping stresses as well as quarrying related activities. This assessment showed cumulative drawdown 200 years after the end of quarrying for the Proposed Action was almost identical to the change in piezometric levels under simulated changes for the No Action Alternative from 1940 to 2240 (Piteau 2023b). If RFFAs within the CESA include additional drawdown, additional drawdown of the groundwater table may occur over the long-term. Cumulative impacts to groundwater drawdown, including at springs sites, would be a moderate to major, permanent, localized cumulative impact.

4.20.16.2 North and South OSF Alternative

The North and South OSF Alternative would increase disturbance within the CESA by 2,271 acres, in addition to past, present, and RFFAs for a total cumulative disturbance of 97,350 acres, or approximately 12 percent of the CESA. Overall, cumulative impacts within the CESA as a result of the North and South OSF Alternative would be the same as described for the Proposed Action as water supply requirements, drawdown requirements, and surface and groundwater monitoring would be the same except total surface disturbance under the Project would be 35 acres less than the Proposed Action, resulting in less cumulative acres of surface disturbance.

4.20.16.3 No Action Alternative

Cumulative drawdown was assessed from simulated heads at certain periods of time relative to the Steady-State Model (simulating hydrologic conditions prior to groundwater development in the area). This assessed changes that may occur due to ongoing pumping stresses as well as quarrying related activities, which showed the maximum differential drawdown between the Proposed Action and No Action Alternative 200 years after the end of quarrying would be less than 20 feet (Piteau 2023b). As a result, cumulative impacts under the No Action Alternative would be similar to the Proposed Action.

4.20.17 Wetland and Riparian Resources

The CESA for wetland and riparian resources includes the Plan boundary and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour. The CESA encompasses 53,790 acres. Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; geothermal exploration; agriculture; dispersed recreation; and livestock grazing. Impacts from the past and present actions include potential increase of run-off into wetlands, groundwater drawdown from groundwater pumping, and potential reduced flows to streams in the area. Additionally, livestock and wildlife grazing may impact wetland and riparian areas through trampling and shearing of streambanks, compaction of wetland soils, trampling of plants, and overuse of riparian plant species. Riparian and wetland areas that have been overgrazed are susceptible to invasion by invasive and noxious weeds, which can displace riparian and wetland species over time. Increased activity in the CESA may increase wildland fire risk, resulting in a loss of vegetation stabilizing banks and an increase in noxious and invasive species. This can cause an increased amount of precipitation runoff and erosion which could drain into wetlands, resulting in indirect impacts to wetland and riparian areas. Past and present projects within the CESA may have directly or indirectly impacted mapped wetlands and riparian areas.

RFFAs in the CESA would include utilities projects, geothermal utilization projects, restoration projects, livestock grazing, and dispersed recreation. These activities would have the same impacts as discussed for past and present actions. Wildland fires in this CESA could also occur in the future. Impacts to wetlands and riparian resources as a result of RFFAs would be expected to continue in common use areas and along the road corridor. Of the 53,790 acres covered by the CESA, 3,090 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately six percent of the CESA.

4.20.17.1 Proposed Action

The Proposed Action would incrementally increase disturbance within the CESA by an additional 2,306 acres (four percent of the CESA) resulting in a total cumulative disturbance of approximately 5,396 acres (approximately 10 percent of the CESA). Disturbance from the Proposed Action to wetlands and riparian resources would be limited to surface disturbance in the OPA and pipeline construction and access road improvement within the Access Road and Infrastructure Corridor. Pending completion of successful reclamation, the effects from surface disturbance would be temporary in nature.

The Proposed Action, combined with past, present, and future actions may cumulatively impact wetlands and riparian resources through removal or disturbance of wetland and riparian communities in the CESA; through the removal of vegetation from upland areas; through potentially altering flow within wetlands and riparian areas in the CESA; through reducing quantity of water received by wetlands and riparian areas within the CESA; and degradation of aquatic habitat or other resources associated with wetlands and riparian areas. The amount of disturbance to wetland and riparian areas within the CESA is likely low as the types of projects authorized within the CESA typically avoid wetland and riparian areas by design when feasible.

Groundwater drawdown associated with proposed dewatering operations is not anticipated to result in a long-term reduction in the amount and extent of available surface water at springs within the groundwater drawdown contour (Piteau 2023b). The contribution of the Proposed Action to these effects on wetlands and riparian areas would be negligible, long-term, and localized.

Predicting the impacts of changing climatic conditions due to potential for altered weather patterns in the future is difficult to ascertain. However, an increase in evaporation due to warmer conditions as well as a decrease in the amount of late winter and spring snowpack would likely continue to decrease as precipitation increasingly falls as rain instead of snow given the projected warmer temperatures. This could cause regional decreases in surface water runoff in the summer months resulting in reduced intermittent or ephemeral flow along drainage channels and increased likelihood of flash floods in Nevada.

Overall, impacts to wetlands and riparian resources in combination with past, present, and RFFAs in the CESA would be minor, long-term, and localized.

4.20.17.2 North and South OSF Alternative

Cumulative impacts to wetland and riparian resources would be the same as described for the Proposed Action except that total disturbance from the Project would be 35 acres less than the Proposed Action. Cumulative impacts to wetlands and riparian resources would be minor, long-term, and localized.

4.20.17.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to wetland and riparian areas would be negligible, long-term, and localized.

4.20.18 Wildlife Resources

4.20.18.1 General Wildlife, Special Status Species, and Migratory Birds

The CESA for general wildlife, special status species (excluding golden eagles, bighorn sheep, and mule deer), and migratory birds, includes the Plan boundary and one-mile buffer of the predicted maximum extent of the 10-foot groundwater drawdown contour for 53,790 acres. Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; geothermal exploration; agriculture; dispersed recreation; and livestock grazing. Less than one acre of wildland fires has been documented in the CESA.

Surface disturbance from mineral exploration and development and utilities, infrastructure, and public purpose activities removes and fragments wildlife habitat and increases the likelihood of spreading noxious weeds and non-native invasive species, which may degrade habitat. Noise and increased human activity

from these operations may displace wildlife or herds to adjacent areas. Once construction is completed and once revegetation reestablishes on reclaimed areas, impacts from utilities would be reduced. Construction of some utilities such as transmission lines create perches for raptors that would remain on the landscape. Creation of additional perches may result in increased predation. Impacts from roads on wildlife includes the potential for increased vehicle-related mortalities, and potential displacement from increased human presence. In addition, vegetation is cleared for the roads, which decreases habitat. Vehicles traveling on the roads also may spread noxious weeds and non-native invasive species, which would affect habitat quality. Grazing from livestock and wild horses and burros within the CESA can change vegetation abundance and influence dominant cover types. Particularly around areas of concentrated use, such as water sources, livestock and wild horses and burros can degrade habitat and promote erosion. This can remove important habitat for wildlife, particularly in the desert environment.

RFFAs include utilities projects, geothermal utilization projects, restoration projects, livestock grazing, and dispersed recreation. Impacts from utilities and geothermal projects would be similar to other projects that reduce foraging habitat through disturbance, increase the likelihood of noxious and non-native weed spread, displacement from areas of increased human activity, and creation of raptor perches. Of the 53,790 acres covered by the CESA, 3,090 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately six percent of the CESA.

Proposed Action

The Proposed Action would increase habitat disturbance in the CESA by 2,306 acres (approximately four percent of the CESA). Most of this disturbance would be short-term and would be restored when operations are complete. The Proposed Action would result in a total cumulative disturbance of approximately 5,396 acres (approximately 10 percent of the CESA). Disturbance may result in the establishment or spread of invasive, non-native weed species which may degrade habitat quality. Effects associated with human presence and noise would increase in the CESA during the life of the proposed Project and may displace wildlife resulting in increased competition in other areas of the CESA. Displacement and habitat fragmentation may result in decreased survival rates. Increased traffic from the Proposed Action may result in increased mortality due to collisions. Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). SP-01 (Cave Spring), SP-03A, SP-06, SP-07, SP-08, SP-09 (North Spring), SP-09A, SP-09B, SP-09C, SP-09E, SP-10 (Mamie Spring), SP-16, SP-17, SP-17A, SP-21, SP-21A, SP-21B, SP-22, SP-25, and SP-26 had surface water present during surveys (Piteau 2023b). If impacts to spring sites are realized, impacts from the loss of a water source, foraging habitat, and reproductive habitat would occur. Effects on general wildlife, special status species, and migratory birds would be minor, long-term to permanent, and localized.

North and South OSF Alternative

Cumulative effects to eagles would be the same as described for the Proposed Action except that total disturbance from the Project would be 35 acres less than the Proposed Action. The North and South OSF Alternative would result in disturbance to 2,271 acres. Quantitative predictions of quarry lake analyte concentrations based the modified backfill configuration would not be expected to match those associated with the Proposed Action, but the same analytes would be expected to exceed the secondary enforceable and non-enforceable standards as well as NDEP Profile III reference values. Cumulative impacts to general wildlife, special status species, and migratory birds.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to wildlife would be negligible, short-term, and localized.

4.20.18.2 Golden Eagles

The CESA for golden eagles includes the Plan boundary and 10-mile radius of the OPA, for 283,429 acres. Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; agriculture; geothermal exploration; dispersed recreation; and livestock grazing. Impacts to golden eagles and their habitat occur from activities such as

mineral exploration and development, geothermal exploration, installation of utilities and infrastructure, and roads. These impacts include direct removal of potential eagle forage areas and nesting habitat. Indirect effects from these activities include degradation, or conversion of habitat for golden eagles; potential reduction in flow to water sources from water consumption; disturbance that prevents golden eagles from breeding; displacement potential due to increased competition and stress; loss of golden eagle active nests, or territories; and or injury or mortality. Operations and maintenance activities that cause movement and noise can also lead to displacement of individuals. Past and present projects have impacted golden eagles by removing habitat through construction of mining facilities, exploration pads, support roads, utilities, and similar infrastructure. Development may have resulted in the loss of productivity of breeding golden eagles, as well as the potential loss of breeding territories. Structures can create artificial nesting or roosting habitat, which (depending on the type) could be beneficial or harmful to eagles. These impacts change the predator and prey relationships for the CESA. Increased human presence and noise can deter golden eagles from areas of activity, further fragmenting CESA habitat. Wildland fires change the habitat available to golden eagles and their prey. Fires convert sagebrush or other shrub habitat into grasslands. These can create fragmented habitat and barriers to wildlife movement, particularly where large swaths of the landscape have been changed to habitat dominated by non-native species. Wildland fires are a natural part of the ecosystem, but also can have increased risk of anthropogenic causes near industrial activity and roadways. Livestock and rangeland management also can impact golden eagles directly and indirectly. The intensity of grazing can change vegetation composition. Important resources, such as water sources, can be altered from grazing.

RFFAs would include mining and mineral development and exploration, utilities, infrastructure, and public purpose activities, geothermal exploration and development, restoration projects, livestock grazing, and dispersed recreation. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. Of the 283,429 acres covered by the CESA, 88,910 acres of disturbance are associated with past, present, and RFFA disturbances, which is a disturbance of approximately 31 percent of the CESA.

Proposed Action

The Proposed Action would increase habitat disturbance in the CESA by 2,306 acres (less than one percent of the CESA). Most of this disturbance would be short-term and would be restored when operations are complete. The Proposed Action would result in a total cumulative disturbance of approximately 91,216 acres (approximately 32 percent of the CESA). Effects associated with human presence and noise would increase in the CESA during the life of the Project. Groundwater drawdown associated with quarry dewatering activities may affect water availability at surface water sites (Piteau 2023b). If impacts to springs are realized, impacts from the loss of a water source and foraging habitat would occur. Effects on golden eagles would be moderate, long-term, and localized.

North and South OSF Alternative

Cumulative impacts to eagles would be the same as described for the Proposed Action except that the North and South OSF Alternative would result in disturbance to 2,271 acres. Cumulative impacts to eagles are anticipated to be minor, long-term to permanent, and localized.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to eagles would be negligible, short-term, and localized.

4.20.18.3 Bighorn Sheep and Mule Deer

The CESA for bighorn sheep and mule deer includes hunt unit 211 for 620,928 acres. Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads; agriculture; geothermal exploration; dispersed recreation; and livestock grazing. Less than one acre of wildland fires has been documented in the CESA.

Impacts to desert bighorn sheep and mule deer can occur from activities such as mineral exploration and development, geothermal exploration, installation of utilities and infrastructure, and roads. Indirect effects from these activities include habitat loss, removal of vegetation, fragmentation of migration corridors, increased use and noise, and introduction of invasive species, and direct effects include displacement of individuals and collision with vehicles. Roads, utilities, and fences can be physical barriers to mule deer movement from summer and winter ranges, and along migration corridors. Operations and maintenance activities that cause movement and noise also can lead to behavioral changes in desert bighorn sheep and mule deer populations. Roads can be routed around high quality habitat and reduced speed limits can limit direct take. Fencing used to minimize impacts to desert bighorn sheep and mule deer, can fragment habitat. Sound-reduction technologies can minimize impacts from noise to desert bighorn sheep and mule deer. Reclamation can restore desert bighorn sheep and mule deer habitat after activities are complete. Past and present dispersed recreation activities can impact desert bighorn sheep and mule deer through habitat disturbance and removal. Additionally, similar to those described for wildlife, past and present livestock grazing within the CESA can alter vegetation abundance and influence dominant cover types especially around water resources.

RFFAs in the CESA would include mineral development and exploration projects; utilities, infrastructure, and public purpose activities; solar development; geothermal development and exploration, restoration projects, livestock grazing, and dispersed recreation. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. These activities would lead to similar disturbances and impacts to desert bighorn sheep and mule deer as stated in past and present actions. Of the 620,928 acres covered by the CESA, 87,901 acres of disturbance are associated with past, present, and RFFA disturbances, which is a disturbance of approximately 14 percent of the CESA.

Proposed Action

Impacts from past, present, and RFFAs in combination with the Proposed Action would result in cumulative displacement and habitat fragmentation through disturbance and removal of habitat. The Proposed Action would increase habitat disturbance in the CESA by 2,306 acres (less than one percent of the CESA) and would result in a total cumulative disturbance of approximately 90,207 acres (approximately 15 percent of the CESA). Displacement and habitat fragmentation decreases survival rates of affected individuals to some degree and increases competition. The additional presence of roads may increase mortality from vehicle collisions. Disturbance within the CESA may lead to the establishment or spread of invasive weeds that may degrade bighorn sheep and mule deer habitat.

North and South OSF Alternative

Cumulative impacts to bighorn sheep and mule deer would be the same as described for the Proposed Action except that the North and South OSF Alternative would result in disturbance to 2,271 acres. Movement through the OPA would be altered by modified placement of OSFs and fencing around Tiehm's buckwheat designated critical habitat. Cumulative impacts to bighorn sheep and mule deer are anticipated to be minor, long-term to permanent, and localized.

No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to bighorn sheep and mule deer would be negligible, short-term, and localized.

4.20.19 Wild Horses and Burros

The CESA for wild horses and burros includes the Plan boundary and Silver Peak HMA, which encompasses 242,868 acres.

Past and present disturbance has resulted from: mineral development and exploration projects; utilities, infrastructure, and public purpose activities; roads and railroads; geothermal development; agriculture; dispersed recreation; and livestock grazing. Past activities that have affected wild horses and burros also include gather and removal operations. Gathers and removal of excess wild horses and burros reduces the population size and changes (at least temporarily), use and distribution patterns, and can impact genetic

variability. Mineral exploration and development, as well as sand and gravel operations remove vegetation from lands that may be used as cover and forage area for wild horses and burros. Surface disturbance can fragment areas of wild horse and burro use. In addition, surface disturbance and vegetation clearing increase the likelihood of spreading noxious weeds and non-native invasive species, which may further reduce available foraging area. Noise and increased human activity from these operations may displace herds to adjacent areas. Impacts to wild horses and burros from utilities, infrastructure, and public purpose activities generally are limited to the initial construction of the utilities and infrastructure. These impacts include vegetation removal, which may reduce foraging areas, and the potential spread of noxious weeds and non-native invasive species. During construction, noise and increased human activity may displace herds to adjacent areas. However, after construction is completed and once revegetation reestablishes on disturbed areas, impacts from utilities would be reduced substantially. Impacts from roads on wild horses and burros includes the potential for increased vehicle-related mortalities, and potential displacement from increased human presence. In addition, vegetation is cleared for the roads, which decreases foraging areas to a minor extent. Vehicles traveling on the roads also may spread noxious weeds and non-native invasive species, which would affect foraging areas.

RFFAs include similar disturbances that are already occurring within the CESA, as well as solar development projects. Impacts from solar projects would be similar to other projects that reduce forage through disturbance, increase the likelihood of noxious and non-native weed spread, and displace herds. Wildland fires in this CESA may occur in the future, as would restoration projects, livestock grazing, and dispersed recreation. Vegetation restoration activities within the CESA could have short-term effects on wild horses and burros by exposing them to treatments that could harm their health, interfere with their movements, cause changes in vegetation that could alter the carrying capacity of the HMAs, or limit their access to water, which could ultimately affect their genetic health. Long-term vegetation management activities would improve the amount and quality of forage, and potentially increase the carrying capacity of the HMAs. These activities would lead to similar disturbances as those described for past and present actions. Completion of gather operations to reduce population size, achieve the AML, remove excess wild horses and burros from outside the HMA, and implement population growth suppression (fertility control) can be expected to occur.

Of the 242,868 acres covered by the CESA, 32,945 acres of disturbance are associated with past, present, and RFFAs, which is a disturbance of approximately 14 percent of the CESA.

4.20.19.1 Proposed Action

Cumulative effects to wild horses and burros would primarily be related to habitat loss, habitat fragmentation, and animal displacement. The few wild horses and burros that occur in the CESA would continue to occupy their respective ranges and breed successfully. The Proposed Action would increase disturbance to wild horse and burro habitat by an additional 2,306 acres (approximately one percent of the CESA) resulting in a total cumulative disturbance of approximately 35,251 acres (approximately 15 percent of the CESA). Pending completion of successful reclamation, the incremental additional effects to wild horses and burros as a result of the Proposed Action would be short- to long-term in nature. The reclaimed areas, and areas associated with habitat conversion, would be capable of supporting wild horse and burro use; however, forage production may change. Effects associated with human presence and noise would incrementally increase in the CESA during the life of the Proposed Action. Groundwater drawdown associated with proposed dewatering operations is not anticipated to result in a long-term reduction in the amount and extent of available surface water (e.g., springs) within the groundwater drawdown contour (Piteau 2023b). The contribution of the Proposed Action to these effects on wild horses and burros would be minor, long-term to permanent, and localized and would be reduced following completion of operations and final reclamation.

4.20.19.2 North and South OSF Alternative

Cumulative impacts to wild horses and burros would be the same as described for the Proposed Action. Total cumulative disturbance in the CESA would be 35,216 acres (approximately 15 percent of the CESA). Cumulative impacts to wild horses and burros would be minor, localized, and long-term to permanent.

4.20.19.3 No Action Alternative

Under the No Action Alternative, previously permitted activities and the other past, present, and RFFAs would continue to occur. No additional cumulative impacts beyond the past, present, and RFFAs would occur. Impacts to wild horses and burros would be negligible, temporary, and localized.

4.21 Mitigation and Monitoring

Mitigation measures, as determined applicable, are identified in this section by resource. The mitigation measures described below would be completed by and financially covered by Ioneer.

4.21.1 Proposed Action

Threatened and Endangered Species – TE-01
Mitigation Measure: Ioneer would conduct preconstruction clearance surveys for Tiehm's buckwheat prior to surface disturbance in designated critical habitat. Surveys would be completed by qualified botanists and include surveying for Tiehm's buckwheat plants in areas proposed for surface disturbance in designated critical habitat. Surveys would be completed no more than two weeks (14 calendar days) prior to surface disturbing activities. Results would be provided to the BLM for review prior to surface disturbing activities occurring.

Effectiveness of Mitigation: Completing preconstruction surveys for Tiehm's buckwheat in designated critical habitat would prevent potential direct impacts to individual Tiehm's buckwheat plant species that may have established outside of known subpopulations.

Impacts of Mitigation: There are no impacts anticipated as a result of monitoring and reporting preconstruction clearance surveys.

Water Resources – WR-01
Mitigation Measure: Potential impacts on surface water resources from the drawdown of the groundwater table could occur if hydrologically sourced from the regional groundwater aquifer. The mitigation would include the development and implementation of a surface water monitoring and contingency mitigation plan. The surface water monitoring and contingency mitigation plan would include quarterly monitoring of surface water resources within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. Ioneer would provide the collected data to the BLM annually to determine if additional mitigation would be required. If monitoring indicates that flow reductions in surface waters are occurring, and that these reductions are likely the result of Proposed Action drawdown, Ioneer would be responsible for implementing mitigation at the affected surface water resource to enhance or replace the impacted surface water resource. Site specific mitigation would occur as outlined in the surface water monitoring and contingency mitigation plan and would depend on the site-specific conditions. Mitigation could include various measures (e.g., flow augmentation, on-site or off-site improvements, etc.), and methods for providing a new water source or improving an existing water source such as:

- Installation of a water supply pump in an existing well (e.g., monitoring well) (assumed approximately 0.75 acre of surface disturbance to implement);
- Installation of a new water production well (assumed approximately 0.20 acre of surface disturbance to implement);
- Piping from a new or existing source (assumed approximately 0.40 acre of surface disturbance to implement);
- Installation of a guzzler (assumed approximately 0.72 acre of surface disturbance to implement);
- Enhanced development of an existing seep to promote additional flow (assumed approximately 0.70) acre of surface disturbance to implement); or

- Fencing or other protection measures for an existing surface water resource to maintain flow (assumed approximately 0.20 acre of surface disturbance to implement).

Monitoring and reporting would continue until the BLM determines there are no longer water drawdown impacts from the Proposed Action. Ioneer would be responsible for acquiring all water rights that may be required for successful mitigation.

Effectiveness of Mitigation: This measure would provide for identification of potential flow-related impacts to surface water resources as a result of Proposed Action groundwater drawdown and trigger implementation of mitigation measures as specified in the surface water monitoring and contingency mitigation plan. The mitigation would be designed to be specific to the use and impact of loss of flow of each surface water site.

Impacts of Mitigation: There are 32 springs and five stock water rights within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. There would be no impacts anticipated from quarterly monitoring surface water resources on public land. If mitigation is triggered and required, impacts would require some level of surface disturbance to implement the mitigation measure. If mitigation is required at all surface water resources, assuming the mitigation with the largest amount of disturbance proposed (i.e., 0.75 acre per site), total surface disturbance associated with mitigation would be approximately 28 acres and would occur within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. Surface disturbance would occur on up to 28 acres of the vegetation communities described in Section 3.14 and impacts would be similar to those described in Section 4.14. All springs, except one, were surveyed to have flow less than one gpm; SP-17 had the highest flow, at 8.26 gpm (BLM 2024r). If pumping is necessary for mitigation, it is anticipated that most sites would be supplemented with about one gpm which would result in negligible impacts to the aquifer.

Water Resources – WR-02
Mitigation Measure: Ioneer would be responsible for monitoring groundwater levels between the quarry and existing groundwater and surface water rights within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. Adverse impacts to groundwater wells and water rights would be monitored and mitigated, as required by the NDWR. Monitoring and mitigation for impacts to groundwater wells and water rights would depend on the actual impact and site-specific conditions and could include a variety of measures. Methods for addressing impacts to groundwater wells and water rights may include:

- For wells, mitigation could include lowering the pump, deepening an existing well, drilling a new well, or providing a replacement water supply of equivalent yield and general water quality.

- For surface water rights, mitigation could include providing a replacement water supply of equivalent yield and general water quality.

Effectiveness of Mitigation: This mitigation measure would effectively identify any adverse impacts to water wells and water rights from the Proposed Action and the mitigation options outlined are anticipated to effectively mitigate adverse impacts.

Impacts of Mitigation: Impacts of mitigation could include surface disturbance if new water sources need to be drilled. This is anticipated to be less than 0.5 acre. Since rate of use of water rights would not change no additional impacts are anticipated. Surface disturbance would occur in the vegetation communities described in Section 3.14 and impacts would be similar to those described in Section 4.14.

Wildlife Resources – WL-01
Mitigation Measure: The access road and infrastructure corridor reclamation seed mix would include Indian ricegrass (*Achnatherum hymenoides*) and desert globemallow (*Sphaeralcea ambigua*) to provide additional forage for pale kangaroo mouse and provide other wildlife species habitat. Indian ricegrass and desert globemallow are species native to Nevada and previously found along the access road and infrastructure corridor during biological baselines completed (EM Strategies 2020c).

Effectiveness of Mitigation: Including these two species in the reclamation seed mix for disturbance that occurs along this corridor would assist with reestablishing the habitat that was present prior to construction of the Proposed Action, as well as provide additional forage for pale kangaroo mouse.

Impacts of Mitigation: Including Indian ricegrass and desert globemallow in the reclamation seed mix for the access road and infrastructure corridor would not result in any additional impacts and would assist with reclaiming the area back to the habitat that was present prior to implementation of Proposed Action surface disturbance.

Wildlife Resources – WL-02
Mitigation Measure: Increased human activity may cause wildlife, including big game species avoidance of the NDOW Silver Peak 04-guzzler, limiting access to water. Groundwater use and drawdown may impact surface water sites used by wildlife; however, guzzlers are not affected by drawdown since they are either sourced by precipitation of manually filled. As mitigation, Ioneer would establish two guzzlers (outside of Tiehm's buckwheat designated critical habitat) to address potential impacts to water sources used by wildlife, including big game species. NDOW Silver Peak 04 (Cave Springs) Guzzler would be relocated and one new guzzler would be established east of the OPA and within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. Ioneer would relocate and rebuild the Cave Springs guzzler and build an additional new guzzler based on recommendations from NDOW and the BLM. Both guzzlers would be established during the four-year construction period of the Proposed Action.

Effectiveness of Mitigation: Moving the existing guzzler away from Proposed Action surface disturbance and activity would attract wildlife use away from the Project. Creating a new guzzler, also away from the Proposed Action surface disturbance, would mitigate potential effects to wildlife if surface water sites are impacted by groundwater drawdown from the Project.

Impacts of Mitigation: Installing two guzzlers is estimated to result in approximately 1.44 (0.72 each) acres of surface disturbance east of the OPA and within the maximum extent of the predicted 10-foot groundwater drawdown contour and its one-mile buffer. Installation of each guzzler would include creation of a level dirt pad measuring 45 feet by 16 feet, apron collection system not to exceed 80 by 40 feet, up to five 2,300-gallon storage tanks to hold a maximum total of 11,500 gallons when full, one steel drinker one foot by two feet, and square pipe rail fence up to 100 feet by 100 feet. Surface disturbance would occur on up to 1.44 acres of the vegetation communities described in Section 3.14 and impacts would be similar to those described in Section 4.14.

Wildlife Resources – WL-03
Mitigation Measure: Ioneer would conduct bat exclusion surveys at ES-3480 to confirm any bats using the abandoned mine land adit have left prior to constructing the haul road. Ioneer would be responsible for closing the adit in coordination with NDOW and BLM.

Effectiveness of Mitigation: By completing bat exclusion surveys prior to closing the adit and completing construction that would impact the adit, the potential direct loss of species would be avoided.

Impacts of Mitigation: No direct impacts to bat species are anticipated from the bat exclusion surveys at ES-3480. Closing the adit would prevent future use by any bat species. This is not anticipated to have an impact as other adits and habitat are available in adjacent areas.

4.21.2 North and South OSF Alternative

No additional monitoring or mitigation would be proposed under the North and South OSF Alternative beyond what has been described for the Proposed Action. Monitoring and mitigation described for the Proposed Action would be applicable to the Noth and South OSF Alternative.

4.21.3 No Action Alternative

No additional monitoring or mitigation is proposed under the No Action Alternative.

4.22 Residual Impacts

4.22.1 Unavoidable Adverse Impacts

Unavoidable adverse impacts from the Proposed Action, North and South OSF Alternative, and No Action Alternative would be anticipated to the resources outlined below from facilities remaining as post-reclamation features (**Table 4-8**). No unavoidable adverse impacts would be anticipated to impact the following resources: air quality and climate change, environmental justice, social and economic values, transportation and access, and wetland and riparian areas.

Table 4-8 Unavoidable Adverse Impacts

Resource	Proposed Action	North and South OSF Alternative	No Action Alternative
Cultural Resources	Removal of up to 12 NRHP-eligible cultural resources from surface disturbance, impacts to three NRHP-eligible cultural resources from vibration, and impacts to two NRHP-eligible cultural resources from changes to the visual and auditory environment. Loss of up to 140 cultural resources that are not eligible for the NRHP.	Removal of up to 19 NRHP-eligible cultural resources from surface disturbance, impacts to NRHP-eligible one cultural resource from vibration, and impacts to two NRHP-eligible cultural resources from changes to the visual and auditory environment. Loss of up to 143 cultural resources that are not eligible for the NRHP.	None identified.
Geology and Minerals	Potential loss of future use of geologic resources beneath mine features such as West and North OSFs and the SOSF as well as within the backfills. The resource would be permanently removed during quarrying.	Same as the Proposed Action, except placement of the South OSF would occur on the Cave Springs Formation.	None identified.
Hazardous Materials and Waste	Residual adverse effects from the use of hazardous materials would depend on the substance, quantity, timing, location, and response involved in the event of an accidental spill or release.	Same as the Proposed Action.	None identified.
Land Use and Realty	Communication Tower 3 would remain post-reclamation. Ioneer may co-own this tower with a major cellular service provider which may require submittal and approval of a ROW application. Permanent reduction of 383 acres for future land use.	Same as the Proposed Action, except permanent reduction of up to 214 acres.	None identified.
Livestock Grazing	Permanent reduction of up to 383 acres of foraging habitat associated with up to 15 AUMs. Permanent economic impacts associated with the loss of AUMs.	Permanent reduction of up to 214 acres of foraging habitat associated with eight AUMs. Permanent economic impacts associated with the loss of AUMs.	None identified.
Native American Traditional Values	Permanent reduction of vegetation and wildlife habitat. Potential permanent impact to Cave Spring from loss of water. Permanent change to the viewshed.	Same as the Proposed Action, except permanent reduction of up to 214 acres.	None identified.
Recreation	Permanent reduction of up to 383 acres of area that could be used for recreation, including 58 acres of permanent disturbance to semi-primitive motorized recreational areas. Thirty-two acres of permanent disturbance to LWC328 and 224 acres of permanent disturbance to LWC338. Permanent reduction of 366 acres to OHV restricted areas. Permanent change to the viewshed from the Silver Peak WSA.	Permanent reduction of up to 214 acres, including 47 acres in semi-primitive motorized recreational areas. Permanent disturbance to 154 acres of designated limited to existing roads and trails, and 51 acres that are limited to existing roads and trails and closed to competition events. Permanent disturbance to 28 acres of LWC328 and 117 acres of LWC338. permanent change to the viewshed from the Silver Peak WSA.	None identified.

Resource	Proposed Action	North and South OSF Alternative	No Action Alternative
Soils	Permanent reduction of up to 383 acres of soils.	Permanent reduction of up to 214 acres of soils.	None identified.
Threatened and Endangered Species	Permanent reduction of up to 279 acres of potential BSSG habitat and permanent conversion of shrub to grassland habitat. Permanent reduction of 383 acres of potential monarch butterfly habitat. Potential increase in foraging habitat for monarch butterfly from quarry lake. Permanent alteration to pollinator relationships, permanent alteration to overland flow and runoff affecting moisture at subpopulations, and permanent reduction of 97 acres of Tiehm's buckwheat designated critical habitat.	Same as the Proposed Action, except permanent reduction of up to 135 acres of potential BSSG habitat and permanent reduction of 214 acres of monarch butterfly habitat, and permanent reduction of 45 acres of Tiehm's buckwheat designated critical habitat.	None identified.
Vegetation	Permanent reduction of up to 383 acres of vegetation. Potential permanent impacts to Mojave fishhook cactus individuals pending location as well as permanent surface disturbance to 102 acres of potential habitat.	Same as the Proposed Action, except permanent reduction of up to 214 acres of vegetation and direct disturbance to one sagebrush cholla.	None identified.
Visual Resources	Permanent change to the viewshed from both the reclaimed and permanent features.	Same as the Proposed Action.	None identified.
Water Resources	Drawdown from dewatering would occur, and wells in the OPA would experience up to 300 feet during the operating period with recovery taking approximately 60 years. Potential impact to surface features from reduction in groundwater for more than 200 years. Four surface water stock rights, and one underground stock water right located within the predicted maximal 10-foot drawdown contour could be impacted. One surface stock water right, one underground stock water right, and nine underground irrigation rights within the supply wells buffer area could be impacted. A post-quarrying quarry lake would be created that would take 60 years to reach equilibrium.	Same as the Proposed Action.	None identified.
Wildlife	Permanent reduction of up to 383 acres of potentially suitable habitat for wildlife species. Addition of potential habitat from the quarry lake. Permanent increased competition for surface water if impacts from dewatering are realized. Removal of one adit.	Same as the Proposed Action, except permanent reduction of up to 214 acres of potentially suitable habitat for wildlife species.	None identified.
Wild Horses and Burros	Permanent reduction of up to 383 acres of foraging habitat.	Permanent reduction of up to 214 acres of foraging habitat.	None identified.

4.22.2 Irreversible and Irretrievable Impacts

The irreversible and irretrievable commitment of resources for the Proposed Action, North and South OSF Alternative, and the No Action Alternative are provided in **Table 4-9**. Irreversible and irretrievable commitments of resources were not identified for the following resources: air quality and climate change,

environmental justice, hazardous materials and solid waste, land use and realty, social and economic values, transportation and access, and wetland and riparian areas.

Table 4-9 Irreversible and Irretrievable Commitment of Resources

Resource	Proposed Action	North and South OSF Alternative	No Action Alternative
Cultural Resources	Removal of up to 12 NRHP-eligible cultural resources from surface disturbance, impacts to three NRHP-eligible cultural resources from vibration, and impacts to two NRHP-eligible cultural resources from changes to the visual and auditory environment. Loss of up to 140 cultural resources that are not eligible for the NRHP.	Removal of up to 19 NRHP-eligible cultural resources from surface disturbance, impacts to NRHP-eligible one cultural resource from vibration, and impacts to two NRHP-eligible cultural resources from changes to the visual and auditory environment. Loss of up to 143 cultural resources that are not eligible for the NRHP.	None identified.
Geology and Minerals	Potential loss of future use of geologic resources beneath mine features such as West and North OSF and the SOSF as well as within the backfills. The resource would be permanently removed during quarrying.	Same as the Proposed Action, except placement of the South OSF would occur on the Cave Springs Formation.	None identified.
Livestock Grazing	Permanent reduction of up to 383 acres of foraging habitat.	Permanent reduction of up to 214 acres of foraging habitat.	None identified.
Native American Traditional Values	Permanent reduction of vegetation and wildlife habitat. Potential permanent impact to Cave Spring from loss of water. Permanent change to the viewshed.	Same as the Proposed Action, except permanent reduction of up to 214 acres.	None identified.
Recreation	Permanent reduction of up to 383 acres of area that could be used for recreation.	Permanent reduction of up to 214 acres.	None identified.
Soils	Permanent reduction of up to 383 acres of soils.	Permanent reduction of up to 214 acres of soils.	None identified.
Threatened and Endangered Species	Permanent reduction of up to 279 acres of potential BSSG habitat, 383 acres of potential monarch butterfly habitat, and permanent reduction of 97 acres of Tiehm's buckwheat designated critical habitat,	Same as the Proposed Action, except permanent reduction of up to 135 acres of potential BSSG habitat, 214 acres of monarch butterfly habitat, and permanent reduction of 45 acres of Tiehm's buckwheat designated critical habitat.	None identified.
Vegetation	Permanent reduction of up to 383 acres of vegetation.	Same as the Proposed Action, except permanent reduction of up to 214 acres of vegetation.	None identified.
Visual Resources	Permanent change to the viewshed from both the reclaimed and permanent features.	Same as the Proposed Action.	None identified.
Water Resources	A quarry lake would be created that would take 60 years to reach near steady-state.	Same as the Proposed Action.	None identified.
Wildlife	Permanent reduction of up to 383 acres of potentially suitable habitat for wildlife species. Removal of one adit.	Same as the Proposed Action, except permanent reduction of up to 214 acres of potentially suitable habitat for wildlife species.	None identified.
Wild Horses and Burros	Permanent reduction of up to 383 acres of foraging habitat.	Permanent reduction of up to 214 acres of foraging habitat.	None identified.

4.22.3 Relationship of Short-Term Uses and Long-Term Productivity

The relationship of short-term uses and long-term productivity for the Proposed Action, North and South OSF Alternative, and the No Action Alternative are provided in **Table 4-10**. Impacts from short-term use and long-term productivity were not identified for the following resources: air quality and climate change, cultural resources, environmental justice, geology and minerals, hazardous materials and solid waste, land use and realty, Native American Traditional Values, recreation, social and economic values, and visual resources.

Table 4-10 Relationship of Short-term Uses and Long-term Productivity

Resource	Proposed Action	North and South OSF Alternative	No Action Alternative
Livestock Grazing	2,306 acres of vegetation removed. Creating a long-term impact and change in the productivity of the site and forage availability once reclaimed.	Same as the Proposed Action, except 2,271 acres of vegetation removed.	15 acres of vegetation removed and reclaimed.
Soils	2,306 acres of soils removed. Creating a long-term impact and change in soil composition and productivity.	Same as the Proposed Action, except 2,271 acres of soils removed.	15 acres of soils removed and reclaimed.
Threatened and Endangered Species	1,064 acres of potential BSSG habitat, 2,306 acres of potential monarch butterfly habitat, and up to 354 acres of Tiehm's buckwheat designated critical habitat removed. Creating a long-term impact and change in habitat.	Same as the Proposed Action, except 782 acres of potential BSSG habitat, 2,271 acres of potential monarch butterfly habitat, and up to 197 acres of Tiehm's buckwheat designated critical habitat removed. Creating a long-term impact and change in habitat.	15 acres of habitat removed and reclaimed.
Vegetation	2,306 acres of vegetation removed. Creating a long-term impact and change in the productivity of the site and forage availability once reclaimed.	Same as the Proposed Action, except 2,271 acres of vegetation removed.	15 acres of vegetation removed and reclaimed.
Water Resources	Dewatering of up to 650 gpm. Creating a long-term impact on groundwater quantity and recovery.	Same as the Proposed Action.	None identified.
Wildlife	2,306 acres of habitat removed. Creating a long-term impact and change in the productivity of the site and forage availability once reclaimed. Removal of one adit.	Same as the Proposed Action, except 2,271 acres of habitat removed.	15 acres of habitat removed and reclaimed.
Wild Horses and Burros	2,286 acres of vegetation removed in Silver Peak HMA. Creating a long-term impact and change in the productivity of the site and forage availability once reclaimed.	Same as the Proposed Action, except 2,171 acres of vegetation removed in Silver Peak HMA.	15 acres of vegetation removed and reclaimed.

5.0 Consultation, Coordination, and Public Involvement

5.1 Consultation and Coordination with Agencies and Tribal Governments

This section describes the specific actions taken by the BLM to consult and coordinate with Native American tribes, cooperating agencies, and other government agencies. Various federal laws require the BLM to consult with Native American tribes, SHPO, USFWS, and USEPA, and cooperating agencies during the NEPA decision-making process. In addition to formal scoping, the BLM implemented collaborative outreach and a public involvement process that included inviting agencies to be cooperative partners for the EIS NEPA process.

The BLM is currently consulting with SHPO to prepare a MOA between the BLM, SHPO, and the Advisory Council on Historic Preservation. Ioneer is working with the BLM and SHPO to develop HPTP as described in Section 2.1.13.3.

The BLM plans to initiate formal consultation with the USFWS through the preparation and submittal of a Biological Assessment (BLM 2024b) that evaluates the potential effects on Tiehm's buckwheat and its designated critical habitat.

5.2 Government-to-Government Consultation with Native American Tribes

Tribal consultation is ongoing, and as part of that process, the BLM will provide the Tribes with this EIS for review and comment. A summary of consultation to date is provided below and in **Table 5-1**.

The BLM contacted the following tribal governments during the EIS process including the Big Pine Band of Owens Valley Paiute Shoshone Indians, Bishop Paiute, Benton (Utu Utu Gwaitu) Paiute, Te-Moak Tribe of Western Shoshone Indians, Ely Shoshone, Shoshone-Paiute of the Duck Valley Indian Reservation, Duckwater Shoshone, Yomba Shoshone, and Timbisha Shoshone.

On January 29, 2020, the BLM TFO sent letters via certified mail to official tribal representatives of the Duckwater Shoshone, Timbisha Shoshone, and Yomba Shoshone tribes to inform them of the Project and to request any comments or questions they may have regarding the Project.

On February 11, 2020, five tribal representatives from the Timbisha Shoshone Tribe accompanied the BLM on a visit to the Project. During the site visit, the tribal representatives expressed concern about impacts to prehistoric cultural resources and inquired about impacts to bighorn sheep and Tiehm's buckwheat. Tribal representatives stated that avoidance of cultural resources is preferred over mitigation.

On June 23, 2020, representatives from the Timbisha Shoshone and the Duckwater Shoshone tribes met with representatives of Ioneer and the BLM at the Project to tour the area and discuss the Project and potential impacts. In a letter to the BLM dated June 26, 2020, the Duckwater Shoshone indicated that two areas contained specific sacred items and should be avoided by the Project activities. Tribal monitors during ground-disturbing activities and another meeting with Ioneer to further discuss concerns were requested.

After a pause on the Project due to the pending listing of the Tiehm's buckwheat to the Endangered Species List and subsequent revision of the Plan, the BLM reinitiated a scoping period. Scoping letters were sent to the Big Pine Paiute Tribe of Owens Valley, the Bishop Paiute Tribe, the Benton (Utu Utu Gwaitu) Paiute, the Te-Moak Tribe of Western Shoshone Indians, the Ely Shoshone, the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, the Duckwater Shoshone, and the Yomba Shoshone on December 19, 2022. Additional letters and emails were sent, including to the Timbisha Shoshone Tribe, on January 27, 2023, with an email sent to the Inter-Tribal Council of Nevada on February 1, 2023. The BLM carried out follow up consultation with the Western Shoshone Defense Project, Big Pine Paiute Tribe of Owens Valley, Bishop Paiute Tribe, Timbisha Shoshone Tribe, and Duckwater Tribe from February 3, 2023, through April 26, 2023. However, prior to this, the BLM met on different occasions with the Duckwater Shoshone Tribe, the Timbisha Shoshone Tribe, and the Bishop Paiute Tribe to discuss this Project as well as others. Scoping comments were received from the Big Pine Paiute Tribe of the Owens Valley, Timbisha Shoshone Tribe, and the Western Shoshone Defense Project. Concerns included impacts to sacred sites, restricted access

to traditional resource areas, degradation of cultural and biotic landscapes within traditional territory, potential effects to cultural properties, inadvertent discovery of human remains, and impacts to culturally significant wildlife and plant resources.

Comment letters received in response to the scoping request included the Big Pine Paiute Tribe of Owens Valley, Timbisha Shoshone Tribe, and the Western Shoshone Defense Project.

The BLM emailed the Tribes on April 27, 2023, regarding an upcoming field visit. Follow up letters were sent to the same Tribes on May 17, 2023, inviting them to become cooperating agencies. Several tribes have shown interest in increasing their involvement in the Project, but to date none has agreed to become a cooperating agency, although they have requested government-to-government bi-weekly meetings. Follow-up consultation with the Timbisha Shoshone Tribe, including Project area visits, were completed on April 27, 2023, and November 9, 2023.

Table 5-1 Tribal Consultation/Coordination

Tribe	Date	Details
Duckwater Shoshone	01/29/2020	Scoping Letter from BLM
Timbisha Shoshone	01/29/2020	Scoping Letter from BLM
Yomba Shoshone	01/29/2020	Scoping Letter from BLM
Timbisha Shoshone	02/11/2020	Five tribal representatives attended Project area visit
Duckwater Shoshone	06/23/2020	Project area visit
Timbisha Shoshone	06/23/2020	Project area visit
Duckwater Shoshone	06/26/2020	Letter requesting avoidance of sensitive areas, presence of tribal monitors during ground-disturbing activities, and further consultation
Duckwater Shoshone	03/25/2022	NAC coordination meeting(s) with Duckwater Shoshone Tribe Chairman Graham regarding a proposed site visit that was implemented on March 25, 2022 resulting in re-staking for avoidance of areas of cultural significance.
Timbisha Shoshone	04/19/2022	BLM presented project updates with the Timbisha Council on April 19, 2022 that included e-planning information in the summary.
Bishop Paiute	04/26/2022	BLM met with the Bishop Paiute Council on April 26, 2022 to present on the BMDO and why the District is expanding its sphere of influence with respect to both the Rhyolite Ridge and Esmeralda 7 Solar proposals.
Big Pine Tribe of Owens Valley Paiute Shoshone Indians	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Bishop Paiute	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Benton (Utu Utu Gwaitu) Paiute	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Te-Moak Tribe of Western Shoshone Indians	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Ely Shoshone	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Shoshone-Paiute	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Duckwater Shoshone	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.

Tribe	Date	Details
Yomba Shoshone	12/19/2022	Scoping Letter from BLM. Correspondent included a link to the project's ePlanning website, direct links to register for the Zoom meetings, and a copy of the news release.
Big Pine Band of Owens Valley Paiute Shoshone Indians, Bishop Paiute, Benton (Utu Utu Gwaitu) Paiute, Te-Moak Tribe of Western Shoshone Indians, Ely Shoshone, Shoshone-Paiute of the Duck Valley Indian Reservation, Duckwater Shoshone, Timbisha Shoshone, and Yomba Shoshone	01/27/2023	Letters and consultation emails from BLM to all affected tribes regarding the updated Rhyolite Ridge POO and request for tribal consultation and input.
Inter-Tribal Council of Nevada	02/01/2023	Email from BLM to Inter-Tribal Council of Nevada Inc's Tribal/State Liaison, Clifford Banuelos for the proposed Rhyolite Ridge project update for the ITCN Environmental Manager's Meeting held on February 3, 2023 in Reno at the ITCN Headquarters.
Big Pine Paiute Tribe of Owens Valley	02/02/2023	Letter expressing opposition to the project, acknowledges ongoing consultation, and resource concerns including Tiehm's buckwheat, water, plants, wildlife.
Timbisha Shoshone	02/03/2023	Letter requesting a 30-day extension of the scoping period.
Western Shoshone Defense Project	02/03/2023	Letter expressing opposition to the project, resource concerns including impacts to springs and wildlife, the Cave Springs sacred site, Indigenous traditional ecological knowledge, ground and surface water contamination, and tribal treaty rights.
Duckwater Shoshone	02/24/2023	Email from BLM to Chairman Warren Graham requesting a call to schedule a coordination meeting or field visit to discuss tribal concerns.
Duckwater Shoshone	02/28/2023	Email from Chairman Graham regarding availability for a call.
Timbisha Shoshone	03/03/2023	Letter expressing resource concerns including impacts to springs, plants, water, wildlife, tribal resources, contamination, vibration and noise, soil, and environmental justice.
Western Shoshone Defense Project	03/03/2023	Letter expressing socioeconomic, environmental justice, and tribal rights concerns.
South Fork Band	04/03/2023	Email from BLM to South Fork Band regarding not attending the presentation to their Council due to winter weather and providing the updated project status list with e-planning accessibility for the Rhyolite Ridge proposed project.
Bishop Paiute	04/22/2023	Email chain regarding BLM pre-meeting with Tribal Administrator and upcoming meeting with council on April 26, 2023.
Timbisha Shoshone, Bishop Paiute, Big Pine Paiute	04/27/2023	Follow up action item email from BLM to known participants for the April 27, 2023 field meeting to share Ioneer contact information.
Big Pine Band of Owens Valley Paiute Shoshone Indians, Bishop Paiute, Benton (Utu Utu Gwaitu) Paiute, Te-Moak Tribe of Western Shoshone Indians, Ely Shoshone, Shoshone-Paiute of the Duck Valley Indian Reservation, Duckwater Shoshone, Timbisha Shoshone, and Yomba Shoshone	04/27/2023	Coordination email/Outlook invitations to all affected Tribes for implementation of a field meeting for consultation/ communication with Ioneer and the BLM TFO Field Manager held on April 27, 2023.
Big Pine Band of Owens Valley Paiute Shoshone Indians, Bishop Paiute, Benton (Utu Utu Gwaitu) Paiute, Te-Moak Tribe of Western Shoshone Indians, Ely Shoshone, Shoshone-Paiute of the Duck Valley Indian Reservation,	05/17/2023	Letters sent by the BLM to all affected Tribes for an invitation request for additional opportunity to communicate/consult in proposed Microsoft Teams or Zoom on a monthly basis.

Tribe	Date	Details
Duckwater Shoshone, Timbisha Shoshone, and Yomba Shoshone		
Timbisha Shoshone	04/27/2023	Field consultation/Project Area visit including BLM and Ioneer
Timbisha Shoshone	06/20/2023	Field consultation/Project Area visit including BLM and Ioneer
Timbisha Shoshone	06/26/2023	Meeting with the Timbisha Shoshone Tribal Council and THPO and BLM.
Bishop Paiute	08/08/2023	Meeting between Scott Distel (BLM) and Brian Adkins (Environmental Director at Bishop Paiute Tribe) regarding cooperating agency status and government to government coordination and consultation. Follow up discussion via email between Brian and Scott on January 30, 2024 regarding Project update and status.
Timbisha Shoshone	11/09/2023	Field consultation/Project Area visit including BLM and Ioneer

5.3 Cooperating Agencies

This section lists agencies/counties that were invited to be cooperating agencies and note which ones accepted the role. In addition, agencies participating as cooperating agencies under existing Memorandums of Understanding are outlined below. A cooperative agency is any federal, state, or local government agency or Native American tribe that enters into formal agreement with the lead federal agency to help develop an environmental analysis. To prepare this EIS, BLM coordinated with the following entities: Department of Energy, USEPA, USFWS, NDOW, NDF, NDEP, Department of Conservation and Natural Resources Sagebrush Ecosystem Technical Team, Esmeralda County, and Nye County.

5.4 Public Involvement

Public participation in the EIS process occurs at four specific points: scoping period, review of Draft EIS, review of Final EIS, and receipt of the ROD.

5.4.1 Scoping

The formal public scoping process began with a news release on December 19, 2022, and publication of a Notice of Intent in the Federal Register on December 20, 2022. The BLM invited the public to submit comments during the public scoping period from December 20, 2022 through January 19, 2023. The Notice of Intent and the news release notified the public of the BLM's intent to prepare an EIS, provided information about the Proposed Action, described the purpose of the public scoping process, identified methods to provide comments, and provided contact information for questions regarding the Project. The news release advertised two public scoping meetings that were to be held virtually on January 4 and 5, 2023. The BLM also advertised the public scoping meetings through the BLM's ePlanning website.

The BLM issued a press release on January 4, 2023, notifying the public that the public scoping period for the Project would be extended by two weeks through February 3, 2023. The BLM further extended the scoping period for an additional 30 days through March 6, 2023, in response to additional requests from a cooperating agency and a consulting Tribe. A press release was issued to notify the public of the additional extension.

The BLM hosted two virtual public scoping meetings, which were held on January 4 and 5, 2023. The public scoping meetings gave agencies, organizations, the public, and other interested parties an opportunity to learn and ask questions about the Project and to share issues and concerns with the BLM. The BLM gave a presentation regarding the NEPA process and then Ioneer provided an overview of the Project. After the presentation, the BLM and Ioneer answered written and oral questions to encourage open and informal dialog between the public and agency representatives. The BLM provided a Project overview on the ePlanning website describing the Project and the public scoping process and the detailed Plan. Instructions on how to provide comments were included on the ePlanning website in the presentation and were discussed during the meetings. Following the meetings, the BLM posted videos of the virtual public

meetings on the ePlanning website. By the close of the scoping period, 95 comment documents had been received. The BLM reviewed the scoping comments and the Draft EIS was prepared.

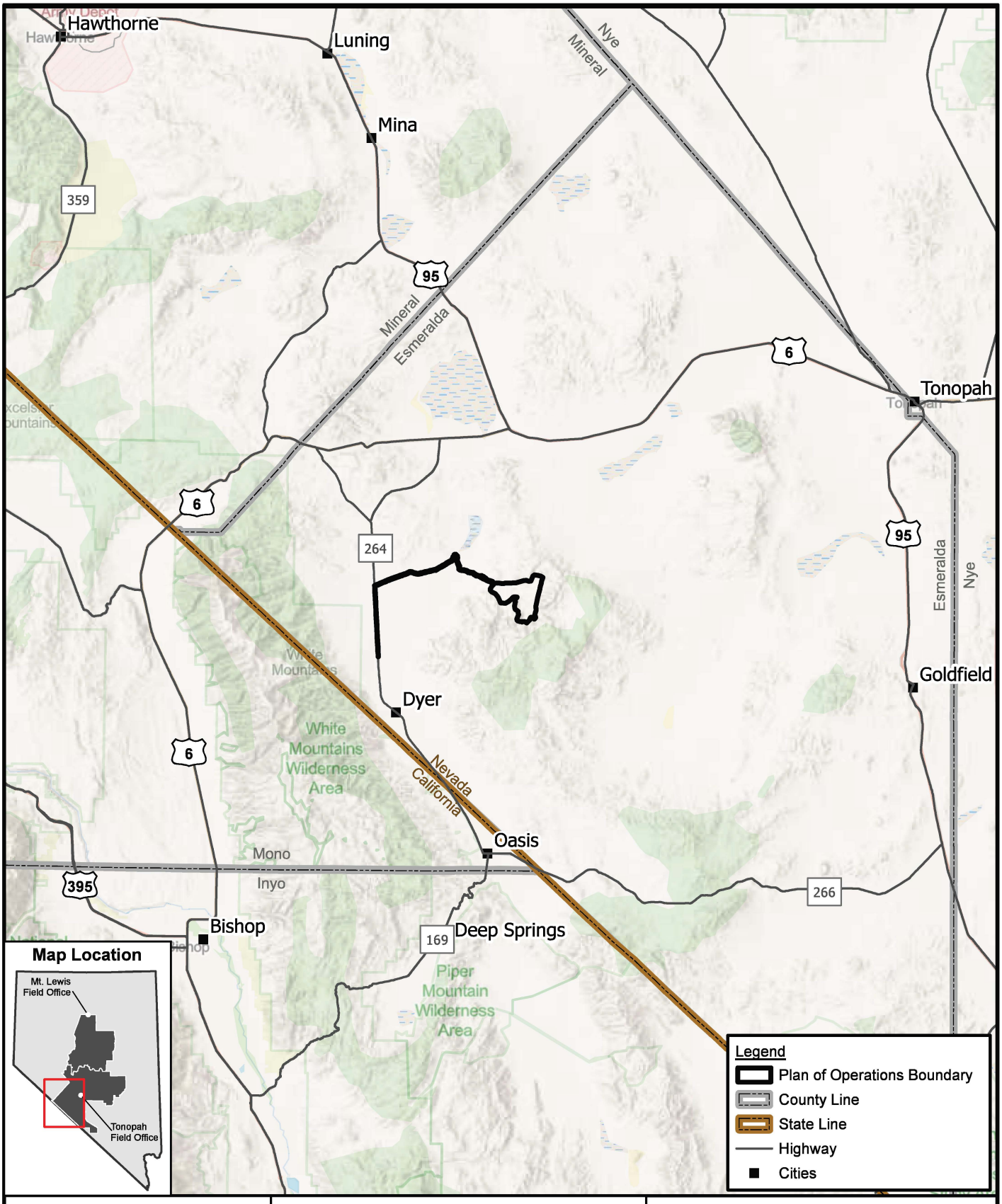
5.4.2 Draft EIS Comment Period

A 45-day Draft EIS comment period is initiated by publication of a Notice of Availability of the Draft EIS in the Federal Register. Public meetings are held to inform the public of the Project, answer questions, and inform the public of how to comment. Public comments received during the public comment period on the Draft EIS will be reviewed and responded to. Responses to comments will be appended to the Final EIS.

5.4.3 Final EIS Availability Period

A 30-day Final EIS availability period will be initiated by publication of a Notice of Availability for the Final EIS in the Federal Register. BLM will review all comments received on the Final EIS during the availability period. If the BLM determines the comments have merit, such as identifying significant new circumstances relevant to environmental concerns from the Proposed Action, the BLM will determine whether to supplement the EIS or if minor changes can be made to the existing EIS. The BLM will address all comments received on the Final EIS in the ROD. At the end of the 30-day availability period and review of comments, a ROD will be prepared and issued. The Final EIS/ROD will cite the conclusions regarding the environmental effects and appropriate mitigation measures for the selected alternative.

Appendix A: Figures



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE PROJECT

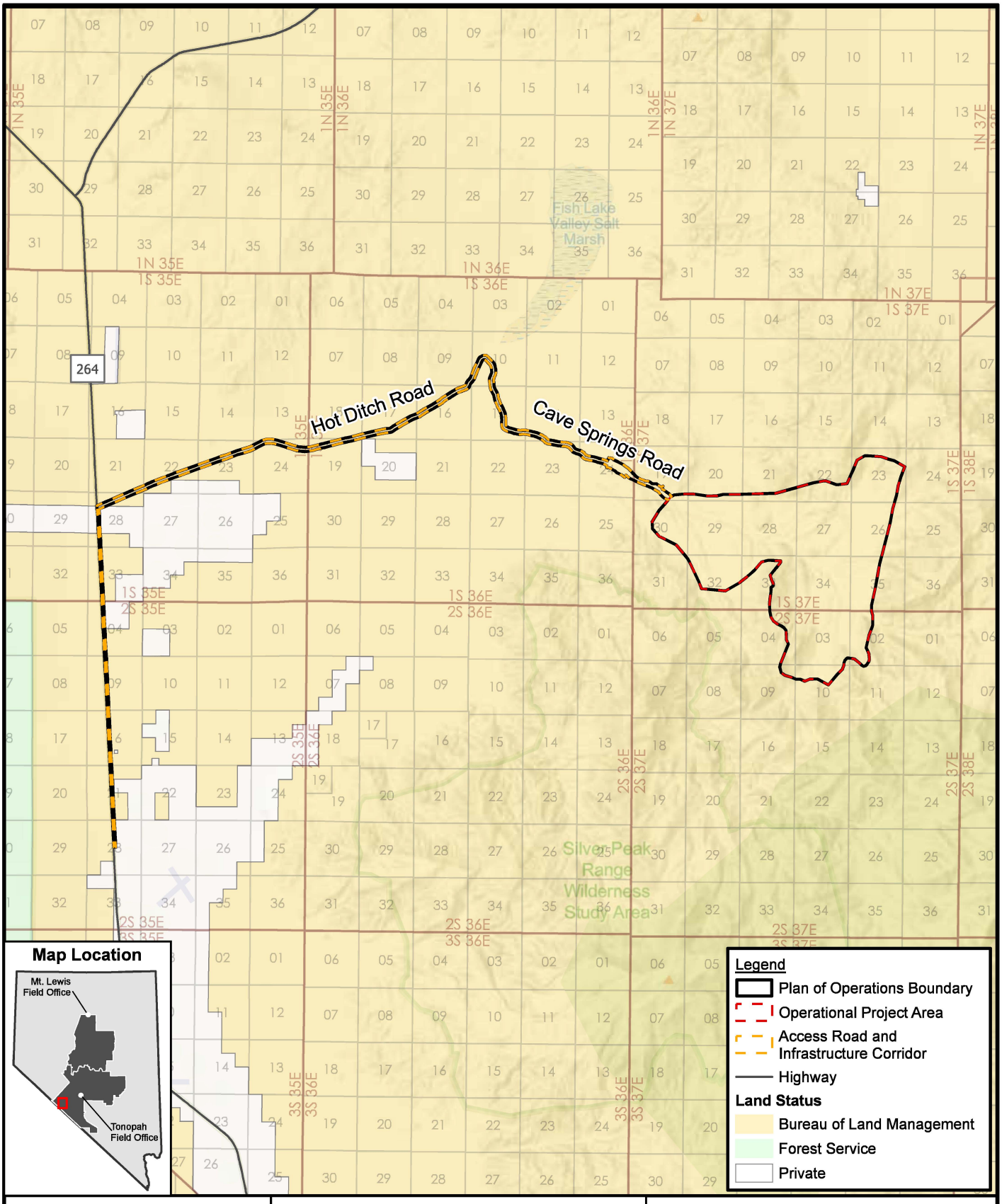
0 12 24 Miles
1 in = 12 miles
N

PROJECT LOCATION

FIGURE 1-1

2022-10-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 2.5 5 Miles
1 in = 2.5 miles

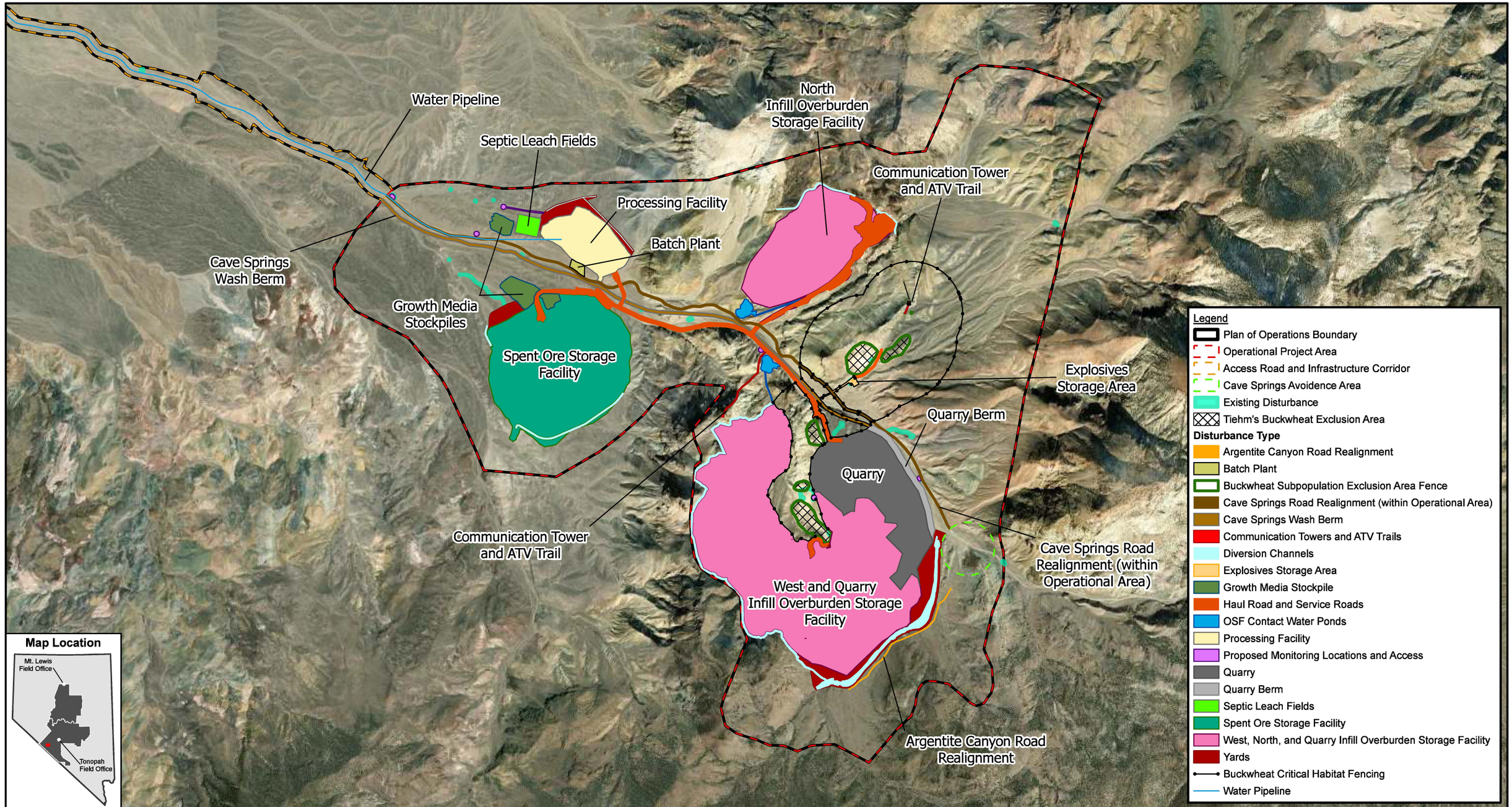
N

PLAN OF OPERATIONS BOUNDARY

FIGURE 2-1

2024-03-04

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 3,000 6,000 Feet
1 in = 3,000 feet

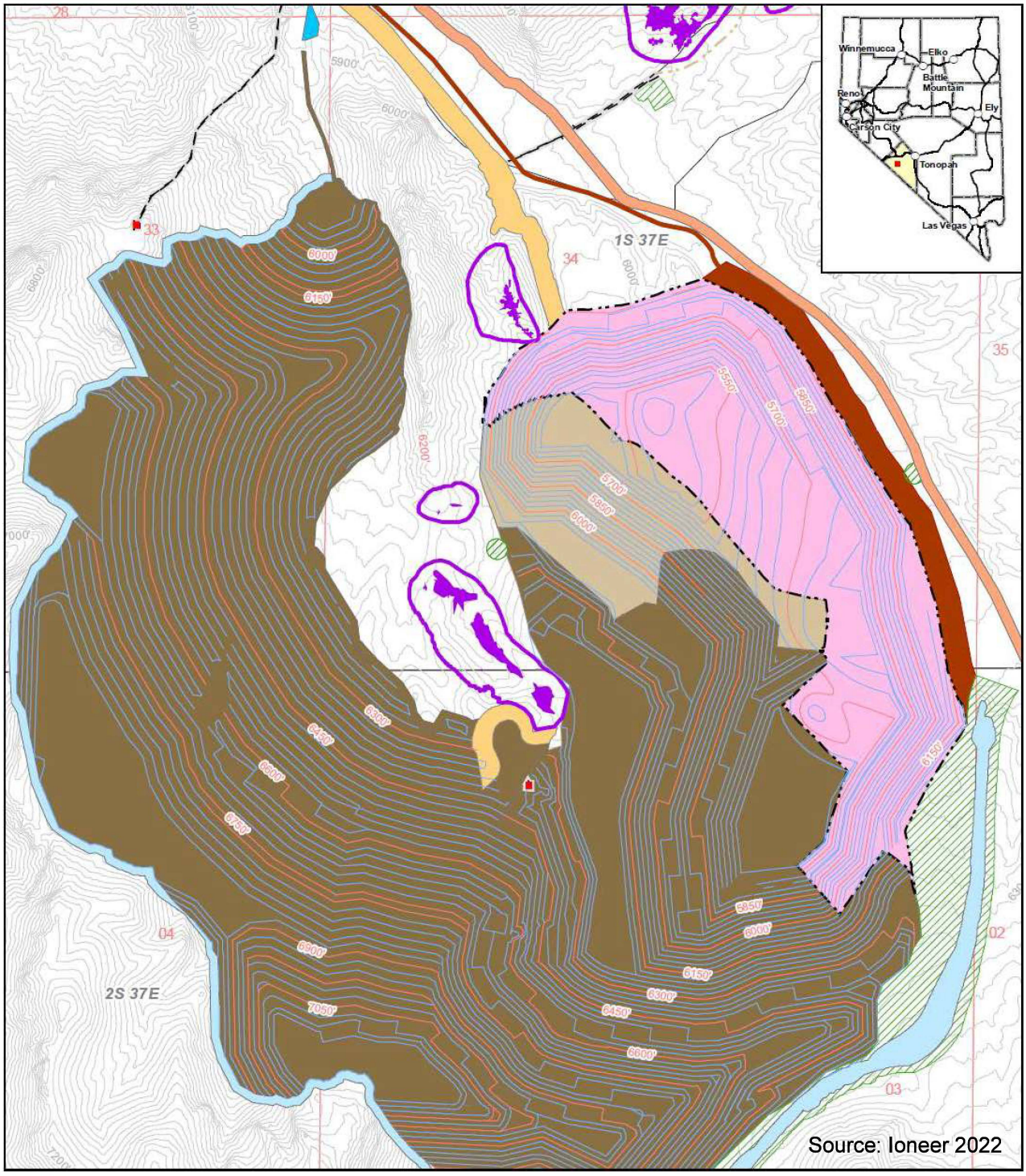
N

PROPOSED ACTION PROJECT FACILITIES

FIGURE 2-2

2024-03-04

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Explanation

- Existing Road
- Exclusion Area Road Reroute
- Buckwheat Populations
- Buckwheat Exclusion Areas
- Quarry
- Buttress
- Overburden Storage Facility
- Diversion Channel
- Pond
- Yard
- Berm
- County Road (Re-Aligned)
- Haul Road
- ATV Trail
- Communication Tower

Contours

- Existing
- Proposed Major
- Proposed Minor

0 500 1,000 Feet

Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

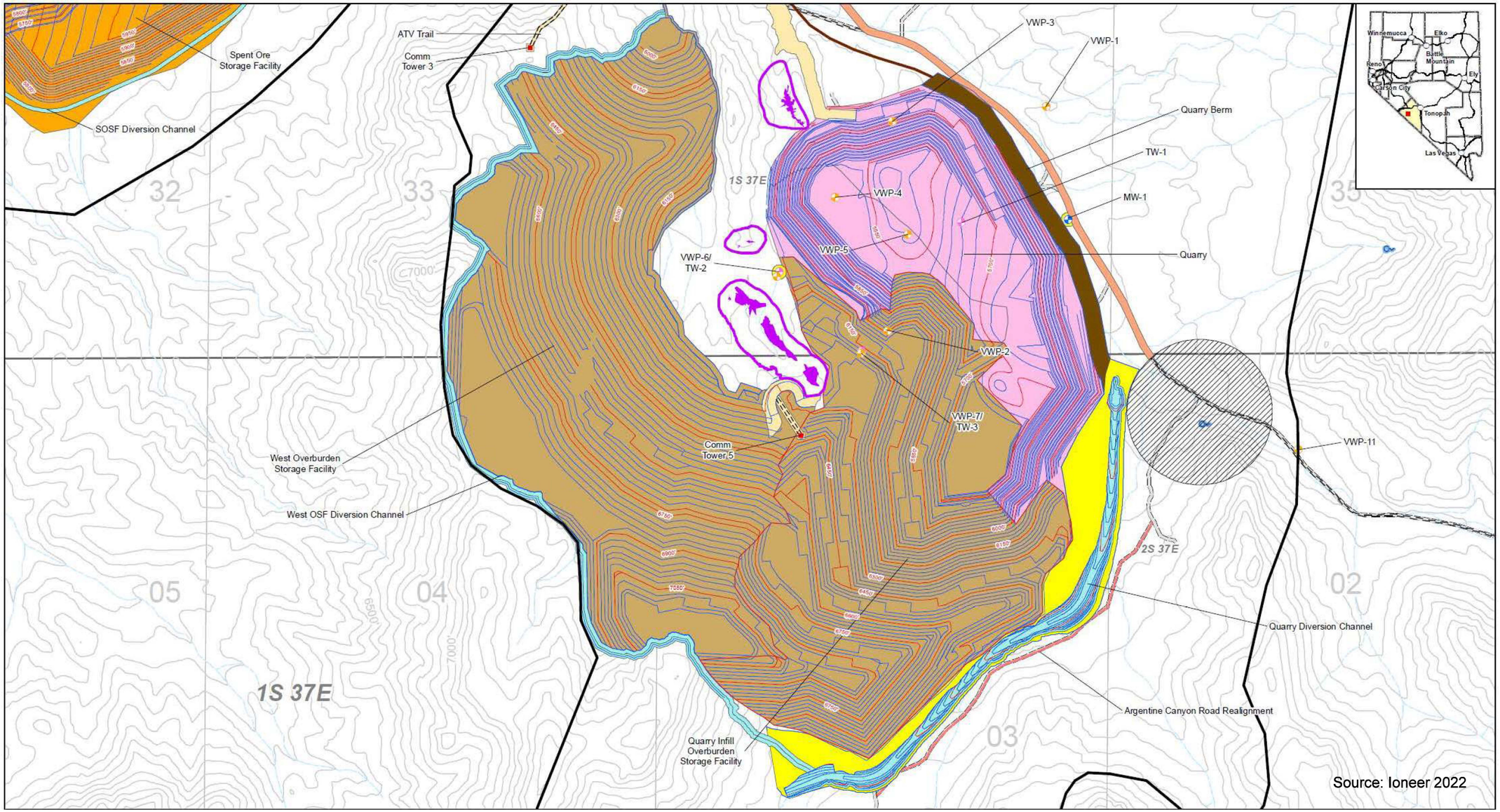
N

PROPOSED ACTION QUARRY

FIGURE 2-3

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Explanation

- Plan of Operations Boundary
- Avoidance Area
- Buckwheat Populations
- Buckwheat Exclusion Area
- Existing Monitoring Well
- Vibrating Wire Piezometer
- Test Well
- Spring/Seep
- Existing Road
- Argentite Canyon Road Realignment
- ATV Trails
- Drainage

Mine Features

- Quarry
- Overburden Storage Facility
- Spent Ore Storage Facility
- Diversion Channel
- Yard
- County Road (Realigned)
- Mine Road
- Berm
- Communication Towers

Contours

- Existing
- Proposed Major
- Proposed Minor

0 1,000 2,000 Feet

Battle Mountain
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Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

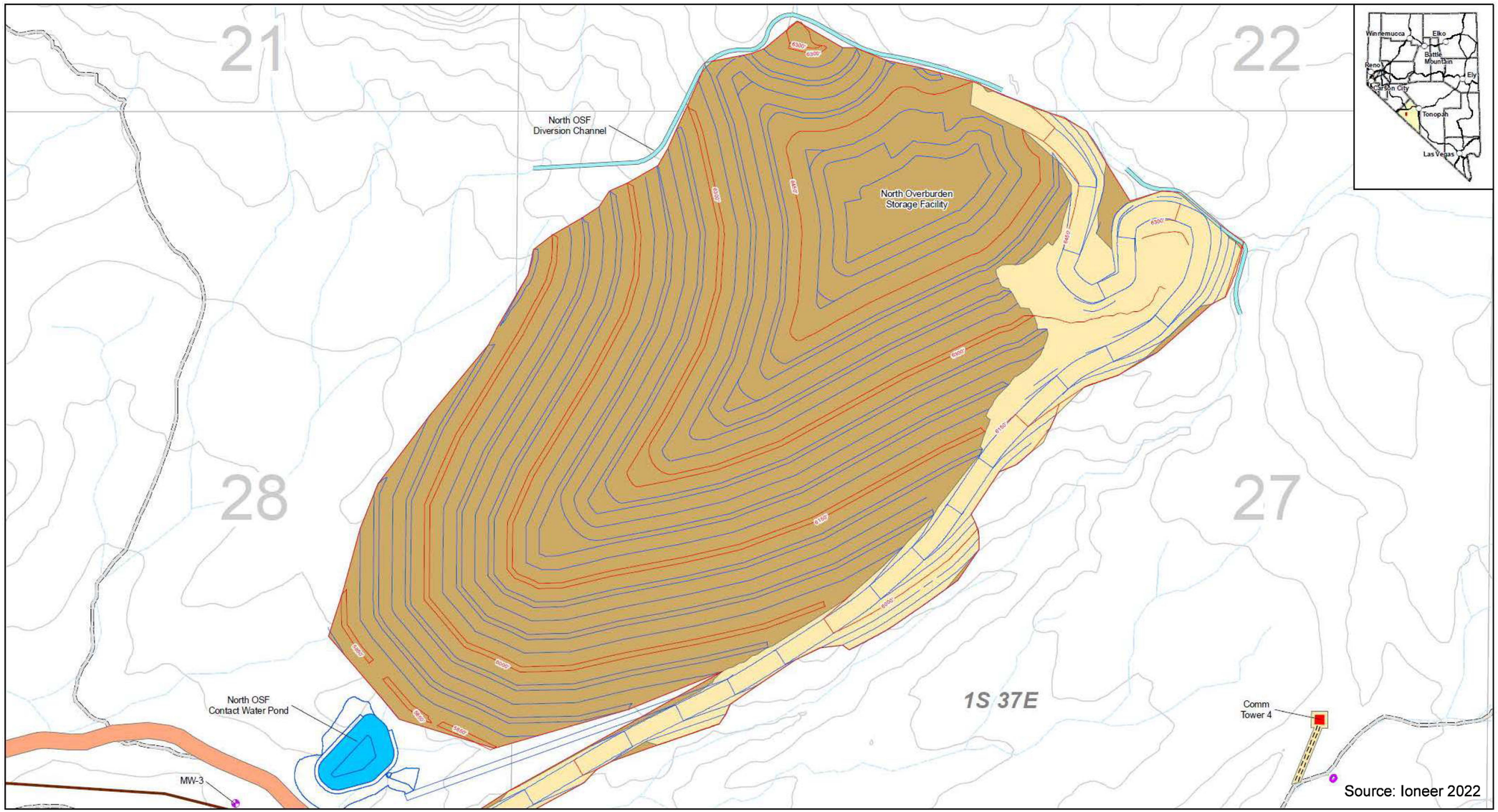
N

PROPOSED ACTION WEST OVERBURDEN STORAGE FACILITY

FIGURE 2-4

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Explanation

- Plan of Operations Boundary
- Buckwheat Populations
- Buckwheat Exclusion Area
- Proposed Monitoring Well
- Existing Road
- ATV Trails
- Drainage

Mine Features

- Overburden Storage Facility
- Pond
- Diversion Channel
- County Road (Realigned)
- Mine Road
- Communication Towers

Contours

- Existing
- Proposed Major
- Proposed Minor

0 500 1,000 Feet

Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

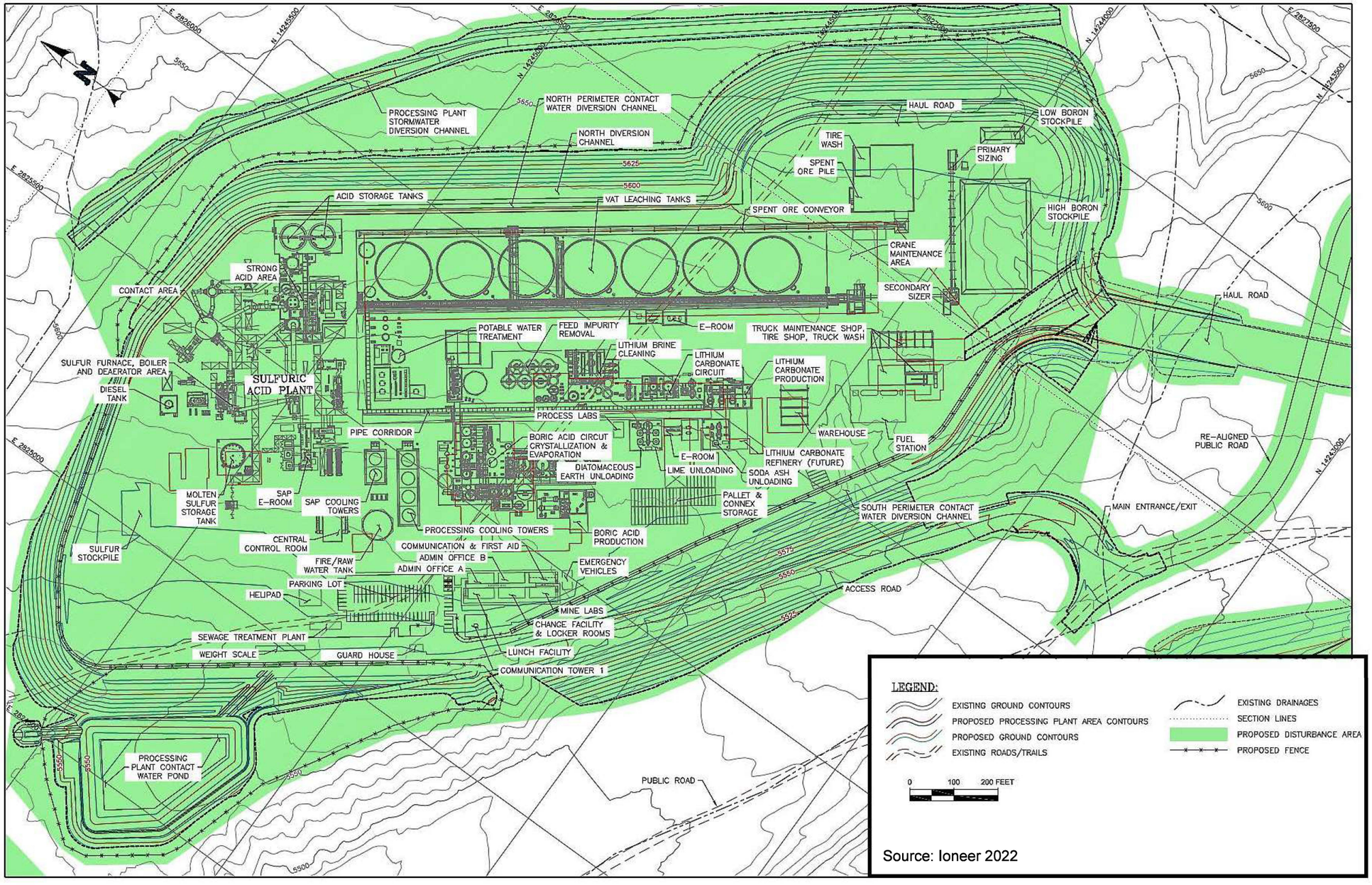
N

PROPOSED ACTION NORTH OVERBURDEN STORAGE FACILITY

FIGURE 2-5

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

PROCESSING FACILITY

FIGURE 2-6

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Explanation

Plan of Operations Boundary

- Control Gate
- Proposed Monitoring Well
- Vibrating Wire Piezometer
- Spring/Seep
- Existing Road
- ATV Trails
- Drainage

Mine Features

- Batch Plant
- Overburden Storage Facility
- Spent Ore Storage Facility
- Processing Facility
- Diversion Channel
- Pond
- Future Pond
- Growth Media Stockpile
- Yard
- County Road (Realigned)
- Mine Road
- Communication Towers

Contours

- Existing
- Proposed Major
- Proposed Minor

0 500 1,000 Feet

Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

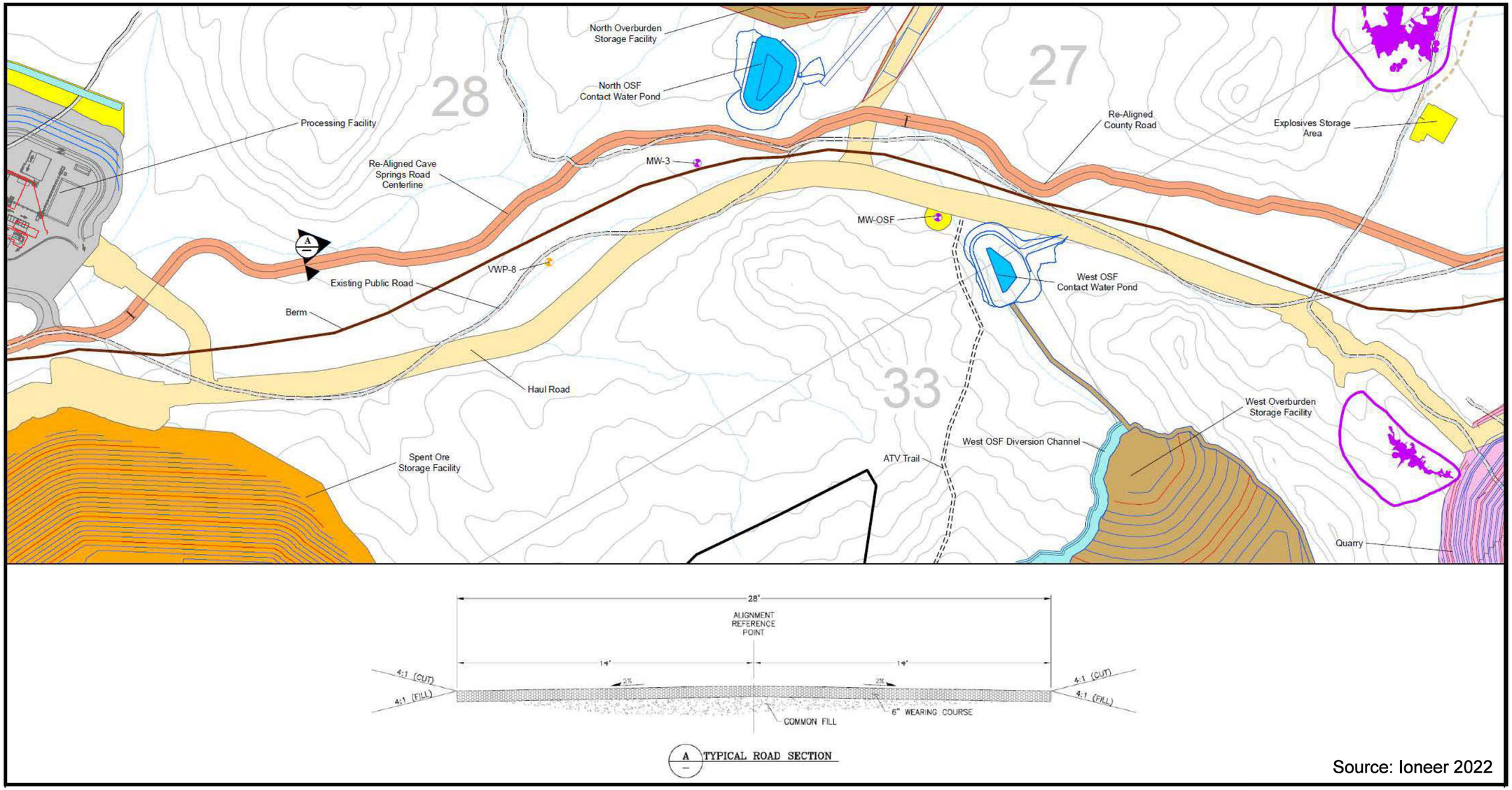
N

SPENT ORE STORAGE FACILITY

FIGURE 2-7

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Source: Ioneer 2022

Explanation

- Plan of Operations Boundary
- Buckwheat Populations
- Buckwheat Exclusion Area
- Control Gate
- Proposed Monitoring Well
- Vibrating Wire Piezometer
- Existing Road
- Buckwheat Exclusion Area Road Reroute
- ATV Trails
- Drainage

Mine Features

- Quarry
- Overburden Storage Facility
- Spent Ore Storage Facility
- Processing Facility
- Diversion Channel
- Pond
- Yard
- County Road (Realigned)
- Mine Road

Contours

- Existing
- Proposed Major
- Proposed Minor

0 500 1,000 Feet

Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

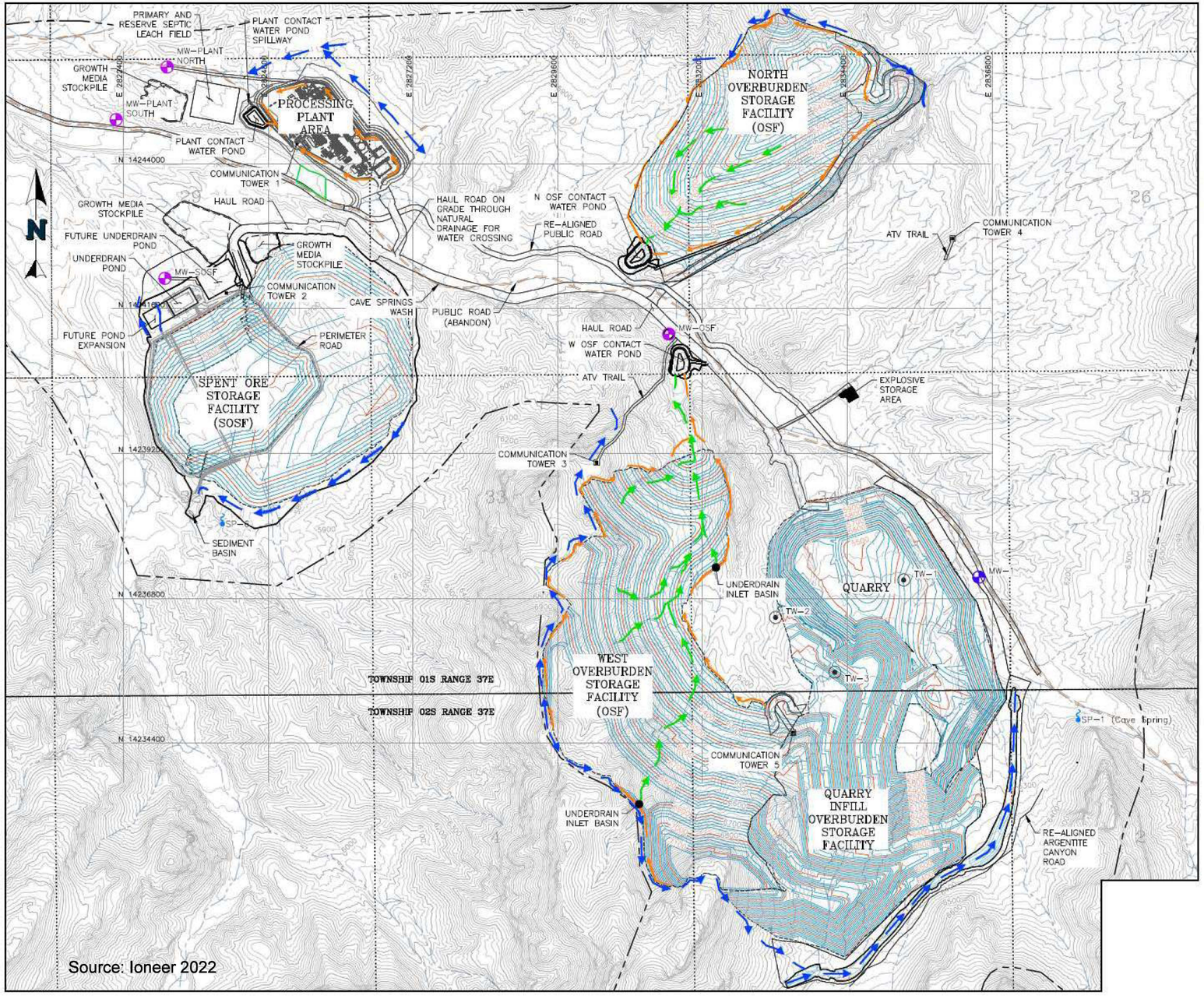
N

PROPOSED ACTION CAVE SPRINGS ROAD REALIGNMENT

FIGURE 2-8

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



LEGEND:

- EXISTING GROUND CONTOURS
- PROPOSED GROUND CONTOURS
- EXISTING ROADS/TRAILS
- EXISTING DRAINAGES
- OPERATIONAL PROJECT AREA
- SECTION LINES
- 20 SECTION NUMBER
- EXISTING NATURAL SPRING/SEEP
- PROPOSED STORMWATER DIVERSION CHANNEL
- PROPOSED CONTACT WATER CHANNEL
- PROPOSED UNDERDRAIN CHANNEL
- PROPOSED FENCE
- EXISTING GROUNDWATER MONITORING WELL
- PROPOSED GROUNDWATER MONITORING WELL
- EXISTING DEWATERING WELLS

0 800 1600 FEET

NOTES:

1. OSF BENCHES WILL DIRECT RUNOFF TOWARD THE PERIMETER CONTACT WATER DIVERSION CHANNELS AT A SLOPE OF 1 PERCENT.

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Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

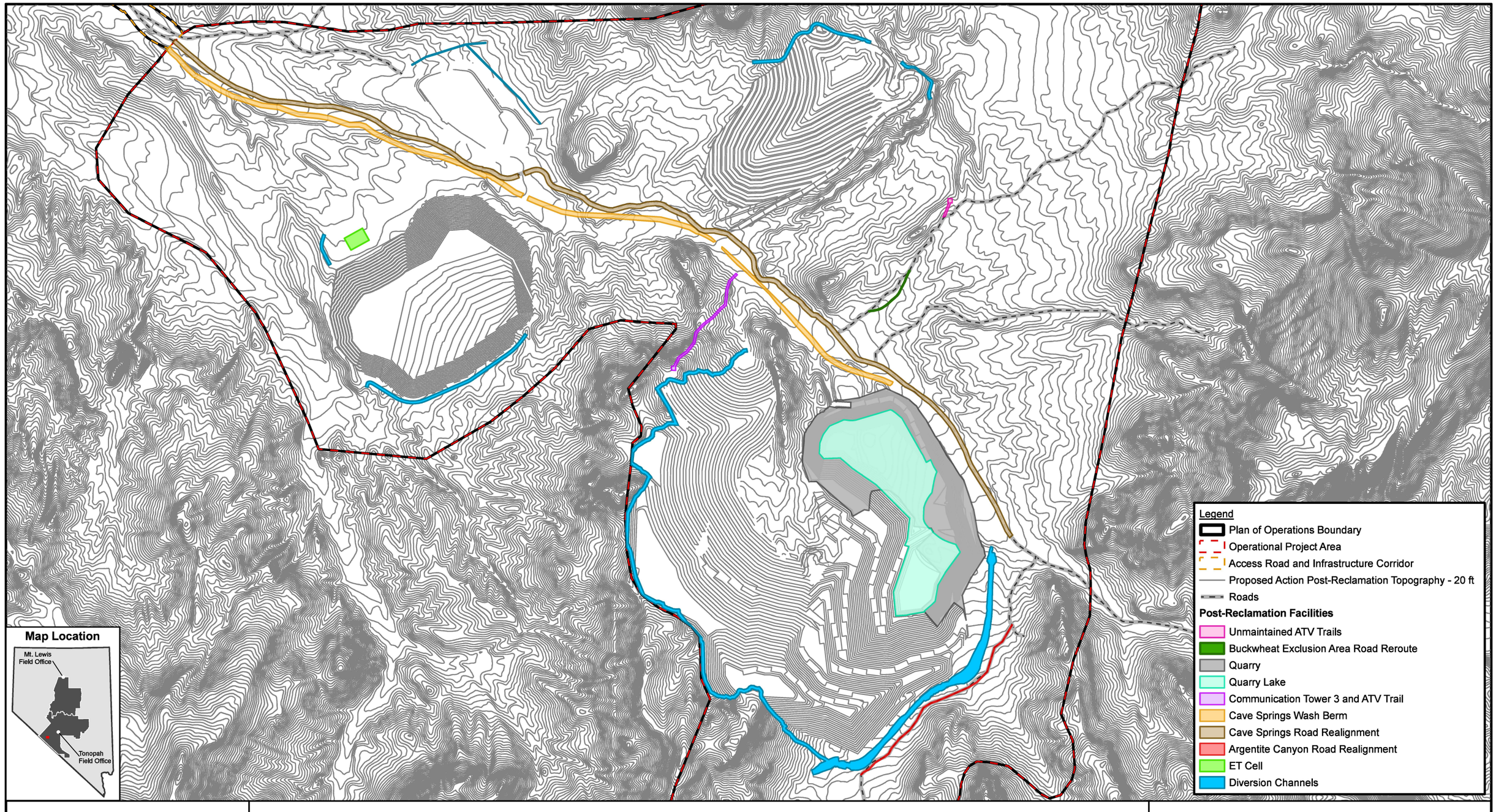
N

PROPOSED ACTION STORMWATER MANAGEMENT LAYOUT

FIGURE 2-9

2022-12-21

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



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BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 2,000 4,000 Feet

1 in = 2,000 feet

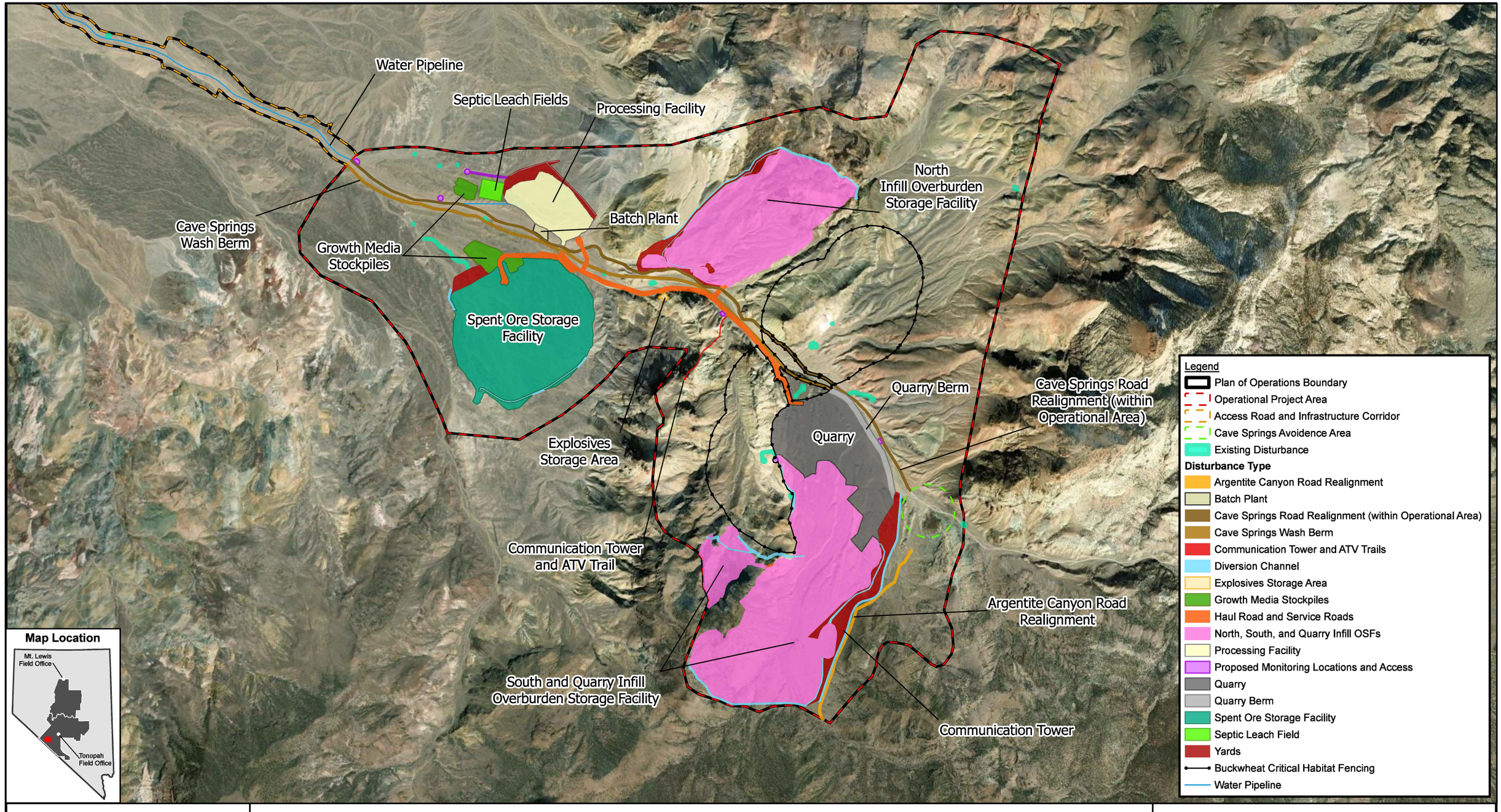
N

PROPOSED ACTION POST-RECLAMATION TOPOGRAPHY

FIGURE 2-10

2022-12-30

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



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BLM District
Tonopah Field Office

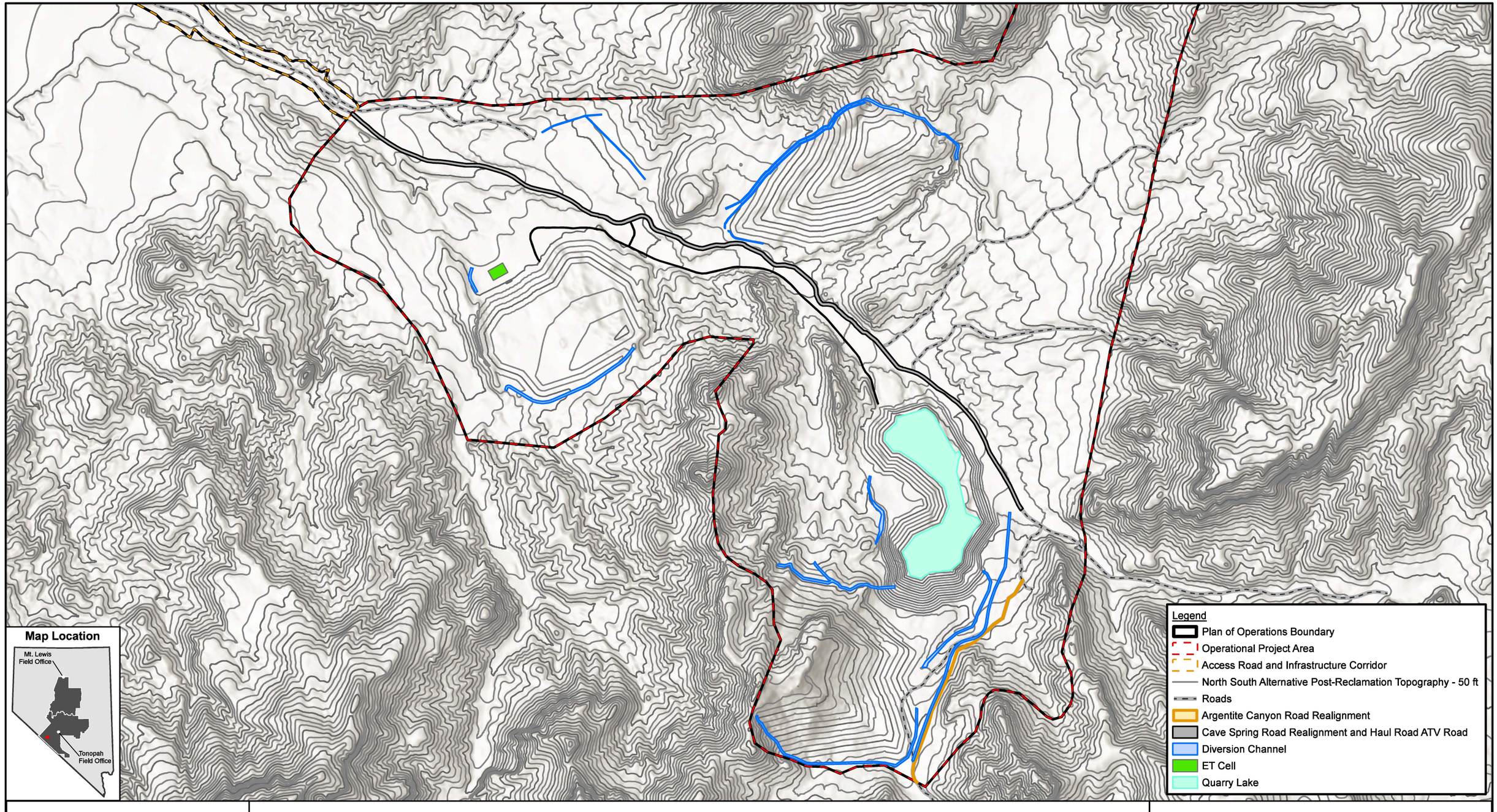
IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

NORTH AND SOUTH OVERBURDEN STORAGE FACILITY OPTION PROPOSED FACILITIES

FIGURE 2-11

2024-03-05

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 2,000 4,000 Feet
1 in = 2,500 feet

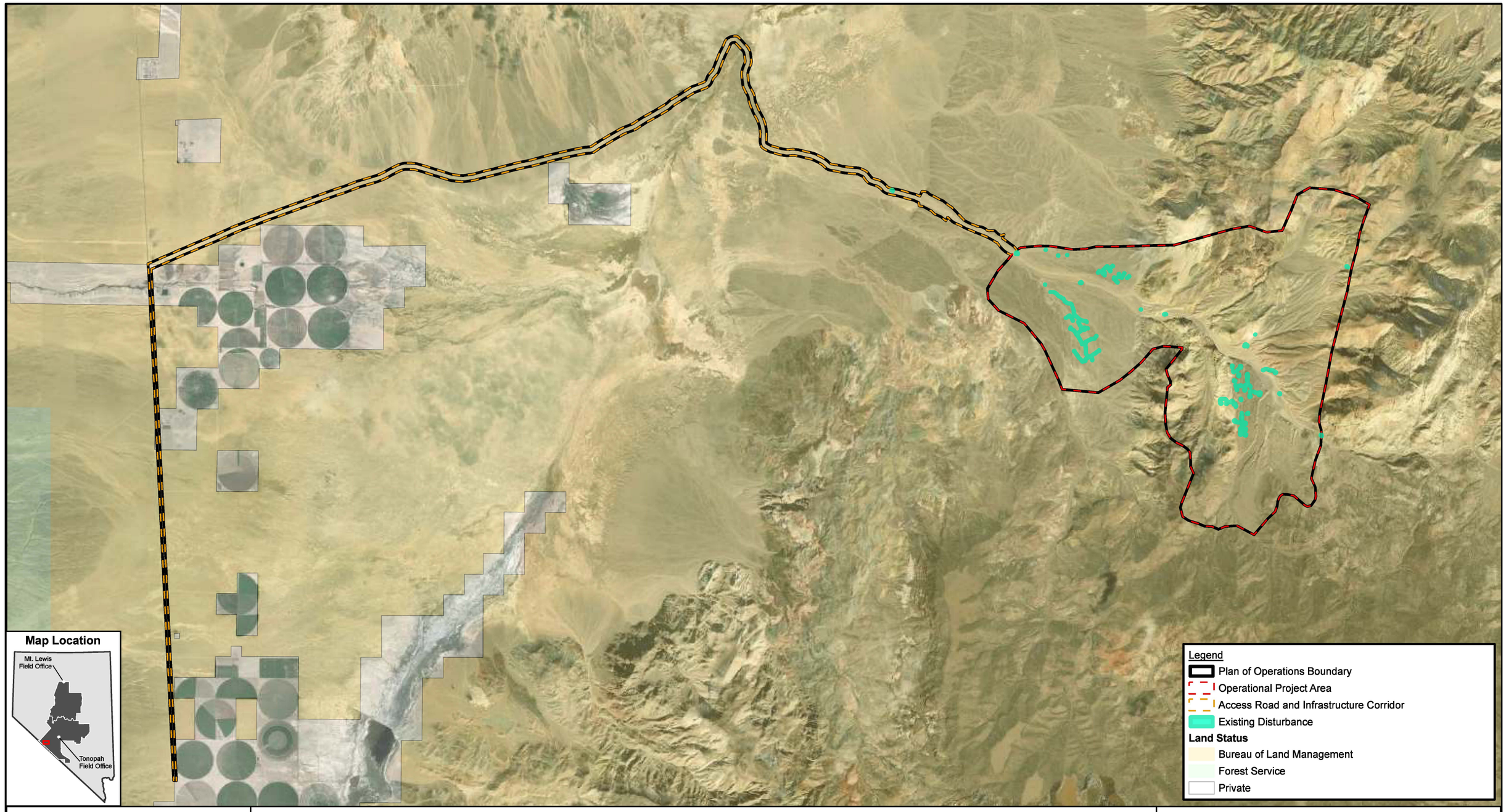
N

NORTH SOUTH ALTERNATIVE POST-RECLAMATION TOPOGRAPHY

FIGURE 2-12

2023-10-02

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 6,000 12,000 Feet

1 in = 6,000 feet

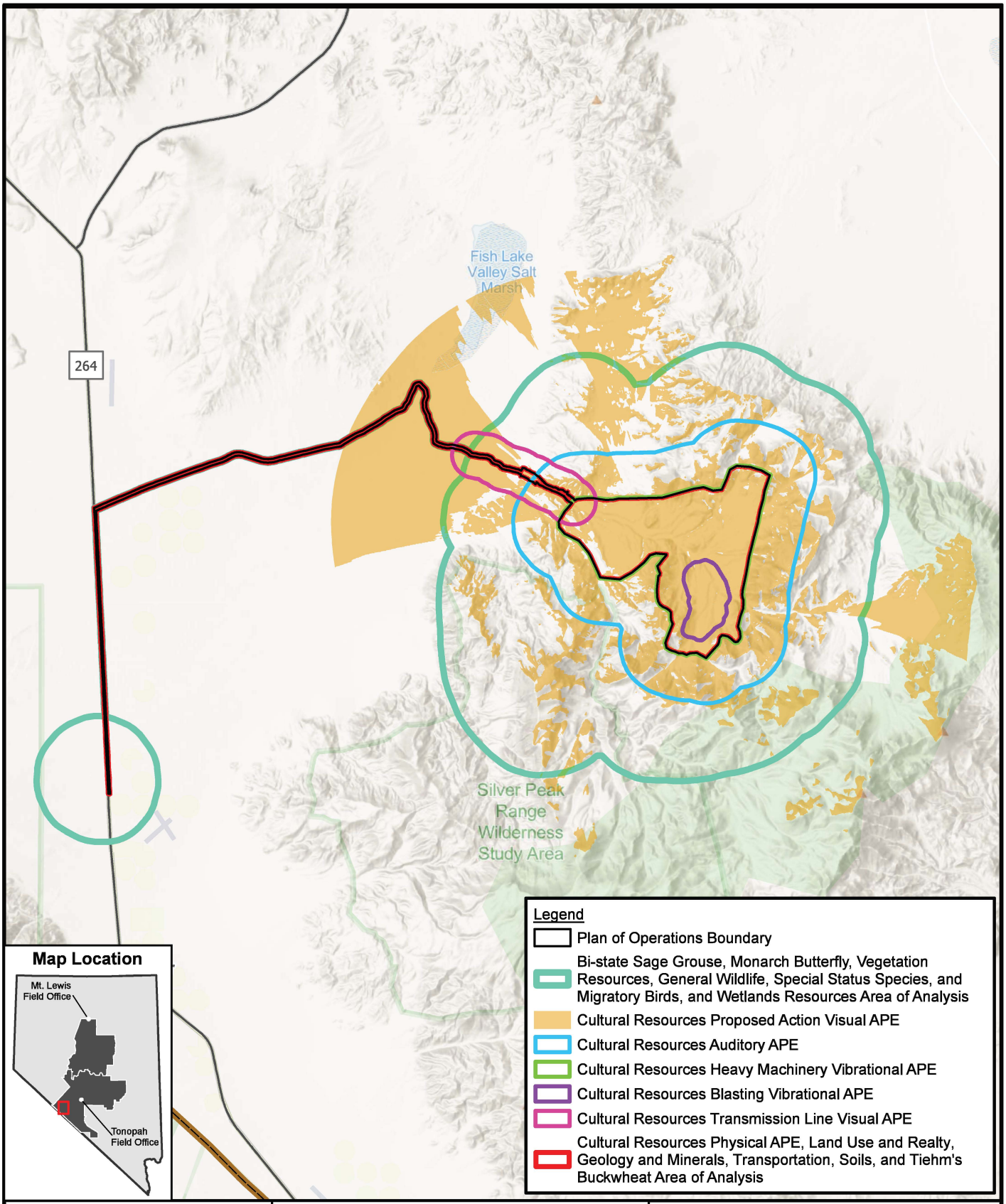
N

NO ACTION ALTERNATIVE

FIGURE 2-13

2023-06-28

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

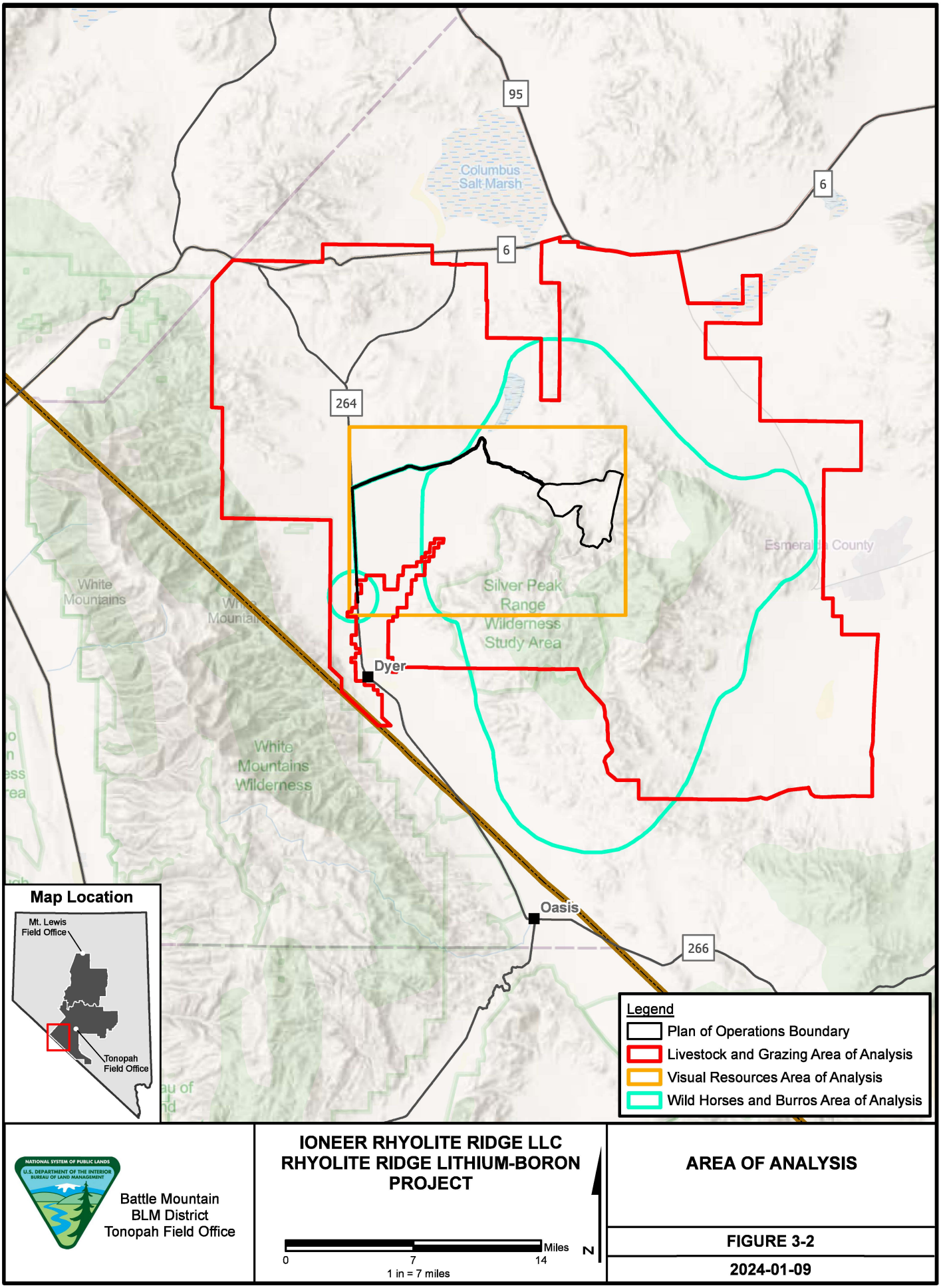
0 3 6 Miles
1 in = 3 miles
N

AREA OF ANALYSIS

FIGURE 3-1

2024-03-05

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

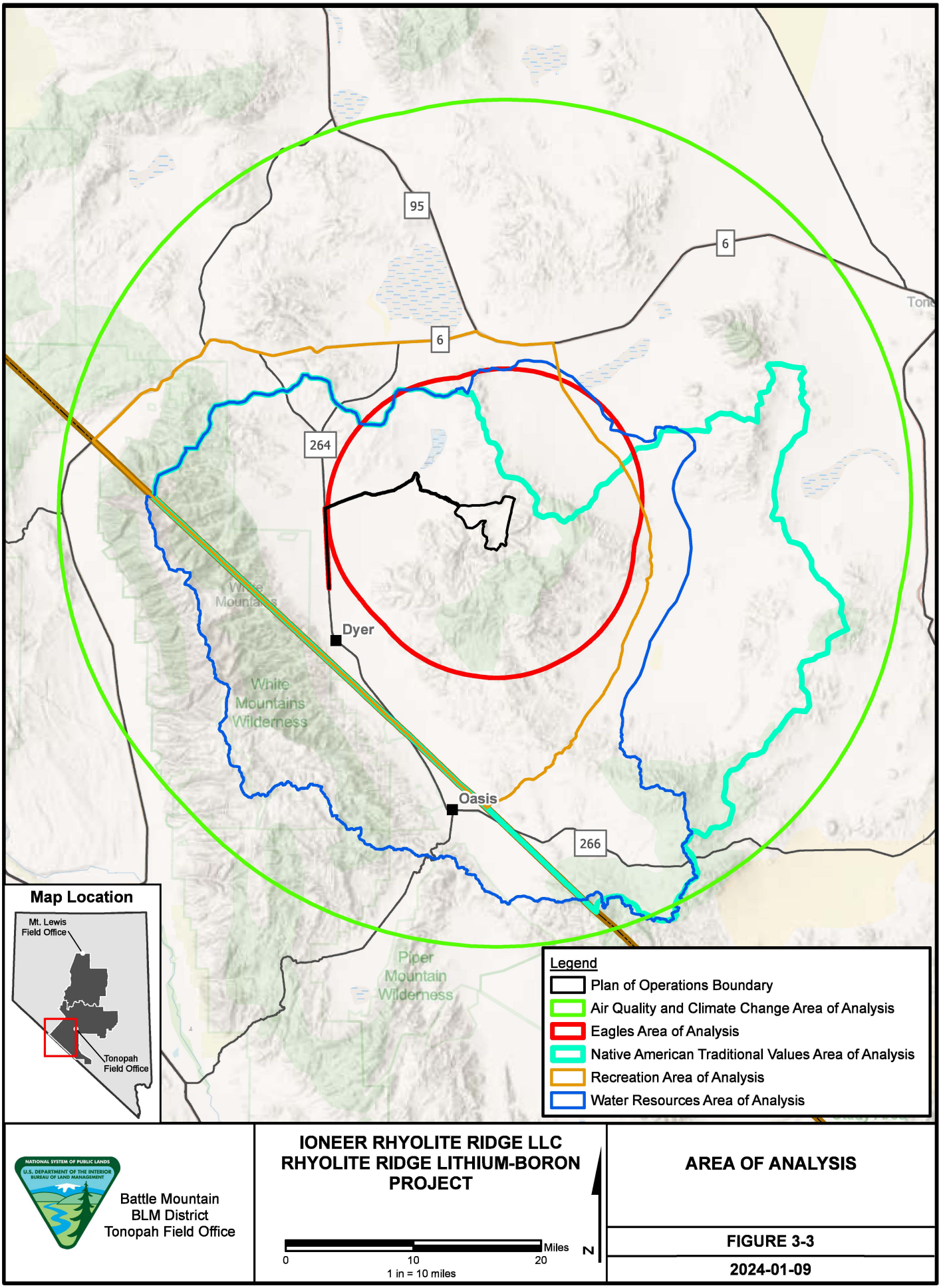
0 7 14 Miles
1 in = 7 miles
N

AREA OF ANALYSIS

FIGURE 3-2

2024-01-09

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 10 20 Miles
1 in = 10 miles

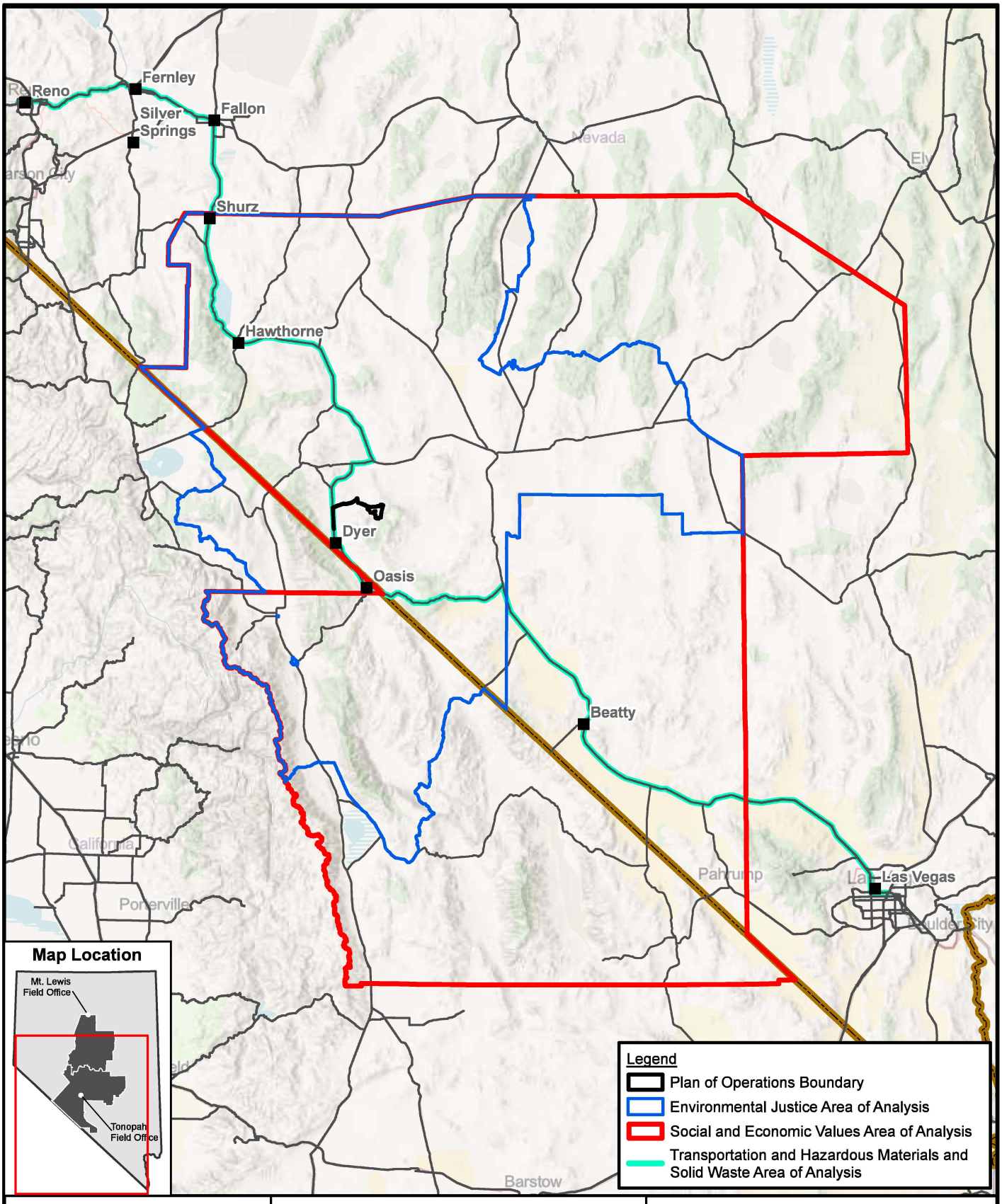
N

AREA OF ANALYSIS

FIGURE 3-3

2024-01-09

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 35 70 Miles
1 in = 35 miles

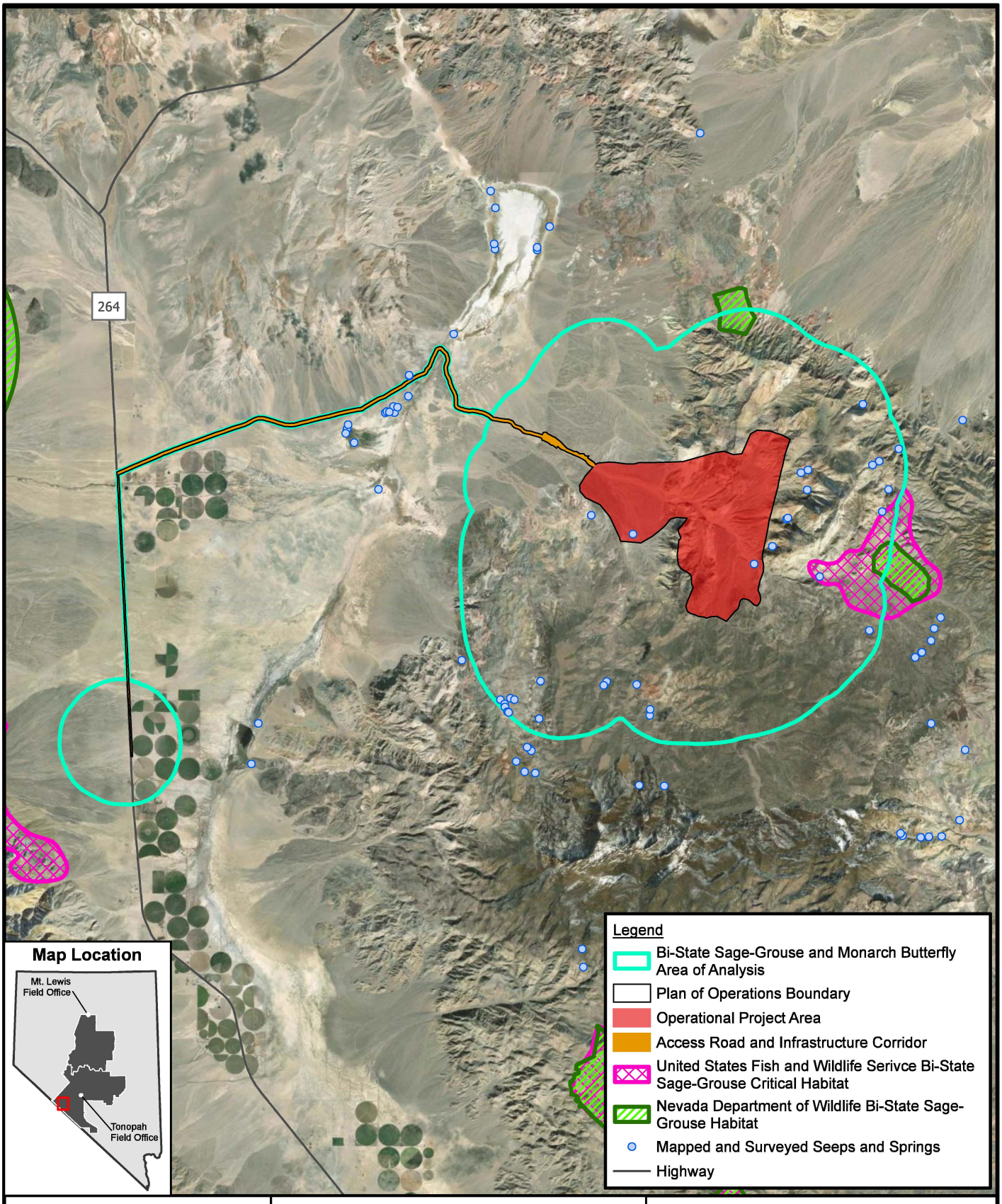
N

AREA OF ANALYSIS

FIGURE 3-4

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER USA CORPORATION
RHYOLITE RIDGE LITHIUM-BORON PROJECT

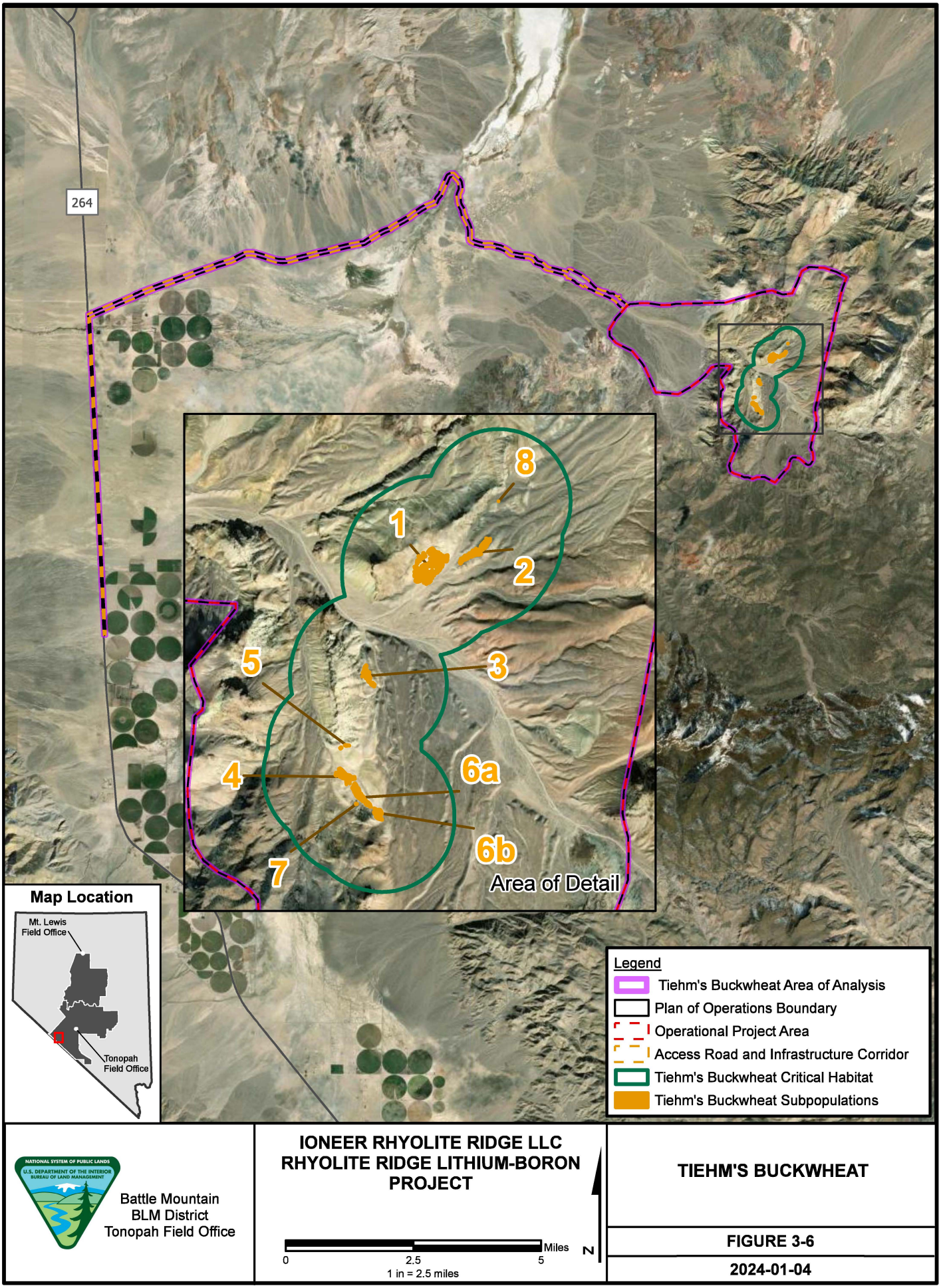
0 3 6 Miles
1 in = 3 miles
N

BI-STATE SAGE-GROUSE HABITAT

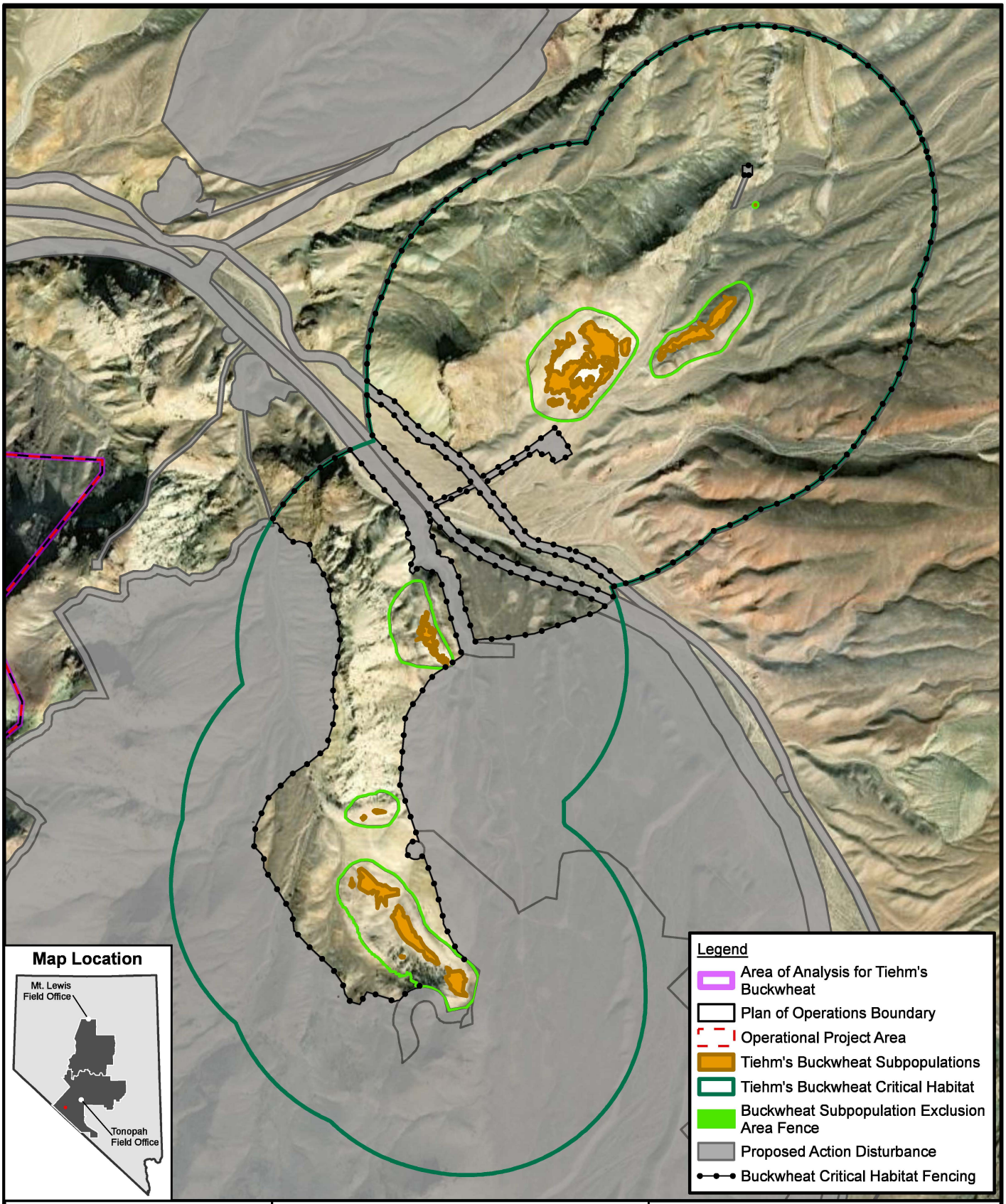
FIGURE 3-5

2024-01-12

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 1,250 2,500 Feet
1 in = 1,250 feet

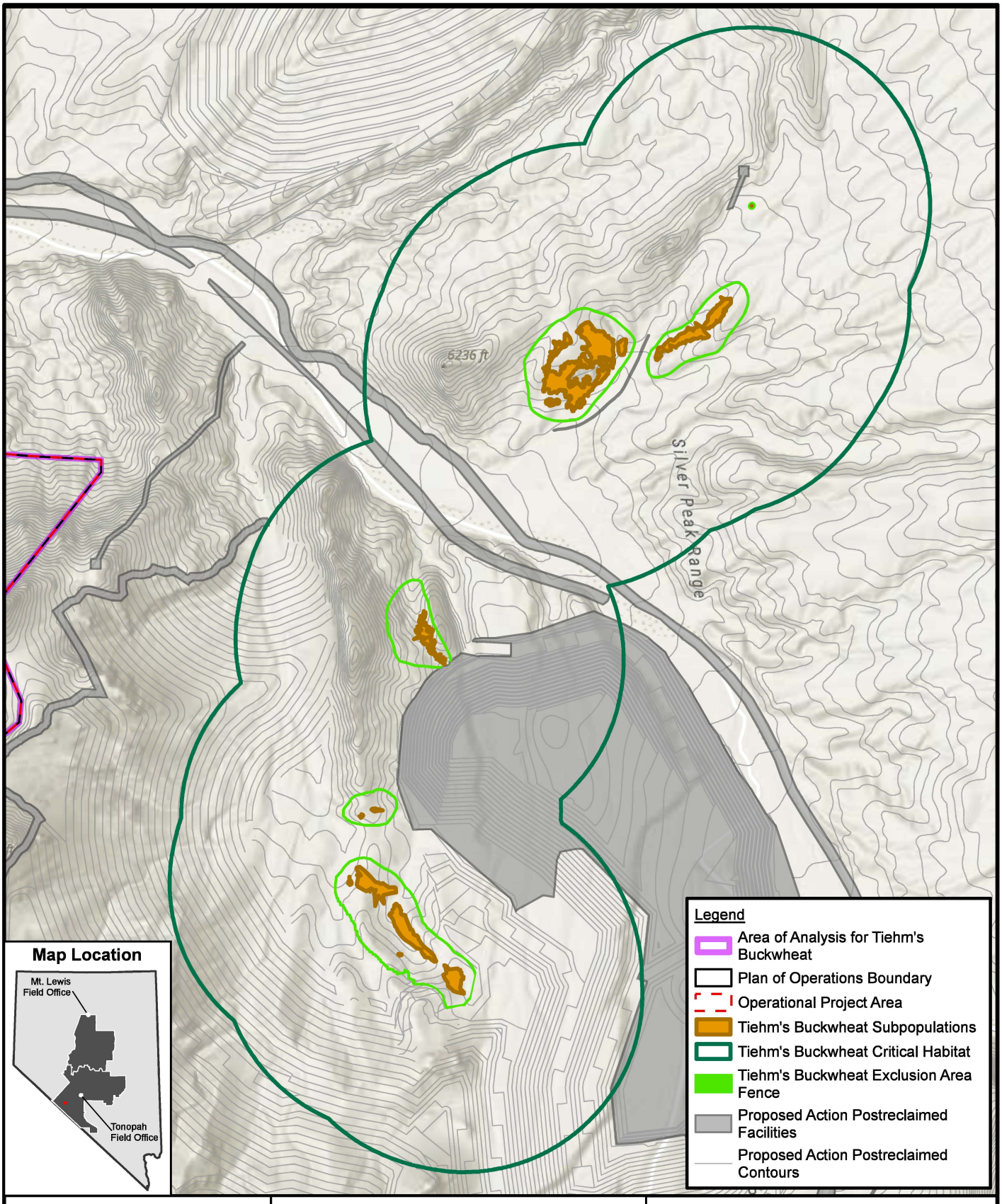
N

PROPOSED ACTION DISTURBANCE TO TIEHM'S BUCKWHEAT CRITICAL HABITAT

FIGURE 4-1

2024-03-05

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

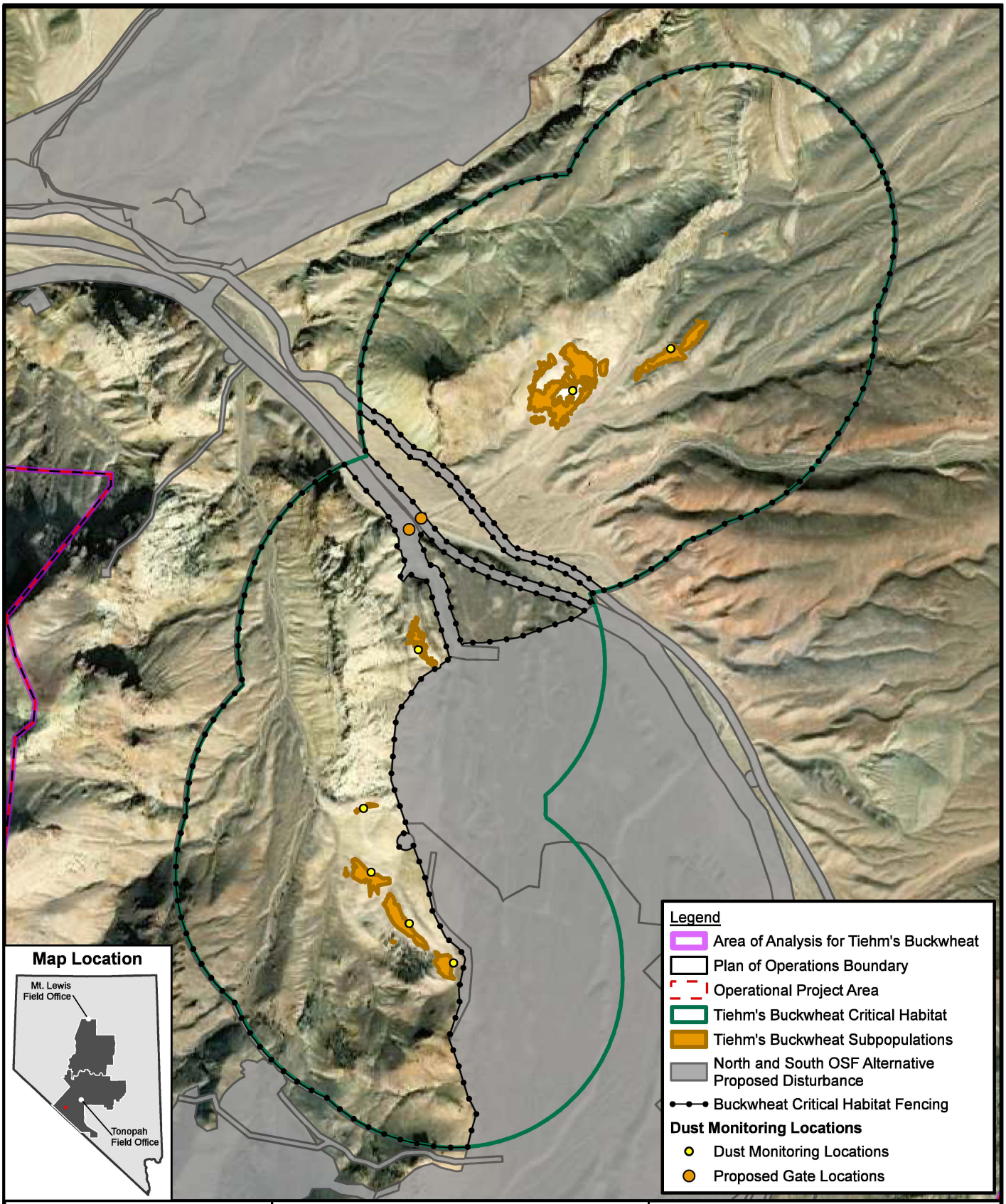
0 1,250 2,500 Feet
1 in = 1,250 feet
N

PROPOSED ACTION POST-RECLAIMED DISTURBANCE TO TIEHM'S BUCKWHEAT CRITICAL HABITAT

FIGURE 4-2

2024-01-02

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 1,250 2,500 Feet
1 in = 1,250 feet

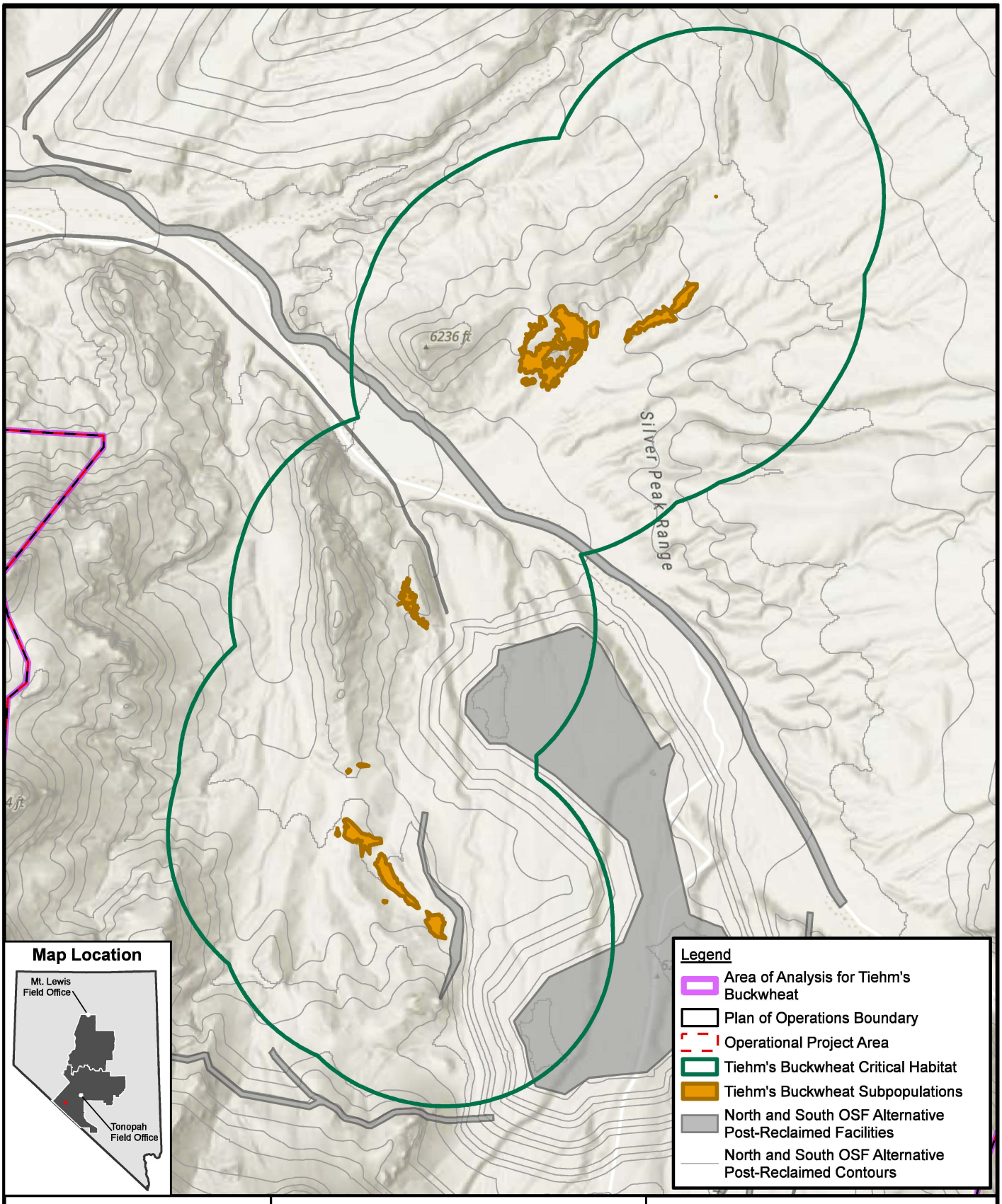
N

PROPOSED FENCING FOR DESIGNATED CRITICAL HABITAT AND DUST MONITORING

FIGURE 4-3

2024-03-19

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 1,250 2,500 Feet
1 in = 1,250 feet

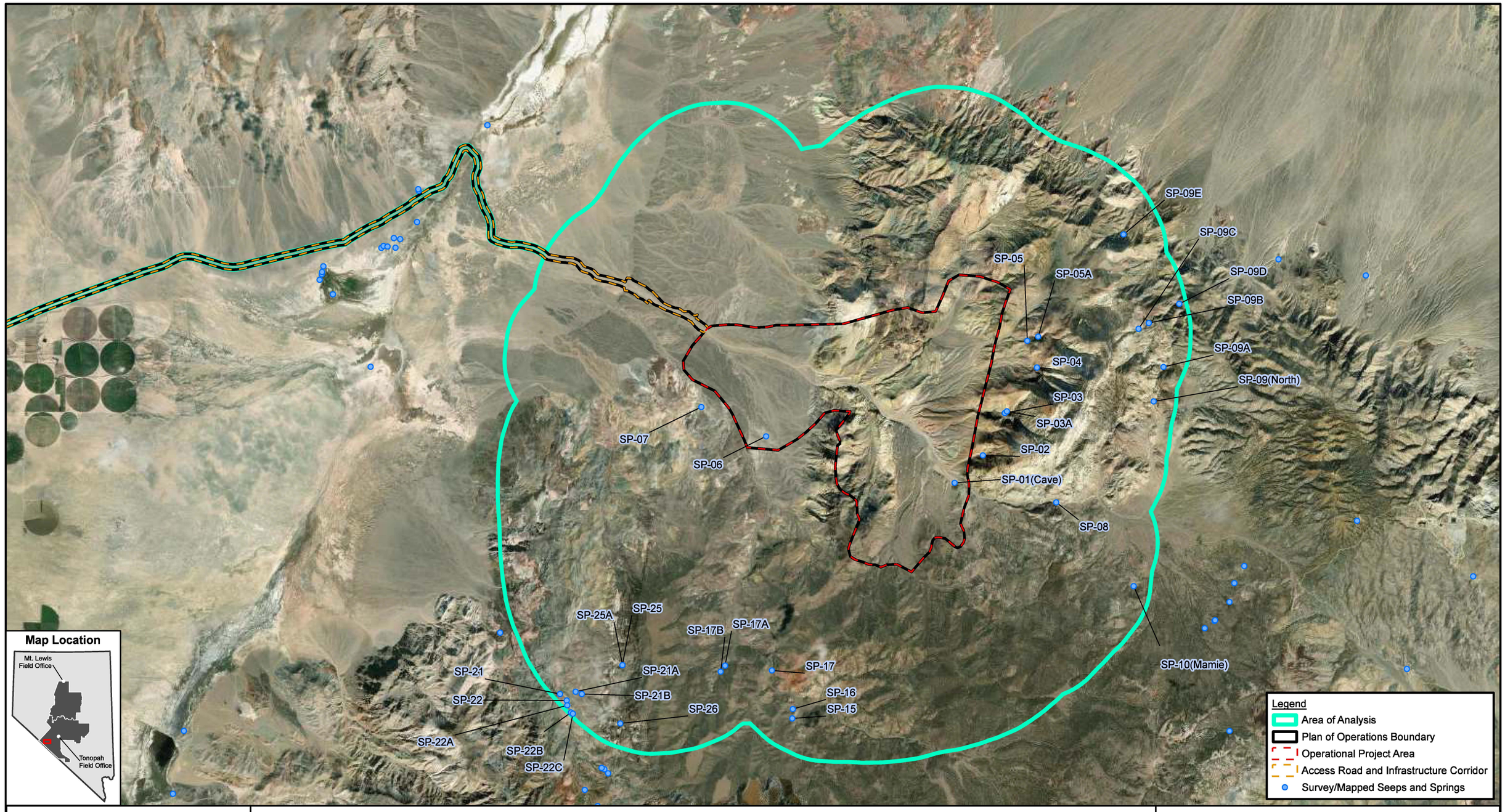
N

NORTH AND SOUTH OSF ALTERNATIVE POST-RECLAIMED DISTURBANCE TO TIEHM'S BUCKWHEAT

FIGURE 4-4

2024-01-02

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 7,000 14,000 Feet

1 in = 7,000 feet

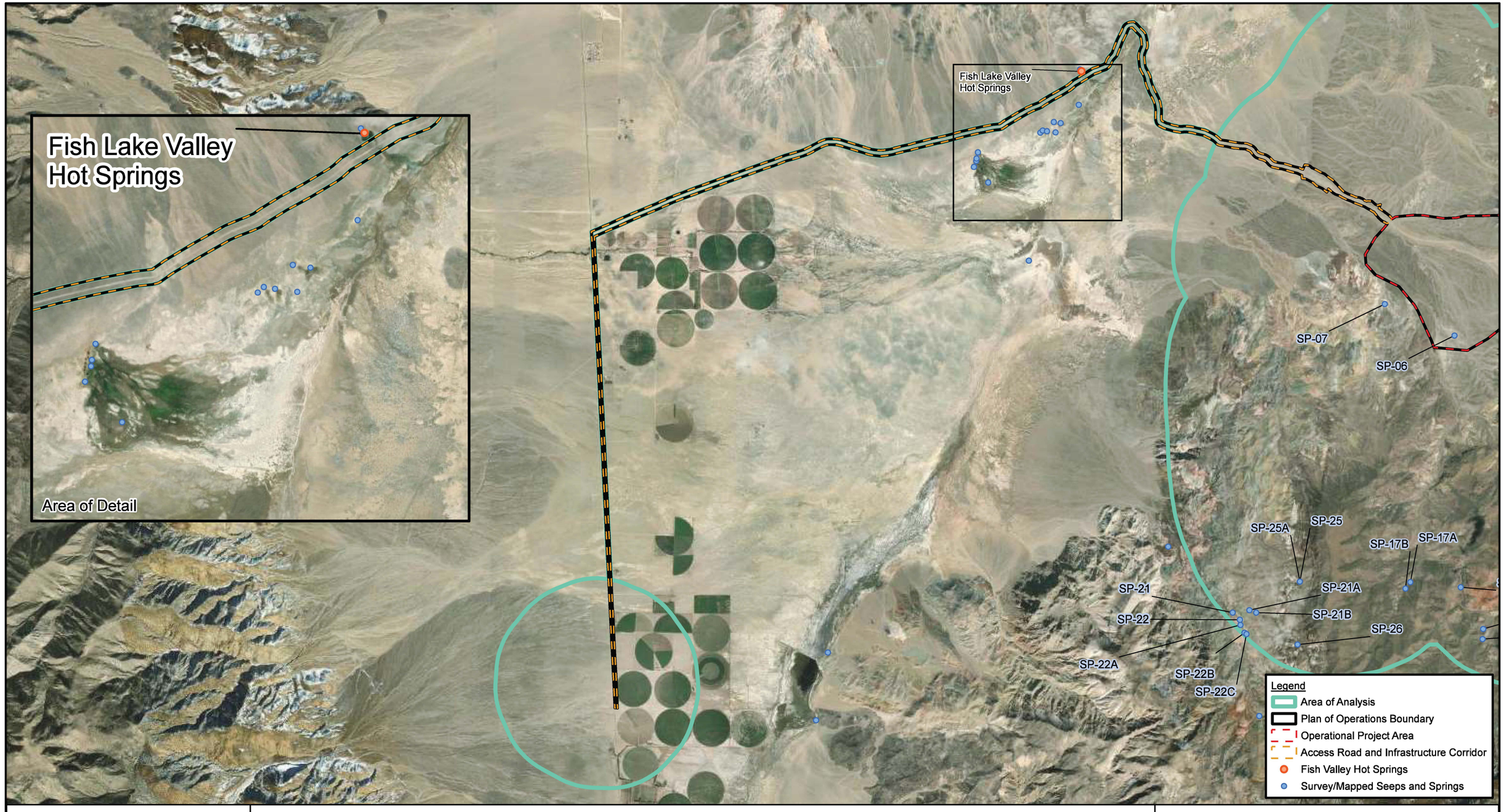
N

OPERATIONAL PROJECT AREA
SEEPS AND SPRINGS

FIGURE 4-5

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain
BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 6,500 13,000 Feet

1 in = 6,500 feet

N

ACCESS ROAD AND INFRASTRUCTURE AREA SEEPS AND SPRINGS

FIGURE 4-6

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Legend

- Area of Analysis (Model Domain)
- Plan of Operations Boundary
- Maximum Extent of the 10-ft Drawdown Contour
- 1-mile Buffer of the Maximum Extent of the 10-ft Drawdown Contour
- TR03D Footprint
- OSF Footprints
- Intermittent Stream
- Perennial Stream

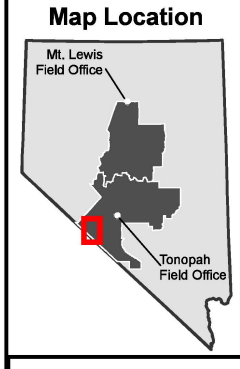
Pumping Well

- Representative Fish Lake Water Supply
- Representative Potable Water Well
- TW-2
- Dryer School and FLV CC Wells
- NHD 'Springs
- Mapped and Survey Seep and Spring Locations

Water Right POD

- COM
- CON
- DOM
- IRD
- IRR
- MM
- OTH
- PWR
- QM
- REC
- STK
- California

Map Location



Reference: Piteau Rhyolite Ridge Groundwater Model Impacts Report Figure 4.17

Battle Mountain
BLM District
Tonopah Field Office

IONEER USA CORPORATION
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 2.5 5 Miles

1 in = 2.5 miles

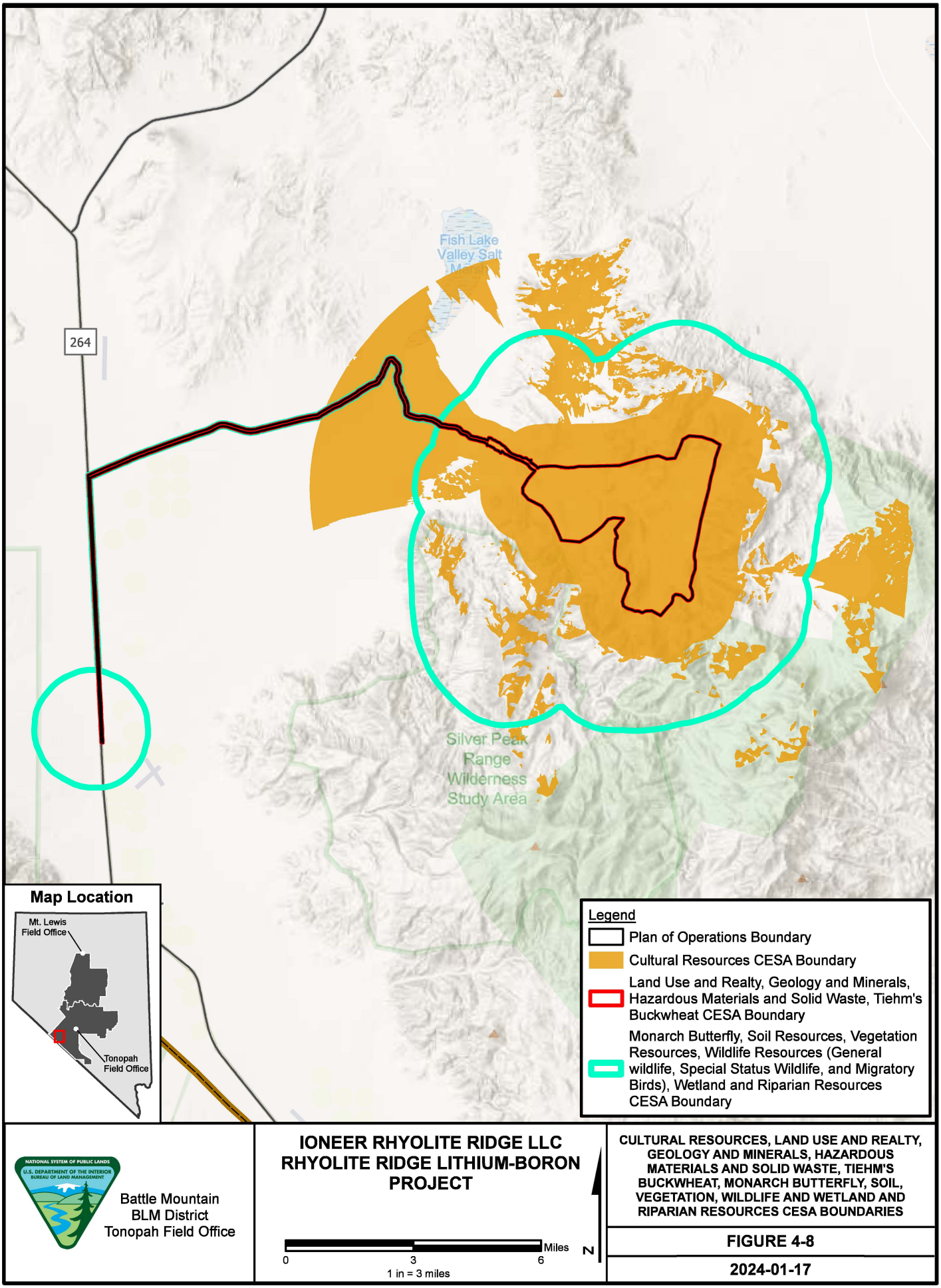
N

MAXIMUM EXTENT OF THE PREDICTED 10-FOOT DRAWDOWN CONTOUR AND ONE MILE BUFFER

FIGURE 4-7

2024-01-04

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 3 6 Miles

1 in = 3 miles

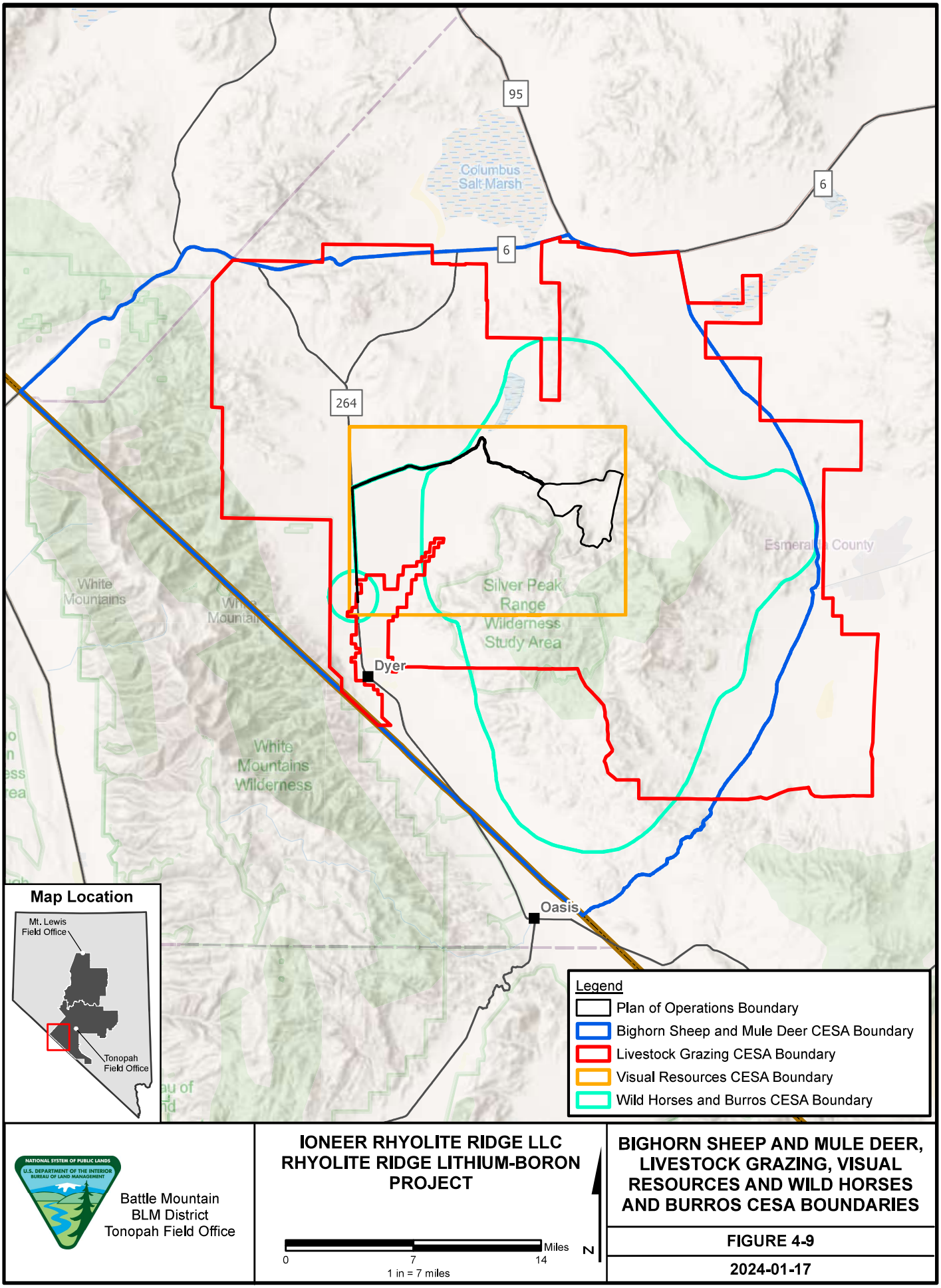
N

CULTURAL RESOURCES, LAND USE AND REALTY, GEOLOGY AND MINERALS, HAZARDOUS MATERIALS AND SOLID WASTE, TIEHM'S BUCKWHEAT, MONARCH BUTTERFLY, SOIL, VEGETATION, WILDLIFE AND WETLAND AND RIPARIAN RESOURCES CESA BOUNDARIES

FIGURE 4-8

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

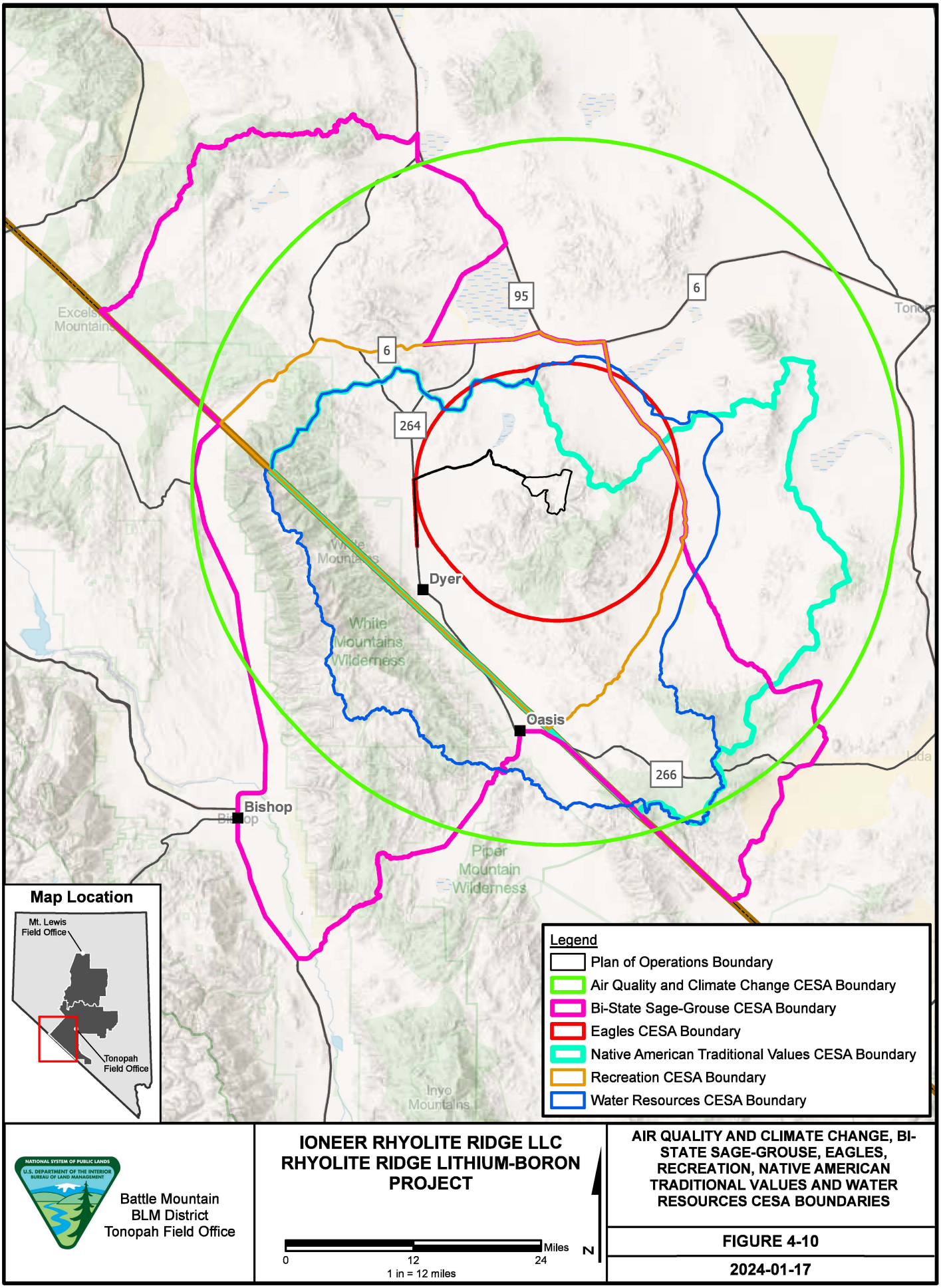
0 7 14 Miles
1 in = 7 miles
N

BIGHORN SHEEP AND MULE DEER, LIVESTOCK GRAZING, VISUAL RESOURCES AND WILD HORSES AND BURROS CESA BOUNDARIES

FIGURE 4-9

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 12 24 Miles
1 in = 12 miles

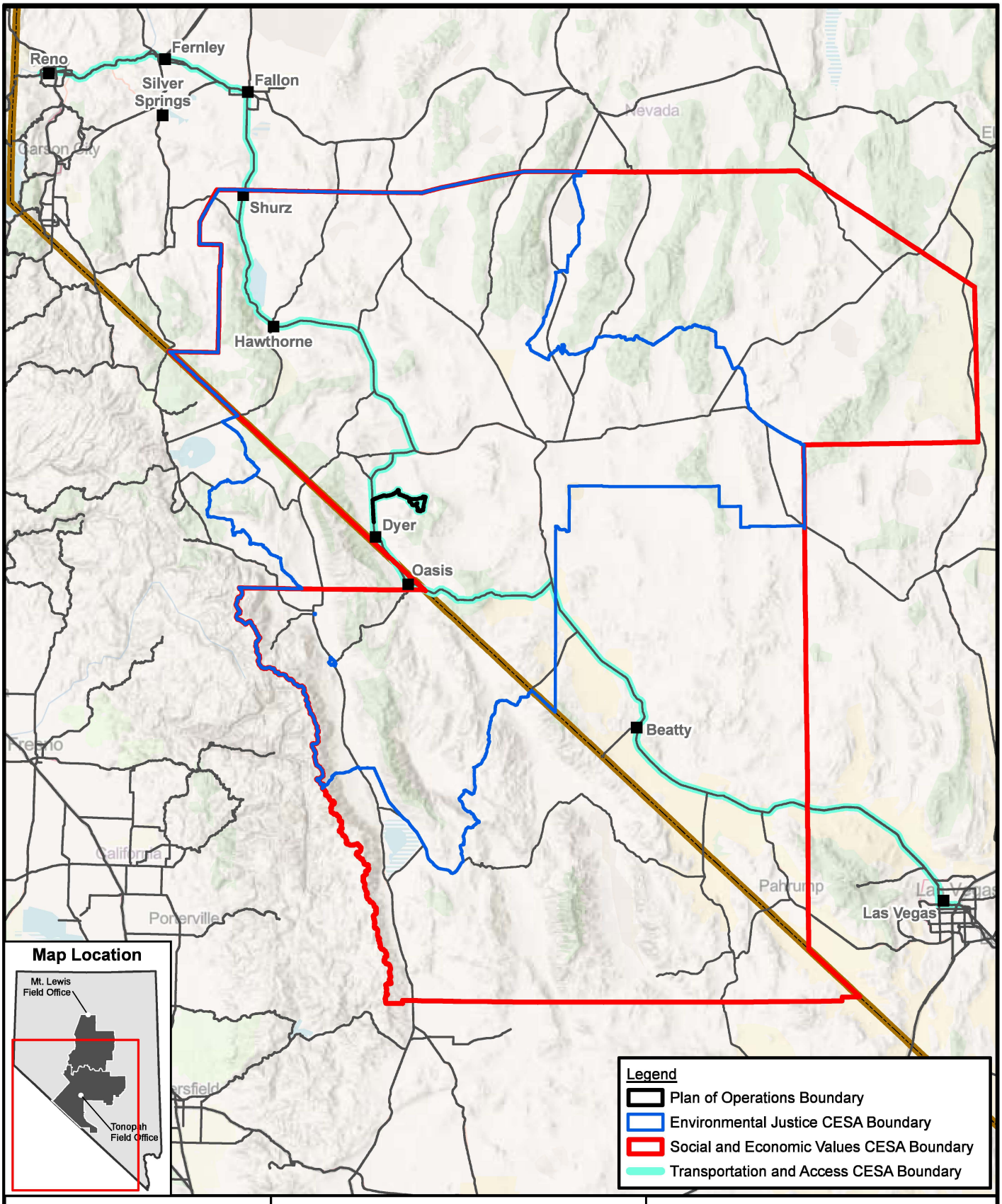
N

AIR QUALITY AND CLIMATE CHANGE, BI-STATE SAGE-GROUSE, EAGLES, RECREATION, NATIVE AMERICAN TRADITIONAL VALUES AND WATER RESOURCES CESA BOUNDARIES

FIGURE 4-10

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.



Battle Mountain BLM District
Tonopah Field Office

IONEER RHYOLITE RIDGE LLC
RHYOLITE RIDGE LITHIUM-BORON PROJECT

0 37.5 75 Miles
1 in = 37.5 miles

N

TRANSPORTATION AND ACCESS AND ENVIRONMENTAL JUSTICE AND SOCIOECONOMIC VALUES CESA BOUNDARIES

FIGURE 4-11

2024-01-17

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Appendix B: Major Permits and Approvals

Permit/Approval	Issuing Authority
Biological Opinion	USFWS
Boiler and High Pressure Vessels Operating Permit	State of Nevada Department of Business & Industry, Division of Industrial Relations, Mechanical Compliance Section
Class II Air Quality Operating Permit	NDEP (Bureau of Air Pollution Control)
U.S. Environmental Protection Agency (USEPA) Identification Number	USEPA and NDEP (Bureau of Sustainable Materials Management)
Eagle Take Permit	USFWS
Explosives Permit	U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives
Fire and Life Safety	State Fire Marshall, Fire Protection Engineering Bureau
General Permit for Domestic Large-Capacity On-Site Sewage Disposal System (a.k.a. Large-Capacity Septic System)[1]	NDEP (Bureau of Water Pollution Control)
General Stormwater Discharge Permit	NDEP (Bureau of Water Pollution Control)
Hazardous Materials Storage Permit	Nevada Department of Public Safety, State Fire Marshall, and State Emergency Response Commission
Industrial Artificial Pond Permit	NDOW
Mine Identification Number Request	MSHA
Mine Registry Form	Commission on Mineral Resources, Nevada Division of Minerals
Notice of Commencement of Operations	MSHA
Notice of Commencement of Mine Operations	Nevada Department of Business and Industry, Division of Industrial Relations, Mine Safety and Training Section
Notice of Dam Construction – All Ponds	NDWR
Permit for Package Wastewater Treatment Plant[1]	NDEP (Bureau of Water Pollution Control)
Permit to Appropriate Water and/or Approval of change in Point of Diversion, Manner of Use, and Place of Use	NDWR
Permit to Construct Dam – SOSF Underdrain Pond and OSF Contact Water Ponds	NDWR
Plan of Operations/Record of Decision	BLM
Public Water System Permit (Non – Transient Non – Community) Operations	NDEP (Bureau of Safe Drinking Water)
Reclamation Permit and Reclamation Cost Determination	NDEP (Bureau of Mining Regulation and Reclamation)
Sewage System Permits[1]	NDEP (Bureau of Water Pollution Control)
Utility Environmental Protection Act (UEPA) Permit	NPUC (Nevada Public Utilities Commission)
Water Pollution Control Permit	NDEP (Bureau of Mining Regulation and Reclamation)

Source: Ioneer 2022

[1] Final Project sewage management option selection would determine whether the permit is for a large capacity septic system or a package wastewater treatment plant.

Appendix C: Alternatives Considered but Eliminated

Table C-1 Rhyolite Ridge Lithium-Boron Project Preliminary Alternatives and Screening Criteria

Group	Preliminary Alternatives	Consistent with Purpose and Need	Technically Practical and Feasible	Environmentally Reasonable	Economically Practical and Feasible	Alternative to Be Considered for Detailed Study in EIS?
Alternatives Considered for Detailed Analysis						
Alternative A – Proposed Action		Yes	Yes	Yes	Yes	Yes
Alternative B – North and South OSF Alternative		Yes	Yes	Yes	Yes	Yes
Alternative C – No Action Alternative		The No Action Alternative is required to be evaluated per CEQ regulations.				Yes
Alternatives Considered but Dismissed from Detailed Analysis						
Quarry Footprint Alternatives	Larger Quarry	Yes	No	No	Not Evaluated	No
	Quarry North of Cave Springs Road	No	Yes	No	Not Evaluated	No
	Quarry Avoids All Tiehm's Buckwheat Designated Critical Habitat	No	Yes	Yes	No	No
	Quarry Avoids All Tiehm's Buckwheat Subpopulations	Yes	Yes	Yes	Yes	This has been incorporated in the Proposed Action
	Quarry Depth Avoids Groundwater Interception	No	No	Yes	No	No
Quarry Backfill/Infill Alternatives	In-Quarry Base Case Storage	Yes	No	No	Not Evaluated	No
	In-Quarry Alternative Storage	Yes	No	No	Not Evaluated	No
	Partial Backfill to Prevent Post-quarrying Quarry Lake	Yes	Yes	Yes (prevent post Project quarry lake); No (potential for groundwater quality issues from flow-through)	No	No
	Backfill of Quarry to Create Post-quarrying Flow-through Conditions	Yes	No (NDEP would not permit flow-through)	No	No	No
	Rapid Infilling of the Post-quarrying Quarry with Water.	Yes	Yes	No	Not Evaluated	No

Group	Preliminary Alternatives	Consistent with Purpose and Need	Technically Practical and Feasible	Environmentally Reasonable	Economically Practical and Feasible	Alternative to Be Considered for Detailed Study in EIS?
Facilities Placement Alternatives	Adit Avoidance Alternative	Yes	Yes	No	Yes	No
	Moving Crushing Plant and Truck Facilities East closer to the Quarry	Yes	Yes	No	Not Evaluated	No
	Separate Stockpiles North-Northwest of the Quarry	Yes	Yes	No	Not Evaluated	No
	North OSF	Yes	Yes	Yes	Yes	This has been incorporated in the North and South OSF Alternative.
	Reduced Quarry Plan	Yes	Yes	No	Yes	No
	North and Southwest OSF	Yes	Yes	Yes	Yes	This has been incorporated in the North and South OSF Alternative.
	Comingled Stockpile West of the Quarry	Yes	Yes	No	Not Evaluated	No
	Processing Plant in Sparks, Nevada	Yes	Yes	No	No	No
	Spent Ore Storage, Separate Facilities at Siting Area 1 (South of Cave Spring Road)	Yes	Yes	No	Not Evaluated	No
	Spent Ore Storage, Comingled Facility at Siting Area 2 (North of Cave Springs Road)	Yes	Yes	No	Not Evaluated	No
	Cultural Resource Site Avoidance	Yes	Yes	Yes	Yes	This has been incorporated in the Proposed Action
	Surface Disturbance Avoids All Tiehm's Buckwheat Designated Critical Habitat	No	No	Yes	No	No
	Surface Disturbance Avoids All Tiehm's Buckwheat Designated Critical Habitat and its One Mile Buffer	No	No	Yes	No	No
Ore Conveyance Alternatives	Conveyor	Yes	No	No	Not Evaluated	No
	Autonomous Haul Trucks	Yes	Yes	Yes	Yes	This has been included in the Proposed Action
	Electric Vehicle Fleet	Yes	No	Not Evaluated	Not Evaluated	No

Group	Preliminary Alternatives	Consistent with Purpose and Need	Technically Practical and Feasible	Environmentally Reasonable	Economically Practical and Feasible	Alternative to Be Considered for Detailed Study in EIS?
Sulfuric Acid Plant Design Alternatives	Importing Sulfuric Acid (vs having a Sulfuric Acid Plant on site)	Yes	Yes	No	Not Evaluated	No
	Single absorption with a tail gas scrubber (with caustic reagent)	Yes	Yes	No	Not Evaluated	No
	Single absorption with MAX3™ (with solvent scrubber)	Yes	Yes	No	Not Evaluated	No
	Double absorption with heat recovery system and tail gas scrubber (with caustic reagent)	Yes	Yes	No	Not Evaluated	No
Leaching Alternatives	Heap Leach Facility	Yes	Yes	No	Not Evaluated	No
	Agitated Tank Tailings Storage Facility	Yes	Yes	No	Not Evaluated	No
Power Supply and Infrastructure Alternatives	55 kV and 120 kV Transmission Line and a 15 MW Service from NV Energy	Yes	Yes	No	Not Evaluated	No
	15 MW Prime Power Diesel Generation	Yes	Yes	No	Not Evaluated	No
	Grid Connection	Yes	Yes	No	Not Evaluated	No
	Diesel Internal Combustion Engine Alternative	Yes	Yes	No	Not Evaluated	No
	Natural Gas	Yes	Yes	No	Not Evaluated	No
	CNG/LNG/Propane Fuel	Yes	Yes	No	Not Evaluated	No
Aggregate Sourcing Alternatives	Near-Site Source	Yes	No	Not Evaluated	Not Evaluated	No
	Existing Commercial Sources	Yes	Yes	Yes	Yes	No – Under 40 CFR 1501.9, this is not considered a connected action.

Group	Preliminary Alternatives	Consistent with Purpose and Need	Technically Practical and Feasible	Environmentally Reasonable	Economically Practical and Feasible	Alternative to Be Considered for Detailed Study in EIS?
Haul Road From Quarry Road Alignment and Traffic Control Alternatives	Utilize Existing Road Where Possible	Yes	No	No	Not Evaluated	No
	Maximize Road Separation	Yes	Yes	Yes	Yes	This has been incorporated in the Proposed Action
	Overpass to Avoid Intersection	Yes	No	No	Not Evaluated	No
	Re-Route Road North of Processing Plant to Avoid Intersection	Yes	Yes	No	Not Evaluated	No
	Four-Way Stop	Yes	Yes	No	Not Evaluated	No
	Manned Guard Booth	Yes	Yes	Yes	Yes	This has been incorporated in the Proposed Action
Access Road Alternatives	Slowing of Quarrying Rate	Yes	No	No	Not Evaluated	No
	Silver Peak Access Road	Yes	No	Not Evaluated	Not Evaluated	No
	Gap Springs Access Road	Yes	Yes	No	Not Evaluated	No
	Alternate Adjacent Access Road	Yes	Yes	No	Not Evaluated	No
	Partial Paving	Yes	Yes	No	No	No
	Group Lithium-Boron trucks in Units From Mine Site (compared to free flow)	Yes	Yes	No	Not Evaluated	No
	Conveyor vs Truck Traffic	Yes	No	No	Not Evaluated	No
	Traffic Control Devices to Manage Traffic	Yes	Yes	Yes	Yes	This has been incorporated in the Proposed Action
	Cave Springs Road Revised Reroute Alternative	Yes	No	No	No	No
Water Use Alternatives	Pumping from Fish Lake Valley	Yes	No	No	Not Evaluated	No
Mine Law	Permit the Project Under 2920 Regulations	No	Not Evaluated	Not Evaluated	Not Evaluated	No

Appendix D: Impact Definitions

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Air Resources	Air emissions impacts would not be measurable.	Air emissions would increase as a result of the Project; however, impacts fall within all applicable air quality standards and would not exceed NAAQS or NVAAQS.	Air emissions would increase as a result of the Project; however, implementation of ACEPMs and/or mitigation measures would reduce impacts to a level that would fall within all applicable air quality standards and would not exceed NAAQS or NVAAQS. If mitigation were required, mitigation would not require careful coordination with local, state, and federal agencies to be effective.	Air emissions would increase significantly as a result of the Project and would exceed applicable NAAQS and NVAAQS regardless of ACEPMs. Mitigation would be required. To be effective, mitigation would have to be carefully coordinated and planned with local, state, and federal agencies if a permit to proceed were to be issued.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Changes are perceived at the location of the activity but dissipate within a specified extent.	Changes are perceived throughout the area of analysis.
Cultural Resources	**No Historic Properties Affected** No measurable change to the current condition of cultural resources would result from Project construction, operation, or reclamation. There would be no effect to the existing NRHP qualities of individual historic properties.	**No Adverse Effect** There would be a measurable change to the current condition of historic properties as a result of Project construction, operation, or reclamation. While a change to a historic property would occur, it would not affect any of the NRHP qualities of individual historic properties, and the eligibility of the property to the NRHP would not be altered.		**Adverse Effects** A large, easily measurable change in the current conditions would result in significant impacts to historic properties as a result of construction, operation, or reclamation of the Proposed Action or action alternatives, and would substantially alter the NRHP qualities and eligibility status of individual historic properties.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the APEs.	Impacts would extend beyond the APEs.
Environmental Justice	There would be no identifiable environmental, health, or socioeconomic impacts of the Project or other alternatives that would affect minority, low-income, or Indigenous communities disproportionately relative to impacts on the total population of the area of analysis.	Environmental, health, or socioeconomic impacts on minority, low-income, or American Indian or Alaska Native communities would occur, but impacts would be localized with minimal identifiable differences between impacts on minority, low-income, or American Indian or Alaska Native populations compared to impacts on the population at large.	Environmental, health, or socioeconomic impacts on minority, low-income, American Indian or Alaska Native groups would occur, would be readily apparent, and would be measurable, but localized with moderate consequence. The Project would noticeably affect minority, low-income, or American Indian or Alaska Native communities disproportionate to the total population of the area of analysis.	Environmental, health, or socioeconomic impacts would be predominantly born by minority, low-income, or American Indian or Alaska Native communities, and the population at large of the area of analysis would not experience the impacts to a reasonably proportionate degree.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects would occur within the area of analysis with primary emphasis on eastern Esmeralda County and the Tonopah community.	Effects would occur across all of the area of analysis counties.
Geology and Minerals	Effects to geologic or mineral resources would occur, but they would be so slight as to not be measurable using normal methods.	Effects to geologic or mineral resources would occur but would be small and just measurable using normal methods.	Effects to geologic resources would occur and would be readily detectable.	Impacts are considered significant. Effects to geologic or mineral resources would occur and would be large, measurable, and easily recognized by a human observer.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the Area of Analysis or the general vicinity of the Plan boundary.	Impacts would extend beyond the Plan boundary and local area boundaries.

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Hazardous Materials	A negligible spill of hazardous materials or fuels would be one that is quite small, easily, and quickly contained, and has no measurable impact on any natural resource.	A minor spill of hazardous material or fuels would be one that has a measurable impact on soil or water resources but is quickly contained and remediated so that the duration and the extent of the spill are limited and there is no residual impact.	A moderate spill of hazardous material or fuels would be one that has a measurable impact over a large area, or a spill into a water resource. A moderate spill would have residual long-term impacts even after containment and remediation.	A major spill of hazardous material or fuels would be one that has extensive measurable impacts to water resources and requires the involvement of state and federal agencies to assess the impact and supervise the containment and remediation. This type of spill would have long-term impacts on natural resources and would require state and federal agency oversight for an extended period of time to ensure proper protection of critical resources and habitats.	Impacts are anticipated to last no longer than one year.	A spill that can be contained and remediated in less than four years.	A spill whose impacts to water, soil, or aquatic resources last more than four years but less than 23 years.	A spill whose impacts to water, soil, or aquatic resources remain unchanged indefinitely, including after reclamation (i.e., 23 years or more).	A spill impacting an area the size of a small park, a parking lot, or an area consisting of less than 10 acres.	A spill impacting an area greater than 10 acres, or a flowing water body, or a lake.
Land Use and Access	Effects to land use, access, realty actions, and existing established communities would either not occur, or impacts would be so slight as to not be measurable or perceptible. No access restrictions to existing land use authorizations would occur. The Proposed Action or action alternatives would not result in any inconsistencies with existing land use plans, goals, and policies, or any inconsistencies could be resolved without modifications to land use plans.	Effects to land use, access, realty actions, and existing established communities would be measurable and perceptible, but would be small and would not affect the validity of existing land use authorizations, nor the ability to implement future realty or land use authorizations. Access to existing land use authorizations would be maintained. The Proposed Action or action alternatives would not result in any inconsistencies with existing land use plans, goals, and policies, or any inconsistencies could be resolved without modifications to land use plans. ACEPMs would effectively minimize impacts to land use, access, and realty.	Effects to land use, access, realty actions, and existing established communities would be readily apparent and measurable, and they may affect the validity of existing land use authorizations, and the ability to implement future realty or land use authorizations. The Proposed Action or action alternatives would conflict with land use plans, goals, and policies, and may require modifications to these plans for conformance. Additional mitigation measures beyond ACEPMs may be required to minimize impacts to land use, access, and realty, but these measures likely would be successful.	There would be significant conflicts with existing land uses, realty actions, and existing established communities, as well as the ability to implement future realty or land use authorizations. The Proposed Action or action alternatives would result in significant conflicts with land use plans, goals, and policies and modifications to these land use plans would be required. Mitigation measures beyond ACEPMs may be required to minimize impacts to lands use, access, and realty, and these measures would have to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects on land uses, realty actions, and access would be limited to the area of analysis (i.e., area of analysis), or to one community.	Effects on land uses, realty actions, and access would extend to multiple communities and outside the area of analysis.
Livestock Grazing	Effects to livestock and grazing would be slight and no reductions to AUMs or change in livestock management would be required. There would be no change or loss of water availability that measurably affects livestock grazing or distribution.	Effects to livestock and grazing may alter the availability of resources that livestock depend on (i.e., water availability; forage), and/or small reductions to AUMs may be necessary. No adjustments to grazing management should be required beyond small AUM reductions.	Effects to livestock and grazing directly affect livestock access to limiting resources (i.e., water availability; forage). Reductions to AUMs are necessary and adjustments to authorized livestock grazing should be considered. Adverse effects would be minimized with implementation of ACEPMs, but reclamation would require long-term monitoring and maintenance.	Effects to livestock and grazing impact livestock management on an allotment level. Reductions in AUMs and a significant change in authorized use would be required. Adverse effects could be minimized with implementation of ACEPMs, but reclamation would require long-term monitoring and maintenance.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects would be limited to the Plan boundary.	Effects would occur beyond the Plan boundary; multiple permittees or allotments may be affected.

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Native American Traditional Values	There would be no change to the current condition of areas of concern to tribes as a result of construction, operation, or reclamation of the Proposed Action or action alternatives. There would be no effect to the existing access of specific areas. Prehistoric or ethnohistoric cultural resources, areas of elevated spiritual concern, TCPs, or sacred sites would not be affected.	There would be no measurable change to the current condition of areas of concern to tribes as a result of construction, operation, or reclamation of the Proposed Action or action alternatives. While a change to the existing access of specific areas may occur, it would not affect that access. Prehistoric or ethnohistoric cultural resources, areas of elevated spiritual concern, TCPs, or sacred sites would not be affected to a measurable degree.	An easily discernable and measurable change to the current condition of areas of concern to tribes as a result of construction, operation, or reclamation of the Proposed Action or action alternatives would occur. Changes to existing access would occur. Prehistoric or ethnohistoric cultural resources, areas of elevated spiritual importance, TCPs, or sacred sites would be affected to a measurable degree.	A large, easily measurable change in condition to areas of concern to tribes would occur as a result of construction, operation, or reclamation of the Proposed Action or action alternatives. Changes to existing access would occur. Prehistoric or ethnohistoric cultural resources, areas of elevated spiritual importance, TCPs, and/or sacred sites would be substantially altered.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects would be limited to prehistoric sites or properties of tribal importance within the area of analysis.	Effects would occur to prehistoric sites or properties of tribal importance outside of the area of analysis.
Recreation	Recreationists would not notice changes to the recreational setting, and proposed activities would not affect their experience. The quality, quantity, and use of recreation areas would not be impacted to a measurable or detectable level. There would be no conflicts with existing federal, state, and local statutes or management plans.	Recreationists may notice changes in recreational setting and the availability of recreational opportunities, and these changes may affect the recreational experience. Impacts to the quality, quantity, and use of recreation areas may be measurable and detectable, and displacement of recreationists to areas outside of the area of analysis would likely occur. However, overall access to recreational opportunities, and the ability to find comparable recreation experiences would not be affected. ACEPMs would effectively minimize impacts to recreational uses in the area.	Changes to the recreational setting and availability of recreation opportunities would be measurable and detectable within the area of analysis. Impacts to the quality, quantity, and use of recreation areas within the area of analysis would be apparent, and would potentially restrict access to recreational areas, reduce recreational opportunities, and\or reduce the quality of recreational areas. Displacement of recreationists to areas outside of the area of analysis would occur, but it would not affect overall access to recreational opportunities outside of the area of analysis. Mitigation measures beyond ACEPMs may be necessary to offset adverse effects, but these measures would likely be successful.	Changes to the recreational setting and availability of recreation opportunities would be measurable and detectable within and outside of the area of analysis. Impacts to the quality, quantity, and use of recreation areas within and outside of the area of analysis would be apparent. There would likely be restricted access to recreational areas, reduced recreational opportunities, and\or reduced quality of recreational areas. Displacement of recreationists to areas outside of the area of analysis would occur, and it would impact quality and quantity of recreational opportunities outside of the area of analysis. Mitigation measures beyond ACEPMs may be necessary to offset adverse effects, and these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the area of analysis or the general vicinity of the area of analysis.	Impacts would extend beyond the area of analysis or the general vicinity of the area of analysis.
Social and Economic Values	There would be a small and unnoticeable impact on the local and regional economy, population, government revenues and/or expenditures, and on public services and infrastructure demands. The consequences of the action would have little to no measurable impact on the social or economic environment.	There would be a small but noticeable impact on the local economy, population, government revenues and/or expenditures, and on public services and infrastructure demands, but there would be minimal to no impact on the regional social or economic environment.	There would be a measurable impact on the local and regional economy, population, government revenues and/or expenditures, and on public services and infrastructure demands. Adverse and beneficial impacts would not prove significant enough to result in long-term impacts to the socioeconomic environment.	There would be a substantial impact on the local and/or regional economy, population, government revenues and/or expenditures, and on public services and infrastructure demands. Effects would reverberate throughout the socioeconomic environment, significantly altering existing conditions, in beneficial or adverse ways.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects would occur at a locally focused scale within the area of analysis.	Effects would occur across a broader area, beyond the area of analysis.

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Soil Resources	Effects to soils would be so slight as to not be measurable.	Effects to soils may occur, and would be detectable, but small and of little consequence to soil quality and productivity. Effects would occur within the area of analysis. Effects would be minimized with implementation of ACEPMs, BMPs, and reclamation of the Proposed Action or action alternatives.	Effects to soils would occur and would be measurable and would occur over a larger area. Effects to soil quality and productivity may occur. However, effects likely would still occur within the area of analysis. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would most likely be effective.	Effects on soils would occur both within and outside of the area of analysis and would be measurable and apparent. Effects to soil quality and productivity likely would occur within and outside of the area of analysis. Mitigation beyond the ACEPMs and BMPs may be necessary, and these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur in the area of analysis.	Impacts would occur beyond the area of analysis.
Threatened and Endangered Species	Effects on threatened and endangered species populations would be so small they would not be measurable or perceptible. Critical habitat would not be altered and there would be no effect on the biological value of the critical habitat.	Effects on threatened and endangered species populations may be detectable, measurable, and perceptible. Impacts would not affect the overall biological value of the critical habitat. Effects would be minimized with implementation of ACEPMs, best management practices (BMPs), and reclamation of the Proposed Action or action alternatives.	Effects on threatened and endangered species populations would be readily apparent, measurable, large, and of consequence. Effects may occur to the overall biological value of the critical habitat. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would most likely be effective.	Effects would include the removal of threatened and endangered species populations or substantial alteration of critical habitat. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Affecting the area of analysis.	Affecting an area beyond the area of analysis.
Transportation and Access	Effects on traffic conditions and access in the area of analysis would either not occur or would be so slight as to not be noticeable by most motorists. No access restrictions to existing, authorized land uses would occur. There would not be a perceptible impact from traffic generation on current traffic conditions.	Effects on traffic flows and access would be measurable and may be noticeable to typical motorists but would be small and would not adversely impact traffic conditions. Access to existing land uses would be maintained. ACEPMs would effectively minimize impacts to the area transportation network.	Effects on traffic flows and access would be measurable and readily apparent to typical motorists but would not exceed state standards. There would be a readily apparent, measurable traffic increase on the access road and paved highway. Additional mitigation measures beyond ACEPMs may be required to minimize adverse effects on transportation, but such measures likely would be successful.	Effects on traffic flows and access would be measurable and would be readily apparent to all motorists. Mitigation measures beyond ACEPMs may be required to minimize impacts to transportation, and such measures would have to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects on traffic generation would be limited to the area of analysis.	Effects on traffic safety and traffic generation would extend beyond the area of analysis.
Vegetation Resources	Effects on vegetation resources would be so small it would not be measurable or perceptible. Plant communities would not be extensively altered and there would be no effect on the biological value or distribution of plant communities.	Effects on vegetation resources would be detectable, measurable, and perceptible, but would occur within the area of analysis and would not affect the overall biological value or distribution of plant communities. Effects would be minimized with implementation of ACEPMs, best management practices (BMPs), and reclamation of the Proposed Action or action alternatives.	Effects on vegetation resources would be readily apparent, measurable, large, and of consequence, but would occur within the area of analysis. Effects may occur to the overall biological value or distribution of plant communities. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would most likely be effective.	Effects on vegetation resources would occur and would substantially change the biological value or distribution of plant communities. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Affecting the area of analysis.	Affecting an area beyond the area of analysis.

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Visual Resources	Effects would not result in any perceptible changes to existing viewsheds or the scenic quality of the existing characteristic landscape. Modifications to the scenic quality of the existing landscape would be consistent with VRM class objectives.	Effects would result in changes to the viewshed and the scenic quality of the existing characteristic landscape, but these impacts would not result in a significant degree of contrast with the existing landscape. Modifications to the scenic quality of the existing landscape would be consistent with VRM class objectives. Effects would be minimized with implementation of ACEPMs and additional mitigation measures.	Changes to the viewshed and the scenic quality of the existing characteristic landscape would be readily apparent, which would result in a noticeable degree of contrast with the existing landscape. Visual impacts may not be consistent with VRM class objectives. Mitigation beyond the applicant committed ACEPMs may be necessary, but these measures most likely would be effective.	The Proposed Action or action alternatives would result in significant impacts to the viewshed and the scenic quality of the existing characteristic landscape, and it would introduce a strong degree of contrast with the existing landscape. Visual impacts would not be consistent with VRM class objectives. Mitigation beyond the applicant committed ACEPMs may be recommended to reduce adverse impacts, and these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Activities would affect the viewshed within the area of analysis but would not be visible outside of the area of analysis.	Activities would affect the viewshed within the area of analysis, as well as outside of the area of analysis.
Water Resources	Effects to water resources and geochemistry could occur, but they would be so slight as to not be measurable or distinguishable from natural fluctuations.	Effects to water resources and geochemistry would occur; but would be small and just measurable using normal methods. Effects are unlikely to affect beneficial uses of the receiving water.	Effects to water resources and geochemistry would occur and would be readily detectable and could affect the beneficial uses of the surface or groundwater resources.	Effects to water resources and geochemistry would be large, measurable, and easily detected and would substantially change beneficial uses of surface or groundwater resources, or hydrologic regime over the area.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Effects would occur at specific site(s) or within the area of analysis.	Effects would extend beyond the area of analysis.
Wetland and Riparian Resources	The wetland and riparian resources within the area of analysis would not be affected, or impacts would not be measurable. Any impacts on the wetland and riparian resources would be slight and short-term. Chemical, physical, or biological changes to water quality would not be affected, or impacts would not be measurable and would not affect the health of the aquatic resources. Any effects would be minimized with implementation of ACEPMs, best management practices (BMPs), and reclamation of the Proposed Action or action alternatives.	Impacts on wetland and riparian resources, such as an increase or decrease in surface flow, loss of wetland acres, or changes in wetland vegetation would be detectable. Chemical, physical, or biological changes to water quality would be detectable. Effects would be minimized with implementation of ACEPMs, BMPs, and reclamation of the Proposed Action or action alternatives.	Impacts on wetland and riparian resources would result in detectable effects. These changes would not be permanent, and the resource would rebound to pre-impact conditions after one season. Chemical, physical, or biological changes to water quality would be detectable, but the desired water quality conditions would only be temporarily degraded. Mitigation beyond the ACEPMs and BMPs may be necessary, but these measures would most likely be effective.	Effects on wetlands and riparian areas would be readily apparent and would substantially change the functional value of the wetland and riparian areas in the context of the area of analysis. Impacts on wetland and riparian resources would result in detectable effects which would likely result in long-term to permanent changes and would impact associated resources such as the biotic community, water quality, water availability, and habitat quality. In extreme cases, biological resources may be extirpated from the area due to loss of habitat. Chemical, physical, and biological changes to water quality would represent a significant degradation from the historic baseline water quality conditions. Mitigation beyond the ACEPMs and BMPs may be necessary to reduce adverse impacts, and these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the area of analysis.	Impacts would extend beyond the area of analysis.

Attribute	Intensity				Duration				Context	
	Negligible	Minor	Moderate	Major	Temporary	Short-Term	Long-Term	Permanent	Localized	Regional
Wildlife Resources	Wildlife would not be affected, or impacts would not result in a loss of individuals or habitat. Impacts to habitat would not be perceptible or measurable.	Impacts to wildlife would be measurable or perceptible; however, the overall viability of the population or subpopulation would not be affected, and the population would recover. Impacts to wildlife or wildlife habitat would be detectable. Effects would be minimized with the implementation of ACEPMs and reclamation.	Impacts would be sufficient to cause a change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability). The change would be measured and perceptible, but the negative impacts could be reversed. Mitigation beyond the ACEPMs may be necessary, but these measures would most likely be effective.	Impacts would be substantial, highly noticeable, and could be permanent in their effect on population or subpopulation survival without active management. Mitigation beyond the ACEPMs may be necessary to reduce adverse impacts, and these measures would need to be monitored to determine their effectiveness.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the area of analysis or be confined to a small part of a population, habitat, or range.	Impacts would occur outside the area of analysis or affect a widespread area of suitable habitat, or a large part of the population or range of a species.
Wild Horses and Burros	Impacts would not result in any perceptible changes to wild horse and burro habitat utilization (e.g., foraging, breeding), distribution, and/or habitat.	Impacts would result in minimally observable and/or measurable changes to wild horse and burro utilization, distribution, or habitat. The Proposed Action or action alternatives could result in a temporary displacement of animals.	Impacts would result in observable and/or measurable changes to wild horse and burro utilization, distribution, health, or habitat.	Impacts would result in marked changes to wild horse and burro utilization, distribution, health, or habitat. The Proposed Action or action alternatives could result in displacement of some or all of the animals.	Impacts are anticipated to last no longer than one year.	Impacts would last through construction (i.e., four years).	Impacts would occur through active quarrying and processing and would remain during reclamation and closure activities (i.e., four to 23 years).	Impacts would remain after reclamation and closure is completed (i.e., 23 years or more).	Impacts would occur within the area of analysis.	Impacts would extend beyond the area of analysis.

Appendix E: List of Preparers

Table E-1 BLM Interdisciplinary Team

Name	Title and/or Document Area of Responsibility
Perry Wickham	Field Manager – TFO
Daltrey Balmer	Assistant Field Manager – TFO
Scott Distel	Project Manager/NEPA Compliance
Randy Martin	Public Outreach
Sandra Brewer	Toxicologist
Ana Ingstrom	Technical Lead/Mine Law Administration/Mine Engineer
Andrew Monastero	Cultural Resources/Paleontological Resources
Prudence Crampton	Native American Coordination and Consultation
Matthew Fockler	Social and Economic Values/Environmental Justice
Katerina St. Claire	Lands and Realty
Kenner Vorheis	Recreation/Visual Resources/Wilderness
Melissa Jennings	Geology and Minerals
Gabrielle Buttermore	Wildlife/Migratory Birds/Special Status Species/Threatened and Endangered Species
Justin Ferris	Surface Hydrology/Floodplains/ Wetlands/Riparian/Water Quality/ Groundwater Hydrology
Thomas Mendoza	Livestock and Grazing Resources/Vegetation/Soils
Quinn Young	Vegetation, including Special Status Species, Noxious Weeds, and Invasive Species, Non-native Species/Threatened and Endangered Species
Frank Giles	Air Quality including Climate Change
Jensen Reese	Hazardous Materials and Solid Waste
Robert Burdick	Forestry/Forests/Fire Management

Table E-2 Cooperating Agencies

Name	Title	Document Area of Responsibility
U.S. Department of Energy		
Todd Stribley	Environmental Protection Specialist	NEPA
David Oster	Environmental Protection Specialist	NEPA
Aydin Johnson	Environmental Protection Specialist	NEPA
U.S. Environmental Protection Agency		
Spencer Quam	Environmental Reviewer	NEPA
U.S. Fish and Wildlife Service		
Justin Barrett	Ecological Services	Threatened and Endangered Species
Sarah Kulpa	Ecological Services	Threatened and Endangered Species
Joe Barnes	Migratory Bird Program	Bald and Golden Eagles, Wildlife Resources, Including Special Status Species and Migratory Birds, Threatened and Endangered Species

Name	Title	Document Area of Responsibility
Nevada Department of Wildlife		
Tracy Kipke	Southern Region Habitat Biologist	Wildlife Resources, Including Special Status Species and Migratory Birds, Vegetation Resources, Including Noxious Weeds and Special Status Plant Species, Wetland and Riparian Resources, and Water Resources and Geochemistry
Jasmine Kleiber	Wildlife Staff Specialist	Wildlife Resources, Including Special Status Species and Migratory Birds, Vegetation Resources, Including Noxious Weeds and Special Status Plant Species, Wetland and Riparian Resources, Threatened and Endangered Species, and Water Resources and Geochemistry
Nevada Division of Forestry		
James Steed	Resource Program Manager	Vegetation Resources, Including Noxious Weeds and Special Status Plant Species, Wetland and Riparian Resources, Threatened and Endangered Species, and Water Resources and Geochemistry
Esmeralda County		
Ralph Keyes	County Commissioner	NEPA
Nancy Boland	County Assigned Representative	NEPA
Nye County		
Megan Labadie	County Assigned Representative	NEPA
Lorinda Wichman	County Assigned Representative	NEPA

Table E-3 Third Party NEPA Contractor

Name	Company	Title and/or Document Area of Responsibility	Degree and Experience
Ben Veach	Stantec Consulting Services Inc. (Stantec)	Principal-in-Charge	BS Forestry 38 years' experience
Kristi Schaff	Nexus Environmental Consultants, Inc. (Nexus)	Senior NEPA Advisor	BS Land Rehabilitation 20 years' experience
Diana Eck	Nexus	Project Manager, Wetlands and Riparian Areas, Visual Resources	BS Wildlife Biology 14 years' experience
Charli Sperry	Nexus	Assistant Project Manager, Wildlife, including Migratory Birds, Special Status Wildlife Species, Recreation	BS Wildlife Ecology and Conservation 10 years' experience
Steve Morton	Stantec	QA/QC	BA General Studies 21 years' experience
Rixey Jenkins	Nexus	Lead Author, Livestock and Grazing, Wild Horses and Burros, Vegetation Including Noxious and Invasive Non-native Weed Species, Soils, Transportation and Access	BS Rangeland Ecology and Management 16 years' experience
Gianni Giuliano	Stantec	Project Coordinator, Environmental Justice, Land Use and Access, Social and Economic Values, and Cumulative Effects	BS Environmental Science 3 years' experience
Dulcy Engelmeier	Nexus	Technical Editor	29 years' experience
Katie Stough	Nexus	Technical Assistance	BS Biology 2 years' experience
Ian Holl	Stantec	GIS Specialist	BA Biology and Environmental Studies 8 years' experience

Name	Company	Title and/or Document Area of Responsibility	Degree and Experience
Jenni Prince-Mahoney	Stantec	Cultural Resources/Native American Traditional Values	Graduate Certificate NEPA BA Anthropology 32 years' experience
Walt Martin	Stantec	Geology and Minerals	MS Geology BS Geological Sciences 40 years' experience
Nancy Lightfoot	Stantec	Hazardous Materials and Solid Waste	BS Geology 30 years' experience
Eric Clark	Stantec	Air Quality	MS Civil Engineering BS Environmental Science 18 years' experience
Ian Dudley	Stantec	Threatened and Endangered Species	MS Biology BS Wildlife and Conservation 13 years' experience
George Fennemore	Stantec	Water Resources, Geochemistry	PhD Applied Mathematics MS Applied Mathematics BS Mathematics 28 years' experience
Tina Davis	Stantec	Administrative Record	BA Humanities/English 23 years' experience

Table E-4 Proponent – Ioneer Rhyolite Ridge LLC

Name	Title
Rebecca Sawyer	Environmental and Community Relations Director
Matt Weaver	Senior Vice President Engineering and Operations
Sasha Meyer	Director of Mining Operations
Bernard Rowe	Managing Director
Sandra Carson	Environmental Professional
Devin Harbke	Environmental Manager
Chad Yeftich	Vice President Corporate Development

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