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

U.S. Fish & Wildlife Service

Thacker Pass Lithium Mine Project

Final Environmental Impact Statement
DOI-BLM-NV-W010-2020-0012-EIS

December 4, 2020

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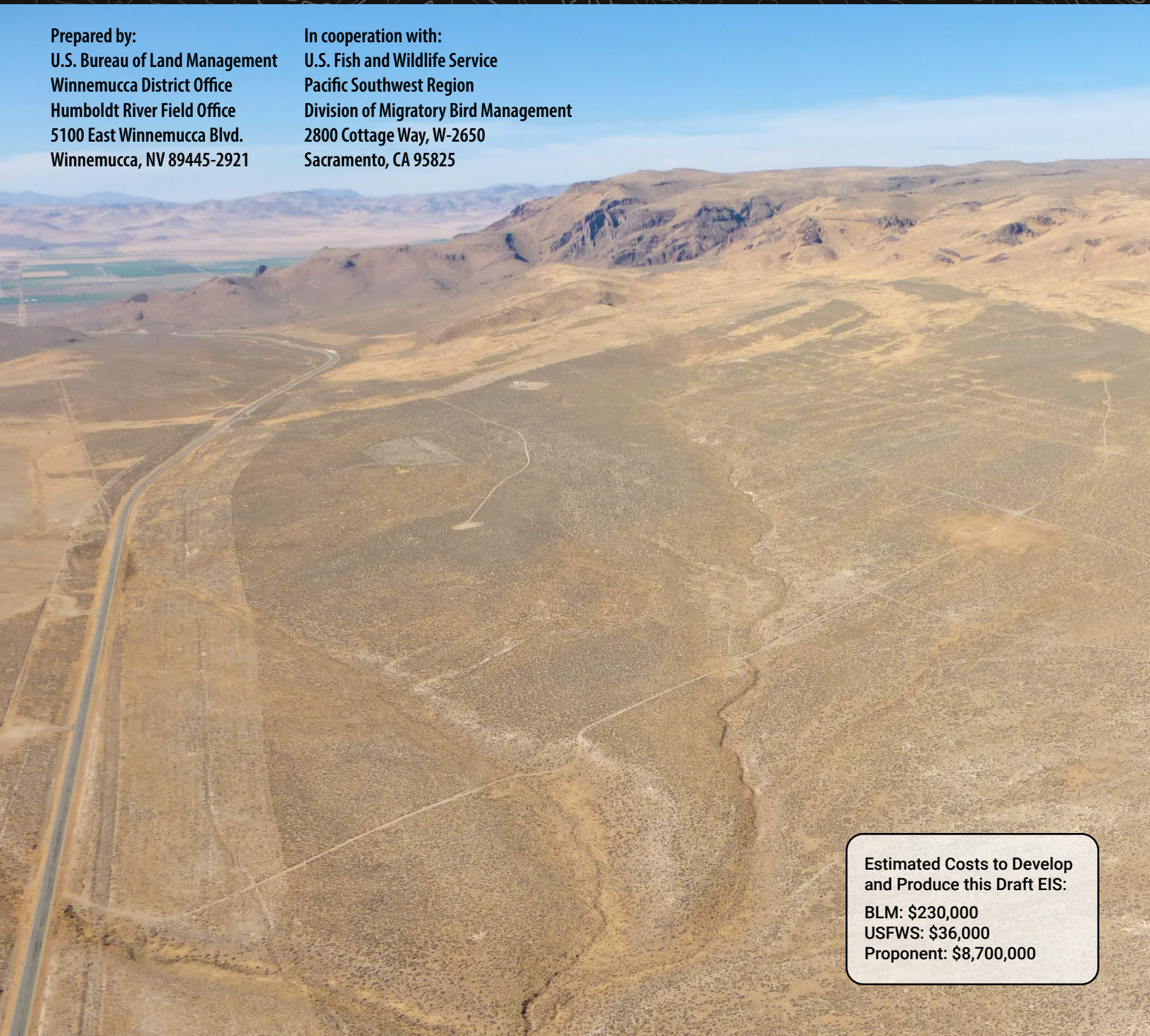

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Proponent: $8,700,000

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Final Environmental Impact Statement
For the Thacker Pass Lithium Mine Project

( ) Draft	**(X) Final**
Lead Agency:	U.S. Department of the Interior Bureau of Land Management Humboldt River Field Office
Cooperating Agencies:	U.S. Environmental Protection Agency U.S. Fish and Wildlife Service Nevada Department of Wildlife Nevada Department of Natural Resource Conservation (Sagebrush Ecosystem Technical Team) Humboldt County
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ABSTRACT

This Final Environmental Impact Statement (EIS) analyzes the potential direct, indirect, and cumulative impacts associated with the proposed Thacker Pass Lithium Mine and Reclamation Plan of Operations and the North and South Area Exploration Plan of Operations. The Final EIS includes modifications made to the Draft EIS in response to public comments received during the Draft EIS review period. The proposed Project consists of construction and operation of an open pit mine, lithium processing plant and ancillary facilities, and continued exploration activities on public lands within the Project area located in northern Humboldt County, Nevada. The Project would be developed in two phases (Phase 1 and Phase 2) during the proposed 41-year mine life. More information is available at: https://eplanning.blm.gov/eplanning-ui/project/1503166/510

Authorized Officer Responsible for the Final Environmental Impact Statement:

Ester McCullough
District Manager
Winnemucca District Office
Bureau of Land Management

EXECUTIVE SUMMARY

The Bureau of Land Management (BLM) Humboldt River Field Office (HRFO) is preparing this Environmental Impact Statement (EIS) in response to a Plan of Operation and Reclamation (PoO) submittal by Lithium Nevada Corporation (LNC) for the Thacker Pass Lithium Mine Project (Project). The proposed Project consists of construction and operation of an open pit mine, lithium processing plant and ancillary facilities, and continued exploration activities on public lands within the Project area located in northern Humboldt County, Nevada.

The United States (U.S.) Fish and Wildlife Service (USFWS), the Nevada Department of Wildlife (NDOW), Sagebrush Ecosystem Technical Team (SETT), and Humboldt County Commissioners are official cooperating agencies for preparation and review of this EIS. The U.S. Environmental Protection Agency and the Nevada Division of Environmental Protection (NDEP) have agency-wide Memorandums of Understanding (MOUs) with the BLM for coordination on National Environmental Policy Act of 1969 (NEPA) projects, and both actively coordinated with the BLM on this EIS.

Proposed Action (Alternative A)

Under the Proposed Action (Alternative A), LNC would construct and operate an open pit lithium mine and processing facility in the Thacker Pass basin. Facilities associated with the Proposed Action include development of an open pit mine; waste rock storage facilities; a coarse gangue stockpile; a clay tailings filter stack; growth media stockpiles; haul and secondary roads; and additional mine facilities to support mining and lithium production operations. The Project would be developed in two phases (Phase 1 and Phase 2) during the proposed 41-year mine life. Phase 1 would include construction of the mine facilities and mining and processing for the first 4 years of mine life. Phase 2 would occur from years 5 to 41 of the mine life, after which the Project would enter the reclamation and closure period (for a minimum of 5 years). In addition, LNC would complete exploration activities as part of the Proposed Action. The Project area includes 17,933 acres of land, of which 10,468 acres and 7,465 acres are associated with the Mine PoO and Exploration PoO, respectively. The total disturbance footprint would be approximately 5,695 acres. Surface and subsurface mineral estates associated with the Project are located on public lands administered by the BLM, Winnemucca District (WD). No state or private lands are included in the Project area. Surface disturbances under the Proposed Action would be concurrently reclaimed by the applicant during the life of mine in areas where mining activity has been completed. The open pit would be actively backfilled during the life of mine and those areas would be concurrently reclaimed prior to the final closure and reclamation period. At the end of mine life, the open pit would be completely backfilled and reclaimed.

Under the Proposed Action, the Applicant is requesting authorization from the USFWS for disturbance to and loss of annual productivity from one Golden Eagle breeding pair for a period of up to five years from the date of the issuance of a take permit, under the Bald and Golden Eagle Protection Act. This Alternative would include monitoring of the nest site and required compensatory mitigation to offset impacts to Golden Eagles. Under this Alternative, LNC would

provide the compensatory mitigation at the required 1.2:1 ratio by retrofitting electric utility poles, as analyzed and discussed in the 2016 Eagle Rule Revision PEIS (USFWS 2016a).

Alternative B (Partial Pit Backfill)

Under Alternative B, the South Pit area would be partially backfilled and the North and West Pits would be backfilled to elevations (**Figure 2.5, Appendix A**). Under this alternative, no permanent pit lakes are anticipated to develop, however; a small intermittently wet area would likely occur in the South Pit area. Backfilling of the West Pit would be anticipated to begin in year seven of the life-of-mine and would continue into the North Pit and a portion of the South Pit as mining progresses. The partial backfill scenario would generate smaller waste rock storage facilities (WRSF) than under the No Pit Backfill option (Alternative C). In addition, this alternative would result in larger long-term disturbance footprints for the WRSF and gangue stockpile as less waste rock and coarse gangue material would be backfilled into the pit in comparison to The Proposed Action. The increased footprints of these facilities would also result in increased visual effects.

Under Alternative B, the USFWS permitting would be the same as in Alternative A.

Alternative C (No Pit Backfill)

Under this alternative, the West, North, and East Pits would not be backfilled at the end of the life-of-mine and the open pit would remain as a post-mining feature. Upon the cessation of pit dewatering at mine closure, three small permanent pit lakes would develop. Water quality in the pit lakes would be anticipated to be degraded and could adversely affect wildlife and livestock. Groundwater quality could also be adversely affected under this alternative. In addition, this alternative would result in larger long-term disturbance footprints for the WRSF and gangue stockpile as waste rock and coarse gangue material would not be backfilled into the pit. The increased footprints of these facilities would also result in increased visual effects.

Under Alternative C, compensatory mitigation would differ from Alternative A under the eagle incidental take permit. Under this alternative, the USFWS would require 1:1 mitigation as retrofits, and 0.2:1 mitigation as nest site enhancement within the Pacific Flyway Eagle Management Unit. The LNC would contribute funds to the National Fish and Wildlife Foundation (NFWF) or directly to a utility company for the retrofits, and would contribute funds for nest site enhancement to NFWF or directly to an ongoing study that is treating Golden Eagle nests for Mexican chicken bugs or other parasites if they are identified as a concern.

Alternative D (No Action Alternative)

Under Alternative D, the No Action Alternative, the BLM would not approve the proposed PoOs for mining and exploration. There would be no construction or operation of the Thacker Pass Mine on BLM-administered lands. Reclamation of existing disturbance would be completed according to previous authorizations. The U.S. Fish and Wildlife Service would not issue an incidental take permit to LNC.

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CHAPTER 1. INTRODUCTION

1.1 IDENTIFYING INFORMATION

Title: Lithium Nevada Corporation – Thacker Pass Lithium Mine Project (Project)

Environmental Impact Statement (EIS) Number: DOI-BLM-NV-W010-2020-0012-EIS

Case File Number: Thacker Pass Mine and Reclamation Plan of Operations, BLM case file number NVN-098586 (LNC 2019a) and the Thacker Pass North and South Exploration Areas, BLM case file number NVN-098582 (LNC 2019b). The Mine and Reclamation Plan of Operations and Exploration Plan of Operations are hereafter collectively referred to as the Plans of Operation (Plans) in this EIS. When referring to a specific plan of operations, the EIS will indicate either the Mine Plan or Exploration Plan, respectively. The Proposed Action is defined as the actions included in both Plans of Operation.

Applicant Name: Lithium Nevada Corporation (LNC), a wholly owned subsidiary of Lithium Americas Corporation (LAC), proposes to construct, operate, reclaim, and close the Thacker Pass Project.

Type of Project: Construction and operation of a lithium mine and continued exploration of the known deposit.

Location of the Proposed Action:

The Project would be located in northern Humboldt County, Nevada, approximately 20 miles west-northwest of Orovada, 62 miles north-northwest of Winnemucca, and approximately 20 miles south of the Oregon border (**Figure 1.1, Appendix A**). The Project area includes both the Mine Plan and Exploration Plan boundary, which together encompasses 17,933 acres. This area is herein referred to as the "proposed Plan boundary" and is located within all or portions of the following Townships and Ranges relative to the Mount Diablo Baseline and Meridian:

- **Mine Plan Boundary**: Township 44 North, Range 34 East, Sections 1, 12; Township 44 North, Range 35 East, Sections 2 through 17; and Township 44 North, Range 36 East, Sections 7, 8, 14 through 23, and 29.
- **Exploration Plan Boundary**: Township 44 North, Range 34 East, Sections 12, 13, 24; Township 44 North, Range 35 East, Sections 1, 2, 7, 8, 12 through 24; and Township 44 North, Range 36 East, Sections 5 through 8, 18, and 19.

Name and Location of Preparing Office: The Bureau of Land Management (BLM) Humboldt River Field Office (HRFO) is serving as the lead agency for preparing this EIS. The BLM HRFO is located at:

BLM-HRFO
Winnemucca District
5100 East Winnemucca Boulevard
Winnemucca, Nevada 89445

Cooperating Agencies: The United States (U.S.) Fish and Wildlife Service (USFWS), the Nevada Department of Wildlife (NDOW), Nevada Department of Natural Resources Sagebrush Ecosystem Technical Team (DCNR/SETT), and Humboldt County Commissioners are official cooperating agencies for preparation and review of this EIS. The U.S. Environmental Protection Agency (EPA) and the Nevada Division of Environmental Protection (NDEP) have agency-wide Memorandums of Understanding (MOUs) with the BLM for coordination on National Environmental Policy Act of 1969 (NEPA) projects, and the EPA and NDEP actively coordinated with the BLM on this EIS.

1.2 SUMMARY OF PROPOSED ACTION

The *Thacker Pass Mine and Reclamation Plan of Operations* (LNC 2019a) and the *Thacker Pass North and South Area Exploration Plan of Operations* (hereafter referred to as the Project) (LNC 2019b) were submitted to the BLM HRFO for review and potential approval of the Project in accordance with BLM Surface Management Regulations under 43 Code of Federal Regulations (CFR) 3809. The BLM prepared this EIS to analyze the effects associated with the proposed Project as described in the Plans.

The Project area would include a total of approximately 17,933 acres (Mine Plan boundary of 10,468 acres; Exploration Plan boundary of 7,465 acres) with an estimated total disturbance footprint of approximately 5,695 acres (Mine Plan area disturbance of 5,545 acres; Exploration Plan area disturbance of 150 acres). The surface and subsurface mineral estates associated with the Project are located on public lands administered by the BLM, Winnemucca District (WD); no state or private lands are included in the Project area. The Project would be an open pit mine with a life expectancy of approximately 41 years. Closure and reclamation of the Project is anticipated to require another five years. The Project would be developed in two phases over the estimated life-of-mine. Phase 1 would include two-years of construction of the support and processing facilities, pre-production waste rock removal, and then mining and processing for the first 4 years of the mine life. Phase 2 would be a continuation of mining and processing between years 5 to 41, after which the Project would enter the reclamation and closure period (for a minimum of 5 years).

The Proposed Action presented in this EIS is based on the recently submitted Plans. For a detailed discussion of the Proposed Action, see Section 2.2, *Proposed Action*. Facilities associated with the Proposed Action include:

- Development of an open pit mine;
- Pit dewatering;
- Construction of two Waste Rock Storage Facilities (WRSFs);
- Construction and operation of mine facilities to support mining operations;
- Construction of a Run-of-Mine (ROM) stockpile;
- Construction and operation of an attrition scrubbing process;
- Construction of a coarse gangue stockpile (CGS);
- Construction and operation of lithium processing facility;

- Construction of a sulfuric acid plant for use in a leaching process;
- Construction and operation of a Clay Tailings Filter Stack (CTFS);
- Construction and maintenance of haul and secondary roads;
- Construction and maintenance of stormwater management infrastructures including diversions and sediment ponds;
- Construction of three growth media stockpiles (GMSs);
- Construction of water supply, conveyance pipeline, booster pump stations, and storage facilities;
- Construction of a 25-kilovolt (kV) power transmission line, substations, and distribution;
- Construction of ancillary facilities to support the Project such as septic systems, communication towers, guard shacks, reclaim ponds, monitoring wells, weather station, fiber optic line, buffer areas, and fencing.

In addition, exploration activities would occur as part of the Proposed Action, which would include surface disturbance associated with the development of drill pads and access roads, overland travel, monitoring well installation, geotechnical investigations, geophysical surveys, sampling, trenching, and bulk sampling.

The proposed battery production facility analyzed in the Draft EIS has been removed from the proposed Mine Plan of Operations by the applicant.

Reclamation of disturbed areas resulting from Project activities would be completed in accordance with BLM and NDEP regulations to prevent unnecessary or undue degradation of public lands. LNC would initiate concurrent reclamation of areas no longer required for operations at the earliest economically and technically feasible time over the mine life.

1.3 BLM AND USFWS PURPOSE AND NEED

The BLM's purpose for this federal action is to respond to LNC's Plans of Operation to construct and operate a lithium mine, lithium processing plant, and related facilities reasonably incident to mining operations on public lands, as well as continued exploration within the proposed Project area. The need for the Proposed Action is established by the BLM's responsibility under the Federal Land Policy and Management Act of 1976 (FLPMA) and the BLM's Surface Management Regulations at 43 CFR 3809 to ensure that operations under the Mining Law of 1872 prevent unnecessary or undue degradation.

The USFWS's purpose for this Federal Action is to respond to LNC's request for an incidental take permit for Golden Eagles under the Bald and Golden Eagle Protection Act (Eagle Act), associated with LNC's mining operations at the Thacker Pass Lithium Mine Project. This is driven by a need for the USFWS to make a permitting decision that may enable LNC to continue mining operations that are consistent with our Eagle Act regulations, including the goal of maintaining stable or increasing breeding populations of Bald and Golden Eagles.

1.3.1 Decision To Be Made by the BLM

The BLM will decide whether the proposed Mine and Exploration Plans cause unnecessary or undue degradation and, consequently, whether to approve the Plans as proposed, approve with modifications, or deny the proposed Plans.

1.3.2 Decision To Be Made by the USFWS

The USFWS will decide whether (1) the incidental take is necessary to protect legitimate interests; (2) the take is compatible with the preservation standard of the Eagle Act; (3) the applicant has avoided and minimized impacts to eagles to the extent practicable; and (4) compensatory mitigation will be provided for any take and consequently, whether to issue an eagle incidental take permit (EITP), approve with modifications, or deny the application.

1.4 PROJECT PERMITS AND APPROVALS

In addition to the EIS, implementing the Proposed Action would require authorizing actions from other federal, state, and local agencies with jurisdiction over certain aspects of the proposed Project. **Table O.2** (**Appendix O)** lists the major permits or approvals already in place or that would be obtained or otherwise addressed and the regulatory agencies responsible for issuing and managing such permits and approvals. LNC is responsible for amending existing permits and applying for and acquiring additional permits and approvals, as needed.

1.5 RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

1.5.1 National and BLM Policies

This EIS is consistent with NEPA, *as amended* (42 U.S.C. §§4321-4347), and Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508; 43 CFR §46). This EIS was also developed to meet the provisions set forth in DOI Secretarial Order (SO) 3355 for streamlining NEPA reviews and implementation of EO 13807 (82 FR 40463). **Table O.1** in **Appendix O** of this EIS presents the Federal and State regulatory settings for each resource analyzed in the Draft EIS.

1.5.2 USFWS Eagle Act

USFWS regulatory jurisdiction includes a broad range of fish and wildlife resources. The USFWS authorities are codified under multiple statutes that address management and conservation of natural resources from many perspectives, including, but not limited to the effects of land, water, and energy development on fish, wildlife, plants, and their habitats. This analysis is based on the Eagle Act (16 U.S.C. § 668) and its regulations (50 CFR 22). The 2016 USFWS Programmatic EIS (PEIS; USFWS 2016a) includes a full list of authorities that apply to this action (PEIS Section 1.6, pages 7 through 12), which are incorporated by reference throughout this FEIS.

The Eagle Act gives the Secretary of the Interior the authority to "authorize the taking of such eagles pursuant to regulations which he is hereby authorized to prescribe." 16 U.S.C.A. § 668a. The applicant has applied to USFWS for a permit for incidental take of Golden Eagles at 50 C.F.R. § 22.26, one of the eagle take regulations that was promulgated under the Eagle Act. USFWS issuance of an EITP must comply with the Eagle Act and all related regulatory requirements of 50 CFR 22.26 (incidental take), and/or 50 CFR 13.21 (general USFWS permit issuance criteria). The USFWS's decision on whether to issue a permit would be based on the analysis in the EIS and applicable permitting regulations. 50 C.F.R. § 22.26(c)(1)(i) states in part, "Compensatory mitigation scaled to project impacts will be required for any permit authorizing take that would exceed the applicable eagle management unit take limits." The USFWS's 2016 PEIS reiterates that for Golden Eagles, take limits are set at zero for all eagle management units. 2016 PEIS Section 2.2.2. The USFWS Record of Decision accompanying the 2016 PEIS selected Alternative 5, which required compensatory mitigation for Golden Eagles at a ratio of 1.2 to 1. (2016 PEIS ROD, PEIS Section 3.3.2.1).

Though Golden Eagles are also protected under the Migratory Bird Treaty Act (MBTA), the Eagle Act is the primary law protecting eagles. The Eagle Act prohibits "take" of eagles and their nests without a permit (16 U.S.C. 668-668c). The Eagle Act defines "take" to include "pursue, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest or disturb," and prohibits take of individuals and their parts, nests, or eggs. The definition includes the term "destroy" to ensure that "take" includes destruction of eagle nests. The term "disturb" is further defined by regulation as "to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, injury to an eagle, a decrease in productivity, or nest abandonment" (50 CFR 22.3).

1.5.3 Land Use Plan Conformance

The Proposed Action is subject to and has been reviewed for conformance with the following plans:

Winnemucca District Resource Management Plan

The Proposed Action and Project alternatives conform with the BLM's WD Record of Decision and Resource Management Plan (RMP) (ROD/RMP) with the exception of existing Visual Resource Management (VRM) designations (BLM 2015a). Specifically, the ROD/RMP states:

- Goal: Make federal mineral resources available to meet domestic needs. Encourage responsible development of economically sound and stable domestic minerals and energy production, while assuring appropriate return to the public. Ensure long-term health and diversity of the public lands by minimizing impacts on other resources, returning lands disturbed to productive uses, and preventing unnecessary or undue degradation to public lands.
- Action MR 1.5: Public lands would remain open and available for mineral exploration and development, subject to the provisions of FLPMA Section 204.

- Objective MR 9: Manage mineral material operations to provide for the mineral and energy needs of the nation, while assuring compatibility with and protection of other resources.

Nevada and Northeastern California Greater Sage-grouse Approved Resource Management Plan Amendment

The Proposed Action is consistent with the Nevada and Northeastern California Greater Sage-grouse ROD and Approved Resource Management Plan Amendment (ARMPA) (BLM 2015) prepared by the BLM to conserve, enhance, and restore Greater Sage-grouse (GRSG) habitat. The ARMPA presents land use plan goals, objectives, land use allocations, and management actions for protecting and preserving GRSG and its habitat on BLM-administered lands in Nevada. The Project is also consistent with the 2019 GRSG ARMPA, should the new guidance be adopted. **Tables N.1** to **N.4** in **Appendix N** identify if the measure is applicable to the proposed Project, and if the Project is consistent with each measure.

State and Local Land Use Plans and Policies

The NDEP, Bureau of Mining Regulation and Reclamation (BMRR) regulates the operations of all existing and new mining operations under the authority of the Nevada Revised Statutes (NRS) 445A.300-NRS 445A.730 and the Nevada Administrative Code (NAC) 445A.350-NAC 445A.447. The regulations recognize that the extraction of mineral materials and the reclamation of land affected by such extraction are necessary and proper.

The Humboldt County Regional Master Plan, updated in 2012, encourages responsible mining operations that result in the least impacts possible (Humboldt County 2012). The Proposed Action is consistent with the goals, objectives, and strategies related to mining and land use policy of the 2012 Humboldt County Master Plan (HCRMP). Goals outlined in the Humboldt County Regional Master Plan relevant to the proposed Project include:

- Open Space Goal: To guide development within well-defined boundaries that will enhance the health, safety and welfare of the community and its residents, promote economic development, and protect the region's natural environment (see HCRMP page 21).
- Economic Development Goal: To maintain and enhance natural resource-based industries including mining, agriculture, ranching, recreation and tourism, and seek value-added manufacturing of those resources (see HCRMP page 30).

The Humboldt County Water Resources Plan (HCWRP) also includes the following policies relevant to the proposed Project:

- General Policy 1: The County supports the doctrines of prior appropriation and beneficial use as established by Nevada State law, and recognizes that the right to buy, sell, and own water rights is a property right available to individuals, corporations, municipalities, and other organizations (see HCWRP page 61).
    - Procedure: The County supports private development of water resources on private, State and federal lands for beneficial use in Humboldt County in a manner that does not deplete or degrade water resources, lead to impacts on natural resources, Health

& Safety or negatively impact the economy of the County. The County supports beneficial uses including, but not limited to, municipal water supply, economic development (industrial uses / mining and milling), irrigation, stock water, recreation and wildlife uses. The County recognizes the State Engineer's authority to issue water rights in this regard and will provide input as appropriate particularly when issuance of such a right may negatively impact the County's customs, culture, economy, or environment.

- Procedure: The County shall encourage and engage in cooperative data collection of water resources in Humboldt County, and sharing of such data to better inform decision related to water management. Any monitoring conducted by the County should focus on general surface and groundwater resources and not on specific water rights unless part of an agreement between the water right holder, State Engineer and County.
- Procedure: The County supports retaining authority of the State, rather than the US Environmental Protection Agency, to protect water quality under the Clean Water Act, and will encourage coordination among all responsible and affected interests when considering water quality actions.

- General Policy 6: The County supports the temporary reservation of water for reclamation of irrigated lands that are retired from production in the event of a water transfer. Reclamation would consist of establishment of desirable, adapted perennial vegetation that would stabilize the site from erosion (wind and water) and prevent establishment of non-desirable invasive or noxious species (see HCWRP page 63).
  - Procedure: The County shall work with the University of Nevada, Reno and/or UNR Cooperative Extension as well as local and regional economic development authorities to quantify the economic value of water being used in Humboldt County, as well as identifying future water needs for economic stability and development within the County.

1.6 SITE HISTORY

In 1975, Chevron began an exploration program for uranium in the sediments located throughout the McDermitt Caldera (Tetra Tech 2014; Advisian 2018). From 1980 to 1987, Chevron began a drilling program that focused on lithium targets and conducted extensive metallurgical testing of the clays to determine the viability of lithium extraction. Chevron sold its interest in 1991 to various intermediary companies prior to acquisition by Western Lithium Corporation (WLC). In 2007, WLC commenced an exploration drilling program focused in the southern portion of the caldera.

In 2016, the WLC company name was updated to LNC. LNC conducted an exploration program in 2017. The objective of the 2017 exploration program was to identify a resource of scale in the Thacker Pass area and avoid known GRSG habitat in the Montana Mountains where habitat quality is substantially lower than in the Montana Mountains to the north. In the Thacker Pass area, a total

of 77 exploration holes totaling 6,653 meters were drilled, a seismic survey was conducted, and the surface geology of the project was remapped. The results indicated a larger lithium deposit than was previously identified, and the data were used to update the estimated mineral resource volumes.

Authorized disturbance within the proposed Project area includes 194 acres as approved under the Kings Valley Lithium Exploration Project (N85255), the Kings Valley Clay Mine (KVCM) Project Environmental Assessment (EA) (DOI-BLM-NV-W010-2010-0001-EA) and two active Notice of Intent (NOI) level exploration projects, referred to as the Quinn River Valley Test Wells NOI (N94510) and the Far East NOI (N95396) (**Figure 2.1, Appendix A**).

Exploration activities under the Kings Valley Lithium Exploration Project Plan of Operations (Kings Valley Lithium Exploration Project) was approved by the BLM in December 2009 and amended in October 2011 and includes up to 75 acres of surface disturbance.

Existing surface disturbance primarily includes areas developed as exploration drill sites and access roads. **Table 2.1** presents approximate acreages of existing disturbance resulting from exploration activity and the KVCM.

CHAPTER 2. ALTERNATIVES

2.1 INTRODUCTION

This chapter summarizes the Proposed Action and alternatives for the proposed Thacker Pass Lithium Mine Project and the potential issuance of an incidental take permit by the USFWS under the Eagle Act. Alternative A is the proposed Project as described in the Plans submitted to the BLM in August 2019 (LNC 2019a, 2019b). Appendices B and C of this EIS contain the complete proposed Mine Plan (LNC 2019a) and proposed Exploration Plan (LNC 2019b), respectively, for Alternative A. Other alternatives considered for detailed analysis in this EIS include Alternative B (Partial Pit Backfill) and Alternative C (No Pit Backfill) as described in sections 2.3 and 2.4, respectively. Alternative D is the No Action Alternative. All alternatives presented in this chapter, including the No Action Alternative, were developed based on public and agency scoping input and supporting technical information provided by LNC and reviewed by the BLM. This chapter also includes a summary of alternatives that were considered but not carried forward for detailed analysis.

2.2 PROPOSED ACTION (ALTERNATIVE A – PREFERRED ALTERNATIVE)

The following sections summarize key components of Alternative A, the Proposed Action, which are detailed in **Appendix B**, *Mining and Reclamation Plan of Operations and* **Appendix C**, *Exploration Plan of Operations*. The proposed Project would be developed in two phases (Phase 1 and Phase 2) during the proposed 41-year mine life. Phase 1 would include construction of the mine facilities and mining and processing for the first 4 years of mine life. Phase 2 would occur from years 5 to 41 of the mine life, after which the Project would enter the reclamation and closure period (for a minimum of five years). Upon receipt of BLM authorization and other required permits, the proposed Project would be developed over a period of approximately two years prior to commercial production. In addition, LNC would continue exploration activities as part of Alternative A. The Project area includes 17,933 acres of land, of which 10,468 acres and 7,465 acres are associated with the Mine Plan and Exploration Plan, respectively.

Alternative A includes USFWS issuing an EITP under the Eagle Act, related to mining operations within the scope of the Project. Under the Proposed Action, the applicant is requesting authorization for disturbance to and loss of annual productivity from one Golden Eagle breeding pair (territory #5 as shown on **Figure 4.5-16**, **Appendix A**) during the period of up to five years from the date of the issuance of the permit. The Proposed Action would authorize the disturbance to and loss of annual productivity from one Golden Eagle territory for a maximum of five breeding seasons. This Alternative would include monitoring of the nest site and required compensatory mitigation to offset impacts to Golden Eagles.

Under this Alternative, the Project would provide the compensatory mitigation at the required 1.2:1 ratio by retrofitting electric utility poles, as analyzed and discussed in the PEIS (USFWS 2016a).

The intent would be to minimize the potential for eagle electrocutions and ensure that the effects of eagle take caused by the Project are offset at the population level.

2.2.1 Surface Ownership and Land Disturbance

The surface and subsurface mineral estates associated with the Project are located on public lands administered by the BLM, WD. No state or private lands are included in the Project area.

Table 2.1 presents a summary of the authorized and existing surface disturbance, and proposed surface disturbance under Alternative A. **Figure 2.2, Appendix A,** presents the layout of mine facilities under Alternative A. Existing disturbance under previous authorizations would be incorporated into the Proposed Action and Plans of Operation and would be reclaimed consistent with BLM and State of Nevada standards, as identified in the Plans.

Table 2.1. Previously Authorized and Existing Surface Disturbance, and Proposed Surface Disturbance for Alternative A

Facility	Authorized Surface Disturbance (acres)	Existing Disturbance to Date (acres)	Alternative A Proposed Total Disturbance (acres)
Previous Authorizations			
Kings Valley Lithium Exploration Project[1]	75	50.5	50.5
Kings Valley Clay Mine[2]	114	4.6	4.6
Quinn River Valley Test[3] Wells NOI	3.5	1.5	1.5
Far East NOI[4]	1.5	0.2	0.2
Total	**194**	**56.8**	**56.8**
Proposed Project			
Mine Pit	0	0	1,099.8
West WRSF	0	0	160.7
East WRSF	0	0	137.2
Mine Facilities, ROM Stockpile, Attrition Scrubbing	0	0	48.3
CGS	0	0	318.3
Processing Facility (Lithium and Sulfuric Acid Plant)	0	0	555.3
Clay Tailings Filter Stack	0	0	1,166.1
Mine Facilities Power Line, Quinn Power Line, and Water Supply	0	0	267.7
Exploration[5]	0	0	300.0
Inter-facility Disturbance[6]	0	0	1,641.4
Total	**194**	**56.8**	**5,694.8**

Sources: LNC 2019a; LNC2019b

[1] BLM Casefile No. N85255 and authorized 01/25/2010
[2] BLM Casefile No. N91547 and authorized 05/15/2014; the Kings Valley Clay Mine was authorized by the BLM but never fully developed by LNC
[3] BLM Casefile No. N94510 and authorized 02/02/2017
[4] BLM Casefile No. N95396 and authorized 05/23/2017
[5] Total surface disturbance for exploration activities includes 150 acres of surface disturbance in the Mine Plan boundary and 150 acres of surface disturbance in Exploration Plan boundary.
[6] Includes haul and secondary roads, GMSs, stormwater infrastructure (diversions and ponds), septic systems, communication towers, guard shacks, reclaim ponds, weather station, fiber optic line, buffer areas, and fencing.

2.2.2 Schedule and Workforce

Construction and mine operations (including processing), would occur 24-hours per day, 365 days per year. Construction of facilities under Alternative A would employ approximately 1,000 temporary construction personnel during Phase I. LNC would initiate the Project through hiring salaried staff to support Project development and operational readiness activities. Mine workforce hiring would start prior to the pre-production timeframe to allow for training prior to equipment arriving at the Project site. Hiring for the process plant facilities would occur primarily during the construction phase. Approximately 183 employees would be needed to support the operational

phase of the Project during Phase 1, and approximately 313 workers would be needed for Phase 2 operations for a total of 496 during the life of the project.

2.2.3 Open Pit

Mining would be conducted by open pit method throughout the 41-year mine life. Ore would be mined using either truck loaders, a surface miner, or excavators. Extracted ore would be transported to the ROM stockpile located south of the open pit (**Figure 2.2, Appendix A**). Waste rock generated during mining activities would be placed primarily in the proposed WRSF (**Figure 2.2, Appendix A**) or placed as backfill material in the pit.

Areas of the open pit would expose basalt outcrops that may require occasional blasting. A percentage or all of the basalt extracted from the open pit may be used as road base material during construction of mine facilities. The basalt would be stockpiled within the mine pit disturbance area and a mobile unit would be used to crush the material for use as road base and construction material. Approximately 230.0 million cubic yards (CY) of ore would be mined, and 190.2 million CY of waste rock material would be generated over the 41-year life of the mine.

A modified panel mining method may also be used as part of the mine operations within the open pit. A section along the length of the pit would be mined to the entire width and depth before proceeding to the next section of the pit. Mining would begin in the western side of the proposed pit (West Pit). After the West Pit is fully developed, mining would proceed easterly by concurrently mining the North Pit and the South Pit (**Figures 2.2 and 2.3, Appendix A**).

A detail of the open pit and cross section(s) is shown in **Figure 2.3 (Appendix A)**. The proposed Project pit would include a bench design consisting of approximately 16-foot mining benches, double-benched to create approximately 33-foot highwalls between catch benches. The catch benches would be approximately 16 feet wide.

2.2.3.1 Pit Dewatering

Sump pumps would be used to dewater and directly fill water trucks for on-site dust suppression. No storage tanks or wells would be needed to support dewatering operations. Pit dewatering is not anticipated until mining advances into the southeast portion of the pit area, currently projected to be in year 2055. The anticipated peak dewatering rate would be approximately 55 gallons per minute (gpm) when mining would occur in the southeast portion of the mine area, projected to occur in year 2065. A numerical groundwater flow model was developed to assess potential affects to local and regional groundwater systems and to predict inflow to the open pit over the period of active mining.

2.2.3.2 Pit Backfilling

During operations, waste rock material would be placed in the WRSF and coarse gangue material in the CGS as described in Section 2.2.4, *Open Pit Mining*, and Section 3.9, *Coarse Gangue Stockpile*, of the Mine and Reclamation Plan presented in **Appendix B**. It is anticipated that by approximately 2026, pit development would advance enough to accommodate a portion of the waste rock material to be placed as backfill in the open pit, with coarse gangue material potentially

being used as pit backfill material by 2035. Backfill placement would be completed by approximately 2067. Backfill volumes would steadily increase until pit advancement eventually allows for all waste rock and coarse gangue material to be placed back in the pit concurrently with mining operations throughout the remainder of the proposed mine life. Approximately 144.3 million CY of waste rock and 75.2 million CY of coarse gangue material would be placed in the open pit as backfill throughout the operational phase of the proposed Project.

Final topography of the backfilled pit would induce positive surface water drainage from the west, at an elevation of 5,366 feet above mean sea level (amsl), toward the east where the backfill would reach an elevation of approximately 4,880 feet amsl. Planned backfill material would be, on average, approximately 200 feet thick, with the thickest portions of material placed in the central pit area. Composition of bulk backfill material would be approximately 65 percent waste rock and 35 percent coarse gangue.

2.2.4 Waste Rock Storage Facilities

Up to 45.9 million CY of waste rock material generated from open pit operation would be placed in two proposed WRSFs, located west and east of the pit (**Figure 2.2, Appendix A**). Waste rock would be hauled to either WRSF based on operational requirements until it can start to be backfilled directly into the mined-out panels in the pit (after four years of operation). Waste rock would also be used as construction material for haul roads and the CTFS, and may be combined with CGS to increase pile stability.

Estimated acres of disturbance associated with the proposed WRSFs are presented in **Table 2.1**. The approximate general design features of the WRSFs are listed in **Table 2.2**.

Table 2.2. WRSFs General Design Features

WRSF	Capacity (million CY)	Top Elevation (feet)	Bottom Elevation (feet)	Total Height (feet)	Bench Height (feet)	Bench Width (feet)	Slope (H:V)
West WRSF	32.7	5,252	4,770	482	50	75	3:1
East WRSF	13.2	5,216	5,008	208	50	75	4:1

Source: LNC 2019a

H:V = Horizontal:Vertical

Stormwater controls would be implemented for the WRSFs as described in Section 3.5, *Waste Rock Storage Facilities,* of the proposed Mine Plan included as **Appendix B** of this EIS.

2.2.5 Mine Materials Processing

2.2.5.1 Mine Facilities

The proposed mine facilities would be located south of the mine pit (**Figure 2.2, Appendix A**) and would be accessed via the mine facilities access road from State Route (SR) 293. The following facilities would be constructed to support mining operations:

- Parking area for employees and visitors;

- Shop/office/warehouse building including change rooms, meeting rooms, first aid, employee line out area, breakroom, bathrooms, and equipment bays for equipment repair and maintenance;
- Fuel farm consisting of gasoline and diesel tank storage and distribution equipment;
- Equipment wash station for mobile equipment;
- Storage area for spare tires for large mobile equipment, large equipment parts, and various other supply/parts inventory;
- Substation that would feed electrical power to the mine facilities; and,
- Ready line for large mobile equipment parking (end dumps, loaders, water trucks, equipment hauler, and motor graders).

Temporary shop/office facilities would be utilized until the permanent shop/office/warehouse building is constructed. A septic system would be utilized for mine-generated sewage.

2.2.5.2 ROM Material Stockpile

Ore would be hauled from the open pit to the ROM material stockpile located south of the pit (**Figure 2.2, Appendix A**). The stockpile would be designed to store approximately 494 thousand CY of ROM material. Material would be end-dumped by haul trucks while dozers and motor graders would move the ore material to ensure the facility is built with 3-Horizontal:1-Vertical (3H:1V) slopes. The ore would be segregated within the pile based on lithium grade to allow the ore to be blended to meet production requirements. Three dozer trap-type feeder breakers would be located on the south side of the stockpile to feed material onto a common conveyor, which would feed a mineral sizer (crusher). The mineral sizer discharge would be conveyed to the attrition scrubbing process.

2.2.5.3 Mineral Processing

Mineral processing facilities in the attrition scrubbing and classification areas would be used to separate the lithium-rich, fine clay material from the low-grade, coarse material referred to as coarse gangue. The attrition scrubbers would use high speed agitators to cause slurry particles to affect one another, thereby creating a scrubbing effect between particles. Up to 40 percent of the ROM material delivered to the attrition scrubbers may be discarded to the CGS once entrained lithium fines have been removed. The lithium-bearing ore would be pumped in the form of a slurry to the downstream processing plant to be processed into various lithium products. The attrition scrubbing area is located to the east of the ROM stockpile, whereas classification would occur in the process plant facilities area approximately two miles to the east (**Figure 2.2, Appendix A**).

Ore would be reclaimed from the ROM stockpile to the attrition scrubbers using dozers, material sizers and a crusher for size reduction, belt conveyors, a storage bin, and belt feeders. Recycled water, raw water make-up, and ore would be combined in the attrition scrubbers where the fine clay particles are “scrubbed” from the coarse gangue particles. Slurry from each train of attrition scrubbers would be gravity discharged onto vibrating screens to remove oversize material prior to pumping the undersize slurry to the classification circuit via the interplant pipeline containment

channel. The screen oversize would be discharged onto a belt conveyor which would report to a stockpile for periodic haulage to one of the WRSFs.

The ore feed bins, attrition scrubbers, dust collector system, sampling system, recycle water tank, raw/fire water tank, fire water pump system and all other associated equipment in the attrition scrubbing area would be installed within a concrete containment. All material contained within the area would be captured in a sump and pumped into the attrition scrubbing circuit. Contact water from the ROM stockpile would be contained and would return to the attrition scrubbing circuit via pump or gravity flow.

2.2.5.4 Coarse Gangue Storage Facility (CGSF)

Coarse gangue material produced by the process described in Section 2.2.5.3, *Mineral Processing*, would be conveyed to the CGS located east of the open pit (**Figure 2.2, Appendix A**). The gangue material would include lithium content whose economic value cannot be currently extracted economically. The stockpile would be designed with a 48.4 million CY storage capacity. Approximately 26.7 million CY of coarse gangue material would be placed in the stockpile. Final coarse gangue volume would depend on the results of the mineral processing through the classification circuit. The remaining stockpile capacity may be used for placement of waste rock material to optimize movement of heavy equipment on the stockpile, when required.

The stockpile would be designed to be a maximum of approximately 200 feet tall with 4H:1V slopes. Any unstable native material present in the base area within the proposed disturbance footprint would be removed and the remaining stripped ground surface would provide a firm foundation. The stockpile would be constructed in 50-foot lifts using trucks and dozers.

Coarse gangue by-product is proposed to first be used in pit backfill beginning in 2035, approximately 13 years into the Project. Geochemical testing of gangue is ongoing and would continue as mining advances to ensure material used in backfilling meets appropriate criteria.

2.2.5.5 Lithium Processing Plant

The layout of the proposed plant site is shown on **Figure 2.4 (Appendix A)**. The process plant site would be accessible by two roads off SR 293. The access to the east would be reserved for reagent deliveries (e.g., sulfur, quicklime, limestone, caustic soda, soda ash) to the facility, while the access to the west would allow access to the main parking lot and other plant facilities. A guard shack would be constructed to regulate access at each of the two proposed access roads off SR 293.

The major facilities in this proposed process area include:

- Guard shack
- Utilities access road
- Interplant pipeline containment channel
- Laydown yard
- Main parking lot
- Warehouse, laboratory, and administration offices
- Classification and sulfuric acid leaching area
- Emergency pond
- Lithium carbonate and lithium hydroxide production area

- Crystallization and tank farm
- Filtration and neutralization area
- Construction laydown area
- Limestone crushing and storage area
- Lithium metal production facility
- Bulk solids and liquids storage and unloading area
- Sulfuric acid plant and sulfur/sulfuric acid storage, loading and unloading area
- Central maintenance shop
- Helicopter pad
- Process plant stormwater pond
- Septic systems
- Main switchyard
- Substation

Process plant support facilities would consist of the central maintenance shop, warehouse, laboratory, and administration offices. The warehouse, laboratory, and administration offices would be within a common building. The administration offices would house the administrative and management staff, as well as provide space for medical treatment. Administration offices would include a reception area, conference/training rooms, break room, and restrooms.

2.2.5.6 Chemical Processing and Lithium Carbonate and Lithium Hydroxide Monohydrate Production

The process facility would be designed to produce primarily lithium carbonate, and lithium hydroxide monohydrate. Other products may include lithium sulfide and lithium metal and are discussed in the following subsections.

Approximately 33,000 tons per year (tpy) of lithium carbonate equivalent (LCE) would be produced during Phase 1 that would be distributed among lithium carbonate, lithium sulfide, and lithium hydroxide monohydrate with market conditions determining the blend of finished products. Phase 2 would increase the production of lithium products to approximately 66,000 tpy. The construction of Phase 2 may begin as early as 2.5 years after the commencement of Phase 1 depending on permit approvals and market conditions.

2.2.5.7 Lithium Metal Production and Products

Approximately 800 tons of lithium metal would be produced annually in Phase 1. Lithium metal is produced via electrolysis by passing a direct electrical current through a molten salt bath consisting of potassium chloride and lithium chloride. The lithium chloride would decompose in the electrical current to form pure lithium metal that floats on the surface of the molten salt bath. Chlorine gas produced from the cell would be removed and used to produce a sodium hypochlorite (bleach) solution.

2.2.5.8 Lithium Sulfide Production

Lithium sulfide for use in solid state batteries would be produced in a three-step process with a pressurized reactor in an aqueous solution or in a non-aqueous high temperature reactor operating between 900- and 1,400-degrees Fahrenheit (°F). Lithium sulfide would be packaged in 55-gallon

drums and sold to the market. Approximately 3,300 tons of annual lithium sulfide production would be produced for internal consumption at the battery production complex.

2.2.5.9 Battery Production

The battery manufacturing process and battery plant has been removed from the proposed Mine Plan of Operations.

2.2.5.10 Sulfuric Acid Plant and Energy Production

Concentrated sulfuric acid would be required to leach lithium from the clay ore. The production of sulfuric acid produces excess heat that is converted to steam and electricity. Sulfuric acid would be produced by burning molten sulfur with air to produce sulfur dioxide (SO_2), catalytically converting the SO_2 to sulfur trioxide (SO_3) and absorption of SO_3 in acid while generating a large amount of excess heat that would be captured to produce steam that would be sent through a steam turbine to generate electrical power. The steam turbine would operate using waste heat recovered from the sulfuric acid plant to generate electricity and the steam turbine would not itself combust fossil fuels, sulfur, or other hazardous materials to generate heat or electricity. Electricity produced would be either distributed directly to the Project facilities or sold back into the power grid. The Project is expected to be a net exporter of electricity, not exceeding 15 megawatts (MW) in Phase 1.

The sulfuric acid plant planned for Phase 1 would be capable of producing approximately 2,900 tons per day of sulfuric acid. The Phase 2 sulfuric acid plant would be sized to double LCE production and would be capable of producing an additional 2,900 tons per day of sulfuric acid. Combined Phase 1 and Phase 2 sulfuric acid production estimated capacity would be 5,800 tons per day. The operation of the sulfuric acid plant would be regulated under a facility Permit to Construct / Permit to Operate that would be issued by the Nevada Division of Environmental Protection, Bureau of Air Pollution Control (BAPC).

2.2.5.11 Clay Tailings Filter Stack

Lithium processing would produce tailings comprised of acid leach filter cake (clay material), neutralization filter cake, magnesium sulfate salt and sodium/potassium sulfate salts, collectively referred to as clay tailings. Limestone would be added to the CTFS on an as-needed basis for structural stability. The clay tailings would be placed in the CTFS which would be a permanent lined storage facility located east of the process plant (**Figure 2.2, Appendix A**).

Estimated acres of disturbance associated with the proposed CTFS are presented in **Table 2.1**. Prior to disposal, the tailings would be dewatered to a wet-basis moisture content of approximately 19 to 27 percent (NewFields 2020). The dewatered tailings would be transported to the CTFS using either conveyors or haul trucks or a combination of the two. Centrifuged mineral salts would be approximately ten percent water by weight before being conveyed to the CTFS. Approximately 353.6 million CY of clay tailings would be placed on the facility over the proposed 41-year mine life.

Approximate general design parameters for the CTFS are presented in **Table 2.3**.

Table 2.3. CTFS Design Parameters

Design Parameters	Phase 1	Phase 2
Side Slope Angle (H:V)	5:1	5:1
Design Height (feet)	350	350
Tailings Storage Capacity (dry tons)	18 million	317 million
Average Loading rate (dry tons/hour)	500	1,000

Source: LNC 2019a

2.2.6 Haul and Access Roads

Primary haul roads and secondary roads proposed for the Project are shown on **Figure 2.2 (Appendix A)**. Drainage ditches and other runoff management structures would be constructed adjacent to the roads for runoff surface water management as described in the Project Stormwater Pollution Prevention Plan (SWPPP) (LNC 2019c). LNC would be responsible for the maintenance of all roads within the Project area and would include activities presented in Section 3.18, *Haul and Secondary Roads*, of the Mine Plan included as **Appendix B** of this EIS.

Proposed dust control measures used for road grading would include watering before and after grading activities and reduction of equipment speeds during operations. Chemical treatment may be used for additional dust suppression, including application of magnesium chloride.

The maximum gradient for proposed haul roads would be less than ten percent with an 80-foot road width. Proposed secondary roads would be approximately 30 feet in width with a 1.5 percent grade. Proposed roads within the plant site would be classified as private roads with access restricted to LNC operations staff and approved mine contractors.

Portions of the road from the plant to the Quinn Production Well would be improved as shown on **Figure 2.2 (Appendix A)** to allow construction of the proposed 25-kV power distribution line and proposed water pipeline from the Quinn Production Well to the process plant. This road would be maintained during the life of the mine but would be reclaimed upon final closure.

2.2.7 Ancillary and Support Facilities

2.2.7.1 Ancillary Facilities

2.2.7.1.1 Site Security, Signs, and Fencing

Active mining areas would be fenced and signed according to Mine Safety and Health Administration (MSHA) regulations and as required by the BLM, NDEP, and NDOW to preclude public and wildlife access for safety. Specific fencing designs would be developed to be consistent with MSHA regulations. In areas where the design of Project related fencing is not determined by MSHA requirements, LNC would consult with NDOW to identify wildlife friendly fence designs and specifications.

2.2.7.1.2 Power Transmission and Distribution

The Project would connect to the existing 115-kV Harney Electric network with a new substation located south of the sulfuric acid plant (**Figure 2.2, Appendix A**). Power from the Harney Electric power line would be used during startup until the sulfuric acid plant is operating, and during times when the sulfuric acid plant is shut down for maintenance.

The proposed main 25-kV substation would be installed at the plant site during Phase 1. A seven-mile-long 25-kV distribution line would be constructed from the plant substation to the Quinn Production Well, parallel to the proposed water pipeline (**Figure 2.2, Appendix A**), and extending to the Quinn Backup Well. A new 25-kV distribution line from the plant substation would be constructed to support the mine area (**Figure 2.2, Appendix A**). A substation would be constructed in the mine facilities area to facilitate power distribution in the mine area, and another substation would be constructed in the attrition scrubbing area.

2.2.7.1.3 Fuel and Hydrocarbon Storage

Fuel storage, antifreeze, and hydrocarbon products including lubricants, oils, and used oil would be stored in the mine area (**Figure 2.2, Appendix A**) and within the process plant area. These would be transported, stored, and used in accordance with federal, state, and local regulations. The fuel storage facilities would consist of above-ground storage tanks, pumps, and connections for loading from vendor trucks and for fueling all mobile equipment on site.

Table 2.4 presents the estimated fuel storage volume, delivery rate, and consumption under Alternative A.

Table 2.4. Proposed Fuel and Chemical Storage

Fuel	Storage (gallons)	Anticipated Trucks/Month	Approximate Daily Consumption (gallons)
Off-road Diesel (mine)	50,000	38	11,300
Off-road Diesel (plant)	42,500	14[1]	14,794[1]
Highway Diesel	8,000	1	68
Gasoline (mine)	3,000	1	182
Gasoline (plant)	1,000	0.2	68
Bulk Tank DEF	330	3	452
Bulk Tank Oil	19,000	2	193
Bulk Tank Coolant	3,000	1	40
Bulk Tank Used Oil	3,000	0.5	-
Bulk Tank Used Coolant	3,000	0.5	-
Bulk Tank Grease	Nine 250-gallon tote	2.5	283
Bulk Solvent	Two 320-gallon tote	0.25	3.3
Propane	Two 350-gallon tanks	0.2	3

[1] Off-road diesel would be used in the package boiler for the sulfuric acid plant and would operate approximately four times per year for 72 hours each cycle. Consumption during runtime would be an estimated 300 gallons per hour. Total consumption of off-

Fuel	Storage (gallons)	Anticipated Trucks/Month	Approximate Daily Consumption (gallons)

road diesel fuel for operation of the sulfuric acid plant package boiler would be approximately 86,400 gallons per year (300 gallons per hour x 72 hours per cycle x 4 cycles per year). The sulfuric acid plant would not continuously consume off-road diesel fuel during operation.

2.2.7.1.4 Safety and Fire Protection

The proposed mine area would operate in conformance with all MSHA safety regulations (30 CFR 1-199) and BLM safety requirements. The chemical plant would operate in conformance with all applicable BLM and Occupational Safety and Health Administration (OSHA) safety regulations in addition to all applicable cooperative agreements, as appropriate. Site access would be restricted to employees and authorized visitors.

The fire water supply for the permanent fire protection would be provided from the raw water tank located within the plant area. The plant would be equipped with underground firewater distribution mains, ensuring that the water requirements for the fire hydrants and all buildings/facilities requiring fire suppression are effectively met. Fire hydrants would be placed at regular intervals around the buildings and other areas as deemed necessary by OSHA standards. The buildings would have sprinkler systems and hand-held fire extinguishers available in accordance with OSHA and MSHA regulations and industry standards. A dedicated fire truck would be located on site for use in structure and equipment fires, as well as wildfires. Personnel would be trained to operate the fire truck and trained staff would be on call 24 hours per day. Employees would be trained in the use of hand-held fire extinguishers and alarm systems according to OSHA standards and State Fire Marshall standards. A Project fire protection plan, including information on specific fire protection equipment, would be established for the Project in accordance with OSHA and State Fire Marshal standards. The proposed Emergency Response Plan (Appendix F of the proposed Mine Plan) provides further detail regarding fire protection equipment and fire response planning.

2.2.7.1.5 Solid and Hazardous Waste Handling and Disposal

Hazardous materials would be transported, stored, and used in accordance with federal, state, and local regulations. Hazardous waste would be stored in a designated building located within the process plant area specifically designed for this purpose including venting and within the process plant area. Hazardous waste would be properly labeled and stored on site and would be subsequently transported to and properly disposed at an authorized facility in accordance with federal, state and local regulations. Employees would be trained in the proper transportation, storage, use, and disposal of hazardous materials.

2.2.7.2 Water Management Ponds

Stormwater runoff from the Project area would be managed through the construction of unlined stormwater sediment ponds. Sediment ponds would be constructed prior to construction of mine facilities. Sediment ponds would be constructed within the Project area to collect and settle out solids transported by stormwater runoff from disturbed areas. The sediment ponds would be designed to store a minimum two-year, 24-hour storm event and release excess water using riser

pipes or by using pumps over time. Water would also be removed by infiltration and evaporation. Sediment ponds would be designed with an overflow system sized to a minimum 25-year, 24-hour storm event (spillway or overflow pipe). In the event of an overflow, water in the pond would be directed to a natural drainage or diversion channels.

2.2.7.3 Water Supply

LNC currently holds 15.5 acre-feet per annum (AFA) of water rights (mining and milling use) within the Project area. Additionally, LNC holds approximately 980 AFA of water rights (irrigation use) within the Quinn River Valley, Orovada Subarea Hydrographic Basin, with options to purchase approximately 2,717 AFA of additional water rights (irrigation use), also within the Quinn River Valley, Orovada Subarea Hydrographic Basin. The Orovada Subarea is currently overallocated by approximately 30,271 AFA. The water right point of diversion would be transferred to the existing Quinn Production Well and Quinn Backup Well (**Figure 2.2, Appendix A**), and point of use would be transferred to the plant site. Prior to initiating mining, LNC would change the manner of use from agricultural to mining and milling.

The transfer of water rights, change in point of diversion, and change in manner of use would be completed in coordination with the Nevada Division of Water Resources (NDWR). Prior to the implementation of Phase 2, additional water rights would be transferred to the Quinn Production Well for use in the mine and process operation. The consumptive water requirement for Project operations is estimated at 2,600 AFA during Phase 1, and 5,200 AFA during Phase 2.

Water from the Quinn Production Well would be piped to a water tank located in the plant area as shown on **Figure 2.4 (Appendix A**) with the support of two booster pumps and/or a pump tank arrangement. A water pipeline would be constructed for the Quinn Production Well and Quinn Backup Well to the raw water storage tank located in the plant. The proposed seven-mile underground pipeline would follow the proposed power line corridor (**Figure 2.2, Appendix A**). Two booster pumps would be installed along the pipeline or wells to pump to a storage tank in the well field that would be used to pump water to the plant. Well water would primarily be used in the production of steam and sulfuric acid while recycled process water would be used throughout the production facility to slurry solids. A water storage tank would be in the tank farm area within the process plant (**Figure 2.4, Appendix A**). Water to supply the mine area would be piped from the process plant area via the interplant pipe containment channel.

2.2.7.4 Stormwater Management

Project-wide Best Management Practices (BMPs) would be implemented to limit erosion and reduce sediment in precipitation runoff from Project facilities and disturbed areas during construction, operation, and initial stages of reclamation. BMPs are designed to prevent, control, and minimize the general migration and transport of pollutants including sediments to natural drainages to protect surface water and groundwater quality in and adjacent to the Project area.

Project stormwater infrastructure would include construction of diversions and sediment ponds as well as installation of culverts at road crossings (**Figure 2.2, Appendix A**). Stormwater would be diverted away from the Project facilities through the construction of drainage structures that

convey water around and downstream of the Project area. Stormwater facilities would be sized to withstand runoff generated from a 25-year, 24-hour design storm events during the operational phase of the Project. Stormwater facilities around the plant site area would be sized to accommodate a 100-year, 24-hour storm event. Diversion channels may remain as permanent features after final reclamation and mine closure and would be sized to handle the 500-year, 24-hour design storm event at closure.

2.2.7.5 Truck Access and Product Loading

Facility access roads within the Project area would be designed for operational and maintenance traffic for the eventual 66,000 tpy production rate. Approximately 60 to 100 one-way truck trips per day, predominantly between the transloading facilities near Winnemucca and the plant, would be made during Phase 1. During Phase 2, between 120 to 200 one-way truck trips per day would be required to support the Project through reagent and product shipments. Deliveries of mine materials and shipments of mine products would occur via trucks at any time to support 24-hour operations at the mine.

Molten sulfur, soda ash, quicklime, caustic soda, and fuels would be transported by rail to the Winnemucca area and transferred to trucks for transportation to the Project site. LNC would use the services of a transloading facility operated by a third-party in the Winnemucca area. Other materials and consumables to support the Project such as limestone, equipment, parts and construction materials would be transported to the Project site by truck from other locations and would be off-loaded at various locations within the processing and mine facilities. Most materials and consumables would be transported by licensed vendors to the Project site via U.S. Highway 95 from the south (Winnemucca), with a small portion arriving from the north (Boise).

2.2.8 Exploration

Exploration activities would continue to be conducted within the Project area focused on expanding understanding of mineralization in and around the known deposit and other areas of interest to develop additional geologic mapping and data compilation. An additional 300 total acres of exploration-related disturbance within the Project area is proposed over the life of the mine. The 300 acres of anticipated exploration related surface disturbance would be split evenly between the Mine Plan area and the Exploration Plan areas (**Figure 2.2, Appendix A**). Exploration activities would include surface sampling, trenching, bulk sampling, and drilling. Exploration activities may also include geotechnical investigations, geophysical surveys, water exploration, and monitoring well installation, as necessary during the life of the Project. Complete details of the proposed exploration activities are presented in Section 3.27, *Exploration Operations*, of the proposed Mine Plan, included as **Appendix B** of this EIS.

Proposed exploration drilling within the Mine Plan boundary would include up to 33 acres (600 drill pads; 40 feet by 60 feet) of disturbance associated with the construction of drill pads, 58.2 acres (211,200 linear feet, 12 feet wide) of disturbance associated with construction of access roads, 6.9 acres (50,000 linear feet, 6 feet wide) of disturbance associated with overland travel, and

up to 51.9 acres of disturbance associated with monitoring well installation, geotechnical investigations, geophysical surveys, and sampling, trenching, or bulk sampling.

Proposed exploration drilling within the Exploration Plan boundary would include up to 30 acres of disturbance associated with the construction of drill pads, 70 acres of disturbance associated with construction of access roads, 40 acres of disturbance associated with overland travel, and 10 acres of disturbance associated with bulk sample excavations and trenches.

Exploration areas would be accessed using existing roads where possible. If additional access is required, exploration areas would be accessed using either overland travel (creating a travel width of six feet), or using improved roads and spurs bladed to an average travel width of 12 feet.

Up to 600 exploration drill sites would be graded and stabilized and include an area for side-cast material and future GMSs. Excavated sumps would be used at each drill site to contain drill cuttings and control drilling fluids. A drill site and sump may be used for more than one drill hole.

As described in the Exploration Plan, Interim Management Plan measures that would be implemented would include: Exploration drill roads, pads, test pits, and sumps would be maintained in operating condition until reclamation is completed to prevent washouts and containment breaches. During extended periods of non-operation or seasonal closure of the exploration activities, all exploration equipment and supplies would be removed from the Project area.

The precise location of exploration drilling activities, including development of drill sites, access roads, and other facilities, is unknown at this time but would occur within the Project area. Road use and locations of drilling activities would be dependent on the results of each phase of exploration. A work plan describing exploration activities for the upcoming season (or as often as changes are made to the authorized work plan), including a map showing specific locations of drill sites, road alignments, water conveyance and storage, monitoring locations, or ancillary facilities, would be submitted to the BLM prior to construction of drill sites or access roads.

2.2.9 Reclamation of Existing Exploration Authorizations

All four existing exploration authorizations (Kings Valley Lithium Exploration Project [N85255], Kings Valley Clay Mine EA [DOI-BLM-NV-W010-2010-0001-EA], Quinn River Valley Test Wells NOI [N94510], Far East NOI [N95396]) would be closed out and associated disturbance would be incorporated into and reclaimed according to the proposed Thacker Pass Mine and Reclamation Plan.

2.2.10 GMSs

Growth media consisting of soils and alluvium would be salvaged from the footprint of proposed disturbances in the Project area as mining progresses. When present, growth media would be stripped and stockpiled for use in future reclamation and closure activities. Growth media would be stockpiled in three stockpiles as shown on **Figure 2.2 (Appendix A)**. **Table 2.5** presents the anticipated volume of growth media expected to be salvaged and placed in the stockpiles.

Table 2.5. Estimated GMS Volumes under Alternative A

GMSs	Volume (cubic yards)
Stockpile #1	170,000
Stockpile #2	1,236,000
Stockpile #3	5,424,000
Total	**6,830,000**

Source: Cedar Creek 2019a

2.2.11 Closure and Reclamation Plan

Reclamation of disturbed areas resulting from activities under Alternative A would be completed in accordance with the proposed Reclamation Plan that has been developed to be consistent with BLM and NDEP regulations. The primary objectives for post-mining reclamation of the Project are to:

- Ensure public safety;
- Reduce or eliminate potential environmental effects;
- Return the site to a condition supporting land uses similar to those in existence prior to mining activities (i.e., livestock forage production, wildlife habitat, recreation, and mineral exploration and development);
- Control infiltration, erosion, sedimentation, and related degradation of existing drainages to minimize off-site effects;
- Achieve reclamation goals that include post-mining contours and topography that blends with the form, line, color, and texture of the existing landscape; and
- Employ reclamation practices using proven methods that do not require ongoing maintenance.

Concurrent reclamation of disturbed areas would be completed in areas where mining or other disturbance activities have been completed. The proposed reclamation schedule outlines major activities for each facility throughout the life of the Project. The schedule is categorized into the following planning periods described below:

- Pre-Production: years prior to commencement of production, Year -2 through Year 0;
- Production: years the mine and processing facilities are active, Year 1 through Year 41;
- Post-Production: years between cessation of mine and processing activities and final bond release. The Post-Production period is further classified into two phases:
    - Closure: years of major reclamation and closure activities, Year 41 and Year 42;
    - Post-Closure: years of site monitoring and maintenance between closure and final bond release (i.e., ending with the release of the reclamation performance bond), Year 41 through Year 46; and,
- Post-Mining: years following final release of the reclamation performance bond.

Post-production final reclamation would include recontouring, cover placement, placement of growth media, and seeding activities. **Appendix B** contains the complete mine closure and reclamation plan for Alternative A. **Appendix C** contains the reclamation plan for the exploration activities that would occur in the Exploration Plan area.

2.2.12 Applicant-committed Design Features

During construction and operation of Alternative A, the applicant-proposed design features would be implemented by the applicant and the BLM to avoid, reduce, and mitigate potential affects to air, land, water, wildlife, and other resources. These design features and measures are summarized in **Appendix D**.

2.3 ALTERNATIVE B (PARTIAL PIT BACKFILL)

This alternative would result in a partial backfill of the South Pit area at the end of mining and concurrent backfill and reclamation of the North and West Pits during active mining (**Figure 2.5, Appendix A**). Under this alternative, although no permanent pit lakes would be anticipated to develop, a small intermittently wet area would likely occur in the South Pit area. Backfilling and concurrent reclamation of the West Pit would be anticipated to begin in year seven of the life-of-mine and would continue into the North Pit and a portion of the South Pit as mining progresses. Backfill material would consist of waste rock and coarse gangue material.

Alternative B includes the issuance of an EITP by the USFWS under the Eagle Act, related to mining operations within the scope of the Project. The applicant is requesting authorization for disturbance to and loss of annual productivity from one Golden Eagle breeding pair (territory #5 as shown on **Figure 4.5-16**, **Appendix A**) during the period of up to five years from the date of the issuance of the permit. The Proposed Action would authorize the disturbance to and loss of annual productivity from one Golden Eagle territory for a maximum of five breeding seasons.

This alternative would include monitoring of the nest site and mitigation to offset impacts to Golden Eagles. Under this Alternative, compensatory mitigation as required under an eagle incidental take permit would be the same as described under Alternative A.

The proposed facilities associated with this alternative would be the same as illustrated for Alternative A (Proposed Action). This alternative would be the same as described for the Alternative A (Proposed Action) with the following exceptions:

- The northern and western portions of the open pit would be concurrently backfilled during mining;
- At the end of mining, the southern portion of the pit would be partially backfilled with waste rock and gangue material to an elevation of approximately 4,709 feet. The actual elevation would be below the pre-mining groundwater level in order to form a seasonal wetland;
- An ephemeral wetland would become established in the southeastern portion of the pit with the seasonal ponding of water in this area. This artificially created wetland would act as a

hydrologic sink over the long term. The evaporative and transpiration (ET) losses associated with this wetland is estimated to be approximately 47 gpm (Piteau 2019b);

- Backfilled material in the pit would be recontoured during reclamation to blend with the surrounding topography. Some excess waste material originating from the southern portion of the open pit would be distributed in other portions of the backfilled pit; and
- Sufficient growth media would be available to reclaim all facilities (6,830,000 CY).

2.4 ALTERNATIVE C (NO PIT BACKFILL)

Under this alternative the West, North, and East Pits would not be backfilled at the end of the life-of-mine and the open pit would remain as a post-mining feature. Upon the cessation of pit dewatering at mine closure, three small permanent pit lakes would develop. In addition, this alternative would result in larger long-term disturbance footprints for the WRSF and gangue stockpile as waste rock and coarse gangue material would not be backfilled into the pit.

Alternative C includes the issuance of an EITP by the USFWS under the Eagle Act, related to mining operations within the scope of the Project. The applicant is requesting authorization for disturbance to and loss of annual productivity from one Golden Eagle breeding pair (territory #5 as shown on **Figure 4.5-16**, **Appendix A**) during the period of up to five years from the date of the issuance of the permit. The Proposed Action would authorize the disturbance to and loss of annual productivity from one Golden Eagle territory for a maximum of five breeding seasons. This alternative would include monitoring of the nest site and mitigation to offset impacts to Golden Eagles.

Under this alternative, compensatory mitigation would differ from Alternative A under the eagle incidental take permit. Under this alternative, the USFWS would require nest site enhancement within the Pacific Flyway EMU as compensatory mitigation. The USFWS would require the Project to contribute funds to the National Fish and Wildlife Foundation or directly to an ongoing study for assistance in treating Golden Eagle nests for Mexican chicken bugs or other parasites if they are identified as a concern. The USFWS considers this a viable option as recent scientific studies found that treating young eagles for the protozoan parasite (*Trichomonas gallinae*) was effective and increased nest site productivity (Kochert et al. 2018). Current and emerging threats of disease and ectoparasites have the potential to negatively affect Golden Eagle productivity (Dudek and Heath 2017).

The proposed facilities associated with this alternative are illustrated in **Figure 2.6 (Appendix A)**. This alternative would be the same as described for the Alternative A (Proposed Action) with the following exceptions:

- The pit would not be backfilled after mining operations have been completed;
- An additional 482 acres of surface disturbance would occur with the expansion of the East WRSF;
- Approximately 267.1 million cubic yards of waste rock and coarse gangue would not be backfilled into the pit but would instead be placed in the East and West WRSFs;

- Approximately 207.2 million cubic yards of additional material (combination of waste rock and coarse gangue) would be placed in the East WRSF;
- The East WRSF would be built to a maximum elevation of 5,270 feet and a maximum height of 480 feet;
- Construction of the East WRSF would require the relocation of the GMS. A specific location for the GMS has not been identified at this time. An option to relocating the GMS would be to develop several smaller GMSs adjacent to existing mine facilities;
- The expanded East WRSF would cover and eliminate a man-made livestock water feature (SP-059);
- Approximately 7.8 million cubic yards of additional waste rock would be placed in the West WRSF;
- A 3.5H:1V geotechnical stability would be maintained for all waste rock and coarse gangue facilities;
- At the end of mining, three small perennial pit lakes would form (the North and West Pit Lakes would be flow-through pit lakes and the South Pit Lake would be a hydrologic sink);
- Evaporative and transpiration (ET) losses due to the formation of three pit lakes would be approximately 134 gpm (Piteau 2019b) compared to 0 gpm for the Proposed Action;
- Approximately 8,363,379 CY of salvageable and stockpiled growth media would be available for reclamation;
- An additional $343.7 million would be spent on haulage of waste rock and coarse gangue material, excluding the capital cost to purchase additional trucks; and
- Four additional haul trucks would be required (at an additional capital cost) to accommodate the additional hauling of waste rock and coarse gangue material.

2.5 ALTERNATIVE D (NO ACTION ALTERNATIVE)

Under Alternative D, the No Action Alternative, the BLM would not approve the proposed Plans for mining and exploration. There would be no construction or operation of the Thacker Pass Mine on BLM-administered lands. LNC would not implement the remaining authorized surface disturbance acreages under previous authorizations and reclamation of existing disturbance would be completed according to the approved reclamation plan for those actions.

Under Alternative D, the No Action Alternative, the USFWS would not issue an incidental take permit for eagles to LNC.

2.6 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2.6 compares the anticipated effects to resources analyzed in this EIS under each alternative. Chapters 3 and 4 provide more detail, including analysis methods and rationale for the effects conclusions.

Table 2.6. Comparison of Potential Effects by Alternative

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
Life of Mine (years)	41	41	41	0
Mine Closure (years)	5	5	5	0
Number of Phases	2	2	2	0
Project area (acres)	17,954	17,954	17,954	0
Total Surface Disturbance on BLM-administered Land (acres)	5,695	5,695	6,177	194
Phase I – New Employment (full-time positions)	183	183	183	No change
Phase II – New Employment (full-time positions)	313	313	313	No change
Water Use Rate	3,230 gpm	3,230 gpm	3,230 gpm	No change
Phase I Water Demand	2,600 afy	2,600 afy	9,100 afy	No change
Phase II Water Demand	5,200 afy	5,200 afy	18,200 afy	No change
Dewatering Required	Yes (~55 gpm)[1]	Yes (~55 gpm)[1]	Yes (~55 gpm)[1]	No change
Potential for Pit Lake Development	No	Yes[2]	Yes	No
Pit Floor Elevation (amsl)	NA	4,709	4,596	NA
Anticipated Maximum Pit Lake Depth (feet)	NA	<1	24 to 85	NA
Approximate Time to Reach Pit Lake Maximum Depth	NA	30 years	30 to 100 years	NA
Average Annual Net Pit Lake Evaporation Rate (gpm)	NA	60.2	32.6 to 63.2	NA
Volume of Required Growth Media (cubic yards)	8,363,379	8,363,379	>8,363,379	130,000
Number of One-way Daily Truck Trips on Hwy 293	120-200	120-200	120-200	No change
Air Quality				
Impacts to Air Quality from Mining, Dust, and Vehicle Emissions (Phase I)	All predicted pollutant concentrations would be within the applicable air quality standards.	All predicted pollutant concentrations would be within the applicable air quality standards.	All predicted pollutant concentrations would be within the applicable air quality standards.	No change
Impacts to Air Quality from Mining, Dust, and Vehicle Emissions (Phase II)	All predicted pollutant concentrations would be within the applicable air quality standards.	All predicted pollutant concentrations would be within the applicable air quality standards.	All predicted pollutant concentrations would be within the applicable air quality standards.	No change
GHG Emissions (Phase I)	79,998 tpy	79,998 tpy	90,182 tpy	No change
GHG Emissions (Phase II)	132,588 tpy	132,588 tpy	142,772 tpy	No change

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
Cultural Resources				
Disturbance to Historic/ Prehistoric Sites	52 sites affected	52 sites affected	52 sites affected	No change
Native American Religious Concerns				
Disturbance to Traditional Cultural Properties, Properties of Traditional Religious and Cultural Importance, or Sacred Sites	None identified. Consultation is ongoing.	None identified. Consultation is ongoing.	None identified. Consultation is ongoing.	None identified. Consultation is ongoing.
Water Quantity and Quality (Groundwater)				
Groundwater Availability	2 drawdown areas. Maximum 10-foot drawdown area extends ~1.4 miles from Project area.	2 drawdown areas. Maximum 10-foot drawdown area extends ~4.8 miles from Project area.	2 drawdown areas. Maximum 10-foot drawdown area extends ~5.2 miles from Project area.	No effects anticipated
Groundwater Mounding	No effects anticipated	No effects anticipated	No effects anticipated	No effects anticipated
Water Rights	No effects anticipated	Same as Alternative A	Same as Alternative A	No effects anticipated
Open Pit Seepage	Maximum of 55 gpm in 2065	Same as Alternative A	Maximum of 134 gpm in 2065	No effects anticipated
Subsidence	No effects anticipated	No effects anticipated	No effects anticipated	No effects anticipated
Groundwater Quality	Potential exceedance of NDEP Profile I standards for antimony, arsenic, sulfate, and TDS	Same as Alternative A	Potential exceedance of NDEP Profile I standards for antimony, arsenic, fluoride, manganese, molybdenum, sulfate, TDS	No effects anticipated
Water Quantity and Quality (Surface Water)				
Surface Water Runoff	Surface disturbance of 5,695 acres. Effects would occur through 2065.	Same as Alternative A	Surface disturbance of 6,177 acres. Effects would occur through 2065.	Surface disturbance of 194 acres. Effects would occur until reclamation is complete.
Seeps and Springs Flow	3 ephemeral springs within drawdown area	Same as Alternative A	5 ephemeral springs within drawdown area. One spring would be covered by the East WRSF.	No effects anticipated

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
Sedimentation and Erosion	Surface disturbance of 5,695 acres may cause erosion during construction. Effects would occur through 2065.	Same as Alternative A	Surface disturbance of 6,177 acres may cause erosion during construction. Effects would occur through 2065.	Surface disturbance of 194 acres. Effects would occur until reclamation is complete.
Pit Lake Formation	No effects anticipated	No pit lakes anticipated. Small intermittent ponding may form in South Pit area.	3 pit lakes anticipated to form	No effects anticipated
Effects to Perennial Streams	<1% reduction in flows in Pole Creek. ~3% reduction in Crowley Creek flows. ~4% reduction in Thacker Creek flows.	~1% reduction in flows in Pole Creek, Crowley Creek. ~4% reduction in flows in Thacker Creek.	~1% reduction in flows in Crowley Creek. ~7% reduction in flows in Thacker Creek.	No effects anticipated
Wetlands and Riparian Zones				
Wetlands and Riparian Resources	Limited vegetation loss and surface disturbance over the life of the mine. Effects would be concurrently reclaimed but could occur through 2065.	Limited vegetation loss and surface disturbance. Surface water flow reduction in Thacker Creek may affect riparian vegetation.	Limited vegetation loss and surface disturbance. Surface water flow reduction in Thacker Creek may affect riparian vegetation.	No effects anticipated
Range Management				
Reduction of AUMs	500 AUMs removed	Same as Alternative A	Same as Alternative A	No effects anticipated
Livestock Water Sources	3 ephemeral springs within drawdown area may experience reduced flow	Same as Alternative A	5 ephemeral springs within drawdown area may experience reduced flow. One spring would be covered by the East WRSF.	No effects anticipated
Livestock Effects from Mining Activity	Livestock injury or mortality could occur from collisions with mine vehicles along SR 293	Same as Alternative A	Same as Alternative A	No effects anticipated

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
Lands and Realty				
Public Land for Multiple Uses	Surface disturbance of 5,695 acres that would be reserved for mineral extraction	Same as Alternative A	Surface disturbance of 6,177 acres that would be reserved for mineral extraction	No effects anticipated
Unreclaimed Features	None	East Pit area would not be backfilled or reclaimed	1,099 acres of open pit would not be backfilled or reclaimed	None
Changes to Public Roads	None	None	None	None
Access to Future Mineral Prospects	2,882 acres of mineral access would be covered by WRSF and CTFS	Same as Alternative A	3,364 acres of mineral access would be covered by WRSF and CTFS	No effects anticipated
Access to Private Property	No effects anticipated	No effects anticipated	No effects anticipated	No effects anticipated
Effects to Previously Authorized Rights-of-Way	No effects anticipated	No effects anticipated	No effects anticipated	No effects anticipated
Social Values and Economics (Construction Phase)				
New Employment	1,000 positions	Same as Alternative A	Same as Alternative A	No effects anticipated
Wages	$68,608,492	Same as Alternative A	Same as Alternative A	No effects anticipated
Change in Population/Housing/ Public Services	675 to 2,700	Same as Alternative A	Same as Alternative A	No effects anticipated
Tax Generation	$8,213,811	Same as Alternative A	Same as Alternative A	No effects anticipated
Change in Economic Activity in Nevada	$20,983,110	Same as Alternative A	Same as Alternative A	No effects anticipated
Social Values and Economics (Operations Phase)				
New Employment	496 positions	Same as Alternative A	Same as Alternative A	No effects anticipated
Wages	$33,837,245	Same as Alternative A	Same as Alternative A	No effects anticipated
Change in Population/Housing/ Public Services	224 to 894	Same as Alternative A	Same as Alternative A	No effects anticipated
Tax Generation	$9,173,622	Same as Alternative A	Same as Alternative A	No effects anticipated
Change in Economic Activity in Nevada	$13,541,454	Same as Alternative A	Same as Alternative A	No effects anticipated

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
Environmental Justice				
Disproportionate Effects to Environmental Justice Populations	None anticipated	None anticipated	None anticipated	None anticipated
Soils				
Direct Disturbance	5,695 acres	Same as Alternative A	6,177 acres	No effects anticipated
Soil Function	Potential decrease in function	Same as Alternative A	Same as Alternative A	No effects anticipated
Effects to Biotic Crusts	No effects anticipated	No effects anticipated	No effects anticipated	No effects anticipated
Transportation, Access, and Public Safety				
Change in Traffic Generation (Phase I)	~60 to 100 additional truck trips per day	Same as Alternative A	Same as Alternative A	No effects anticipated
Change in Traffic Generation (Phase II)	~120 to 200 additional truck trips per day	Same as Alternative A	Same as Alternative A	No effects anticipated
Vegetation				
Vegetation Cover	Surface disturbance of 5,695 acres of vegetation removed over the life of mine. Effects would be concurrently reclaimed but could occur through 2065.	Same as Alternative A	Surface disturbance of 6,177 acres of vegetation removed over the life of mine. Effects would be concurrently reclaimed but could occur through 2065.	No effects anticipated
Establishment of Noxious Weeds	Surface disturbance of 5,695 acres of vegetation removed over the life of mine.	Same as Alternative A	Surface disturbance of 6,177 acres of vegetation removed over the life of mine.	No effects anticipated
Special Status Plant Species				
Number of Species Potentially Affected	No effects anticipated	Same as Alternative A	Same as Alternative A	No effects anticipated
Special Status Wildlife				
GRSG Habitat (2015 ARMPA)	5,011 acres of PHMA, 545 acres of GHMA would be removed	Same as Alternative A	5,493 acres of PHMA, 545 acres of GHMA would be removed	No effects anticipated
GRSG Habitat (2019 ARMPA)	5,695 acres of PHMA would be removed	Same as Alternative A	6,177 acres of PHMA would be removed	No effects anticipated

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)
GRSG Leks within One Mile	1	Same as Alternative A	Same as Alternative A	None
Pygmy Rabbit Habitat	3,561 acres would be removed	Same as Alternative A	4,063 acres would be removed	No effects anticipated
Western Burrowing Owl Habitat	5,695 acres would be removed	Same as Alternative A	6,177 acres would be removed	No effects anticipated
Visual Resources				
Contrasting Visual Elements	Project features would be visible from KOPs 1, 2, 3, 6, and 7	Same as Alternative A	Same as Alternative A, with the exception of contrasts at KOP 7 would be increased and the length of effects would be increased due to the unbackfilled pit remaining as a post-mining feature	No effects anticipated
Night Skies	Fixed and mobile lighting would affect night skies. Lighting would follow dark sky principles as practicable.	Same as Alternative A	Same as Alternative A	No effects anticipated
General Wildlife				
Bighorn Sheep Habitat	753 acres of year-round habitat would be removed	Same as Alternative A	798 acres of year-round habitat would be removed	No effects anticipated
Mule Deer Habitat	852 acres of year-round habitat would be removed	Same as Alternative A	897 acres of year-round habitat would be removed	No effects anticipated
Pronghorn Habitat	427 acres of year-round habitat and 4,960 acres of winter range	Same as Alternative A	501 acres of year-round habitat and 5,013 acres of winter range	No effects anticipated
Eagle and other Wildlife (Migratory Birds)				
Golden Eagle Territories Potentially Affected	1	Same as Alternative A	Same as Alternative A	No effects anticipated
Migratory Bird Habitat	5,695 acres would be removed	Same as Alternative A	6,177 acres would be removed	No effects anticipated

Effect	Alternative A (Proposed Action - Preferred Alternative)	Alternative B (Partial Pit Backfill)	Alternative C (No Pit Backfill)	Alternative D (No Action Alternative)

[1] Dewatering of approximately 55 gpm would not be required until mine year 30 (approximately 2054).
[2] Seasonal and/or intermittent accumulation of small volumes of water within the open pit is anticipated under this alternative. Anticipated water accumulations would not be characterized as a pit lake.

< = less than; > greater than; afy = acre feet per year; amsl = above mean sea level; ARMPA = Approved Resource Management Plan Amendment; AUMs = animal unit months; GHMA = General Habitat Management Area; gpm = gallons per minute; NA = not applicable; PHMA = Priority Habitat Management Area; tpy = tons per year; TDS = total dissolved solids

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The Thacker Pass Project Options Analysis report (LNC 2019c) describes the complete range of options that have been considered by the applicant during the design of the Project. Potential environmental and social effects; the operational factors including costs, closure, and reclamation; and the constructability and technical feasibility factors for each option are considered in the report. This section summarizes the alternatives that the applicant considered during the initial Project design period but has determined to not to include in the proposed Plans (LNC 2019a; 2019b). The BLM has reviewed the Options Analysis report as part of its evaluation of potential alternatives to the Proposed Action (Alternative A) and determined that none of the alternatives considered by the applicant required further detailed analysis in this EIS.

2.7.1 Alternate CTFS Location(s)

Under this alternative, an alternate site for the CTFS facility located immediately east of Thacker Pass on the south side of SR 293 was evaluated by the applicant. This south site would require an increased surface disturbance footprint from the additional haul roads and infrastructure required to operate the CTFS during mining operations. In addition, the south site would require mine traffic to cross the highway, potentially creating additional risk of vehicle and wildlife collisions and other public safety issues. The BLM eliminated this alternative from further analysis due to the additional anticipated surface disturbance and traffic safety related effects in comparison to the Proposed Action that is substantially similar in scope.

2.7.2 Alternate WRSF Configurations

Under this alternative, a single WRSF would be developed on the west side of the proposed open pit with a capacity of approximately 55-million cubic yards. Waste rock would be placed in approximately 55-foot lifts at the angle of repose with intermediate benches places to form an overall slope of 3H:1V. This alternative would result in a larger WRSF footprint on the west side of the mine area and an increase in facility height in comparison to the Proposed Action. This increase in footprint and height would require the WRSF be located closer to Thacker Creek and SR 293 and result in an increased visual contrast at these locations. The BLM dismissed this

alternative from detailed analysis as it would be anticipated to result in unavoidable additional effects to visual resources resulting from the increased facility height, and increased surface disturbance footprint, and other potential effects to resources in comparison to other feasible WRSF configurations analyzed under the Proposed Action.

2.7.3 Alternative Power Supply

2.7.3.1 Natural Gas Pipeline

This alternative was reviewed by LNC during the preliminary design phase of the Project. Under this alternative, a natural gas connection pipeline would be constructed from the existing Kinder Morgan Ruby Pipeline to provide natural gas to the Thacker Mine site. LNC reviewed several potential pipeline alignments with the shortest alignment requiring a 24-mile connection. This alternative would result in a substantially increased surface disturbance footprint due to the distance between the proposed mine site and the existing Ruby Pipeline. In addition, the use of natural gas to power mine operations would result in increased air and carbon emissions in comparison to the Proposed Action. This alternative was dismissed from detailed analysis by the BLM as it would be anticipated to result in unavoidable additional effects to multiple resources that would be affected within a pipeline surface disturbance footprint in comparison to the Proposed Action. This alternative is also considered economically infeasible by LNC due to the cost of construction and operation of a pipeline over the distance that would be required to service the proposed mine site.

2.7.3.2 Power Supplied from the Existing Grid

Under this alternative, a tie into the existing Harney Electric 115-kV powerline that parallels SR 293 would be constructed through the proposed mine site. The BLM dismissed this alternative from detailed analysis as it is considered economically infeasible by LNC when compared to the cost of internally generated power under the Proposed Action as described in Section 2.2.5.10, *Sulfuric Acid Plant and Energy Production*.

2.8 BLM PREFERRED ALTERNATIVE

The BLM has determined the preferred alternative is the Proposed Action (Alternative A). The preferred alternative has been determined to be the alternative that best fulfills the agency's statutory mission and responsibilities, considering socioeconomic, environmental, technical, and other factors.

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 SUPPLEMENTAL AUTHORITIES

The BLM is required to consider specific elements of the human environment that are subject to requirements specified in statue, regulation, or by Executive Order. **Table 3.1** presents what resources or elements are present within the proposed Project area and could be potentially affected under the Proposed Action in addition to rationale for dismissing detailed analyses of those elements determined to be present but not affected. Section 4.1, *Introduction to Issues Evaluation*, presents rationale for the specific issues carried forward for detailed analysis.

Table 3.1. Supplemental Authorities

Supplemental Authority	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale for Analysis/Reference Section
Air Quality			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.9 and 5.9.
Areas of Critical Environmental Concerns	X			No ACECs would be affected under the Proposed Action.
Cultural Resources			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.10 and 5.10.
Environmental Justice			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.12 and 5.12.
Floodplains	X			The Proposed Action is not anticipated to affect designated flood plains.
Noxious Weeds, Invasive and Non-native Plant Species			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.7 and 5.7.
Migratory Birds			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.5 and 5.5.
Eagles			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.5 and 5.5.
Native American Religious Concerns			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.18 and 5.9.
Farmlands (Prime or Unique)		X		Areas designated as potential Prime Farmlands within the Project area are not irrigated and therefore not designated as Prime Farmlands.
Threatened or Endangered Species			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.5 and 5.5.
Wastes, Hazardous or Solid			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.16 and 5.16.
Water Resources			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.3 and 5.3.
Wetlands and Riparian Zones			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.4 and 5.4.

Supplemental Authority	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale for Analysis/Reference Section
Wild and Scenic Rivers	X			No designated Wild and Scenic Rivers would be affected under the Proposed Action.
Wilderness	X			No designated Wilderness Areas would be affected under the Proposed Action.

3.2 ADDITIONAL AFFECTED RESOURCES

In addition to elements covered by supplemental authorities that require consideration in NEPA documents, the BLM considers other important resources and uses that may be affected from the alternatives. Other resources or uses of the human environment that have been considered for this EIS are listed in **Table 3.2**.

Table 3.2. Additional Affected Resources

Resource	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale for Analysis/Reference Section
Geology and Minerals			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.2 and 5.2.
Fuel Management and Wildfire		X		Wildfire and fuels management would be managed according to state and federal requirements. Best Management Practices would be implemented to reduce the risk of wildfire occurrence.
Fisheries			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.17 and 5.17.
Lands with Wilderness Characteristics	X			No Lands with Wilderness Characteristics would be affected under the Proposed Action.
Noise			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.14 and 5.14.
Paleontology	X			No areas of high potential fossil yield would be affected under the Proposed Action.
Rangeland Management			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.8 and 5.8.
Lands and Realty			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.13 and 5.13.
Recreation			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.17 and 5.17.
Social Values and Economics			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.11 and 5.11.
Soils			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.9 and 5.9.
Special Status Species			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.6 and 5.6.
Transportation, Access, and Public Safety			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.13, 4.16, 5.13, and 5.16.

Resource	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale for Analysis/Reference Section
Vegetation			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.4 and 5.4.
Visual Resources			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.15 and 5.15.
Water Quantity			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.3 and 5.3.
Wild Horses and Burros	X			No designated Wild Horse Management Areas would be affected under the Proposed Action.
Wilderness Study Areas	X			No designated Wilderness Study Areas would be affected under the Proposed Action.
Wildlife			X	Effects are anticipated under the Proposed Action. Refer to Sections 4.5 and 5.5.

3.3 AFFECTED ENVIRONMENT

Information regarding the existing conditions of resources potentially affected by the Proposed Action are summarized in **Appendix G**. Information regarding the analysis areas by resource and analysis assumptions is summarized in **Appendix L**.

The proposed Project area is located in northern Humboldt County, Nevada and includes approximately 17,933 acres (Mine Plan boundary of 10,468 acres; Exploration Plan boundary of 7,465 acres) of sagebrush steppe and grassland vegetation communities situated on the east side of the Thacker Pass area between the Montana Mountains to the north and the Double H Mountains to the south. Current land uses in the proposed Project area include livestock grazing, recreational activity, and mineral exploration.

CHAPTER 4. ENVIRONMENTAL EFFECTS

4.1 INTRODUCTION TO ISSUES EVALUATION

This chapter analyzes direct and indirect environmental impacts that may occur from implementation of the Proposed Action and alternatives outlined in Chapter 2. Analysis of similar issues have been grouped by resource topic in the following sections. **Appendix L** includes effect analysis methodology for each resource including analysis methods, effect indicators, and other information on the nature and type of potential effects.

Key resources and supplemental authorities identified for detailed analysis in this EIS through the scoping process are identified in **Table 3.1** and **Table 3.2**.

Potential effects to resources that are present but that the BLM has determined to be unlikely to occur or that would be mitigated through the design features of the Proposed Action or alternatives were not brought forward for detailed analysis are also identified in **Table 3.1** and **Table 3.2**. **Table 4.1** describes the issues identified by the BLM, cooperating agencies, and members of the public during the scoping process and coordination with cooperating and other agencies. Some issues that could affect multiple resources are evaluated in Chapter 4 of this EIS under the appropriate resource sections, while others that may affect only a single resource are discussed under that specific resource topic. For example, potential effects to resources involving water quality and quantity are addressed under multiple resources.

Table 4.1. Issues Identified for Evaluation

Issue	Description
Air Emissions	Potential airborne emissions resulting from the proposed Project and alternatives. Emissions sources include mine site construction and operations equipment and vehicles, on-road transportation trucks and equipment that would transport material to and from the Project area, processing area equipment and machinery, and fugitive dust.
Project Infrastructure	Potential effects from Project infrastructure include visual, auditory, and other changes to the existing Project area. Project infrastructure includes mining facilities (open pit, WRSFs, CTFS, stockpiles, GMS, stormwater management structures, electrical powerlines and sub-stations, equipment maintenance shop), ore processing facilities (ore conveyance, attrition scrubber, chemical plant, and battery production facility), and support/ancillary facilities (administrative offices and staff facilities).
Ground Disturbance	Ground disturbance includes potential effects that would result from areas of active ground disturbance resulting from mine construction and operation as well as continued mineral exploration activity.
Noise	Noise effects include all noise generating sources from mine construction and operation in addition to continued mineral exploration activity.
Public Access	Effects to public access include modifications to existing public roads and rights-of-ways within the Project area and installation of mine fencing and berms to ensure public safety.
Public Safety	Public safety effects include mine related truck traffic within the mine site and adjacent areas, additional on-road mine related delivery trucks and vehicles, and sources of hazardous materials or chemicals.

Issue	Description
Transportation	Effects to transportation include additional on-road mine related delivery trucks and vehicles, and sources of hazardous materials or chemicals in addition to vehicles transporting staff to and from the mine site.
Waste, Hazardous and Solid	Effects of wastes (Hazardous and Solid) include potential for unintended releases (spills) of hazardous or solid materials at the mine site or during transportation to and from the site. Storage of hazardous materials at the mine site is also evaluated.
Water Quality & Quantity	Potential effects to water quality and quantity include modifications to existing water rights, the potential for mine related groundwater aquifer drawdown, contamination of ground or surface water from unintended materials releases (spills) and the potential for adverse effects to groundwater resulting from surface water infiltration into the open pit or though above ground mine facilities (WRSF, CTFS, or other stockpiles). Water produced and used by the mine from the proposed production wells could also affect surface water stream flows in nearby perennial and intermittent streams or springs.
Bald and Golden Eagles	Potential effects to Bald and Golden Eagles are analyzed under a single section heading to assist USFWS evaluation of the applicant's application for an Eagle Take Permit under the Bald and Golden Eagle Protection Act (50 CFR 22). The impacts were programmatically analyzed in the PEIS (USFWS 2016a).
Quality of Life and Non-Market Values	Quality of life and non-market values are analyzed under the Social and Economic Values section only.

4.2 GEOLOGY AND MINERALS

4.2.1 Issue – Ground Disturbance

4.2.1.1 Alternative A (Proposed Action – Preferred Alternative)

Direct effects on geologic and mineral resources from the proposed Project would include: (1) the mining of approximately 230 million CY of lithium ore; (2) the generation and permanent disposal of approximately 190.2 million tons (46.9 million CY) of waste rock and gangue material; and approximately 353.6 million CY of clay tailings.

Surface disturbance resulting from the Proposed Action is summarized in **Table 2.1**. Disturbance associated with construction and reclamation of the WRSFs, CGS, and CTFS would change the topography and geomorphology within the Plan boundary. Most of the proposed open pit would be backfilled and reclaimed. A portion of the highwall would remain exposed but would be contoured to blend with the surrounding topography (LNC 2019a). Other facilities (such as stockpiles, the process facility, ancillary facilities, and haul roads) cause localized disturbance. However, many of these localized features would eventually be dismantled, removed, or reclaimed and, for the purposes of this analysis, assumed to be less likely to result in large-scale permanent alteration of the natural topography or geomorphic features in the area.

The open pit would disturb approximately 1,100 acres. A portion of the highwall would remain exposed but would be contoured to blend with the surrounding topography (LNC 2019a). Although the open pit would be backfilled and reclaimed, the final reclaimed surface of the backfilled pit would result in changes to the topography. The disposal of waste rock material would result in approximately 298 acres of disturbance associated with the construction of East and West WRSF

and approximately 318 acres of disturbance associated with construction of the CGS. Construction of the CTFS would result in approximately 1,166 acres of disturbance. Construction and reclamation of the Open Pit, WRSFs, CGS, and CTFS would replace the natural undulating topography with higher, more homogenous topography. In summary, construction and reclamation of the open pit, WRSFs, CGS, and CTFS would result in a total of approximately 2,882 acres where the natural topographic and geomorphic features would be permanently altered within the Project boundary.

4.2.1.2 Alternative B (Partial Pit Backfill)

Direct effects and disturbance to geologic and mineral resources under Alternative B would be the same as described for Alternative A (Proposed Action).

4.2.1.3 Alternative C (No Pit Backfill)

Direct effects and disturbance to geologic and mineral resources under Alternative C would include those described under Alternative A (Proposed Action).

Alternative C would result in an additional 482 acres of disturbance compared to the Proposed Action. Disturbance associated with construction and reclamation of the open pit, WRSFs, CGS, and CTFS would change the topography and geomorphology within the Plan boundary. The open pit would disturb approximately 1,100 acres. The disposal of waste rock and gangue material would result in approximately 780 acres of disturbance associated with the construction of East and West WRSF. Construction of the CTFS would result in approximately 1,166 acres of disturbance. The open pit would remain at closure and not be partially backfilled or recontoured (as would occur under Alternatives A and B). Construction and reclamation of the WRSFs, CGS, and CTFS would replace the natural undulating topography with higher, more homogenous topography. The construction of the WRSFs, CGS, and CTFS would result in a total of approximately 3,364 acres where the natural topographic and geomorphic features would be permanently altered within the Project boundary. Compared to the Proposed Action, Alternative C would result in an approximate 16 percent increase in the area where the natural topography would be permanently altered within the Project boundary.

4.2.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.2.2 Issue – Public Safety

Primary issues related to public safety associated with geology and minerals include stability of the open pit, WRSFs, CGS, CTFS under static and earthquake loads. Noise and ground vibration effects resulting from drilling and blasting during open pit mining are discussed in Section 4.5.2.

4.2.2.1 Alternative A (Proposed Action – Preferred Alternative)

Pit Slope Stability

The proposed open pit is described in Section 2.2. At the end of mining, the proposed pit would extend up to approximately 12,400 feet long (southeast-northwest) and 5,160 feet wide (southwest-northeast). The maximum depth of the pits as measured from the existing ground surface would be approximately 370 feet with bottom floor elevations ranging from 4,900 feet amsl in the west sub-pit area to 4,600 feet amsl in the east sub-pit area.

Open pit mines can experience periodic slope instability problems due to weak geologic materials; adversely oriented geologic structures, such as bedding, faults, and jointing; and groundwater presence. Large (Magnitude 6.0 or greater) seismic events can trigger failure of slopes that are marginally stable under static conditions (Azhari and Ozbay 2017). Geotechnical site investigation studies and laboratory testing were used as the basis to characterize the important mechanical and structural characteristics of the geotechnical units to support the slope design process (Barr 2019). The pit slope stability evaluation used a factor of safety value of 1.3 to assess the long-term stability based on drained, fully softened clay strengths applied to the interbedded clay and ash. The results of the pit slope stability evaluation conclude that the calculated factor of safety would meet or exceed the 1.3 minimum factor of safety design criteria. The kinematic slope-stability analysis also concluded that structurally controlled instability is not expected. Therefore, large scale slope instability is not expected during the operation or post-closure period.

WRSFs and CGS Stability

The proposed Project includes the development of the East WRSF and the West WRSF, and CGS as described in Section 2.2. Waste rock materials would consist of primarily weak claystone with relatively small amounts of alluvium and basalt overburden material excavated during the mining process. Coarse gangue would consist of fine-to-coarse sand material generated during mineral processing by hydrocyclones that separate the high lithium-bearing, fine clay and silt materials from the low lithium-bearing, coarse gangue materials. Growth media would be salvaged within the WRSFs and CGS footprints. The WRSFs and CGS would be constructed on a native claystone foundation that exhibits properties similar to a stiff soil rather than competent bedrock (NewFields 2020b).

NewFields (2020b) completed a stability evaluation of the CGS and the WRSFs for the proposed Project. The stability analysis was based on the following design assumptions (NewFields 2020b):

- The East WRSF design is a maximum of 150 feet thick. It has an inter-bench slope of 4H:1V, 75-foot wide benches and 50-foot lift thicknesses for an overall slope of 5.5H:1V.
- The West WRSF would be constructed at a 3.5H:1V continuous slope with a maximum thickness of 275 feet.
- The CGS design is a maximum of 200 feet thick as measured vertically from the foundation soils to the top of fill. It has an inter-bench slope of 4H:1V, 75-foot wide benches and 50-foot lift thicknesses for an overall slope of 5.5H:1V.

Minimum acceptable factors of safety for static and pseudostatic (i.e., seismic loading) conditions were established as 1.3 and 1.05, respectively. The results of the slope stability evaluation indicate adequate factors of safety for static conditions for the WRSFs and CGS. The pseudostatic stability evaluation indicates that the factor of safety could be less than 1.05 for the West WRSF under both the operational basis earthquake event and maximum design earthquake event. A deformation analysis conducted to evaluate potential slope movement during the maximum design earthquake event estimates that potential slope displacements of up to 4 feet. NewFields (2019) concluded that the 4 feet of movement is within tolerable limits for the facilities. Therefore, the results of the stability assessment indicate that affects associated with instability of the WRSFs and CGS during operation and post-closure are not anticipated.

CTFS Stability

The proposed Project includes the development of the CTFS as described in Section 2.2. The CTFS is designed to store the mechanically placed filtered tailings solids (filter cakes and sulfate salts) generated during lithium production. A stability evaluation was conducted to support the facility design and verify that the facility would remain stable under expected loading conditions (NewFields 2020a). The stability evaluation assumed a maximum facility height of 400 feet as measured vertically from the top of the stack to the geomembrane liner. Minimum acceptable factors of safety for static and pseudostatic conditions were established as 1.3 and 1.05, respectively. The results of the slope stability evaluation indicate adequate factors of safety for static conditions. The pseudostatic stability evaluation indicates that the factor of safety could be less than 1.05 under the design earthquake event. A deformation analysis conducted to evaluate potential slope movement during the maximum design earthquake event estimates that potential slope displacements of up to 32 inches. NewFields (2020a) concluded that the up to 32 inches of movement is within tolerable limits for the facilities. As described in the NewFields report: *"The concept of "tolerable limits" was developed primarily for water retaining structures, such as traditional slurry tailings facilities, and refers to minor seismic induced deformation of the crest elevation and slopes without uncontrolled release of retained solutions."* In summary, the results of the stability assessment indicate that affects associated with instability of the CTFS under static or seismic loading conditions are not anticipated.

4.2.2.2 Alternative B (Partial Pit Backfill)

The design of the open pit, WRSFs, CGS, and CTFS under Alternative B would be the same as described for Alternative A (Proposed Action). Therefore, the results of the stability assessment indicate that effects associated with instability of the open pit, WRSFs, CGS, and CTFS during operation and post-closure are not anticipated.

4.2.2.3 Alternative C (No Pit Backfill)

The design and stability of the open pit, West WRSFs, and CTFS under Alternative C would be the same as described for Alternative A (Proposed Action). However, the East WRSF would be expanded to the north, south and east to accommodate both waste rock and coarse gangue material. NewFields (2020c) evaluated the stability of the expanded facility under Alternative C. The slope

stability analysis assumed the facility would be designed to have a maximum height of 416 feet (as measured vertically from the native ground surface to the top surface of the facility) and 3.5H:1V continuous slope. The results of the slope stability evaluation indicate adequate factors of safety for static conditions. The pseudostatic stability evaluation indicates that the factor of safety could be less than 1.05 under both the operational basis earthquake event and maximum design earthquake event. A deformation analysis conducted to evaluate potential slope movement during the maximum design earthquake event estimates that potential slope displacements of up to 16 inches. NewFields (2020c) concluded that the 16 inches of movement is within tolerable limits for the facilities. Therefore, the results of the stability assessment indicate that the East WRSF is expected to be stable during the operation and post-closure period (NewFields 2020c).

4.2.2.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.2.3 Recommended Mitigation and Monitoring

No additional mitigation measures are proposed beyond the best management practices committed to by the applicant in the mine plan and other supporting documents.

4.2.4 Residual Effects

Residual effects to geology and mineral resources as a result of the proposed Project would include the permanent removal of up to 230 million CY of ore, and the permanent alteration of the landscape on a total of up to approximately 1,821 acres as a result of the proposed development of the open pit, waste rock and gangue storage facilities, and clay filter stack facility. These residual effects would be the same under Alternative B and would increase under Alternative C to up to 3,364 acres of permanent residual surface disturbance.

4.3 WATER QUALITY AND QUANTITY

4.3.1 Issue – Water Quality and Quantity

Key water resource issues identified for the proposed Project include: (1) potential reduction in surface water and groundwater quantity for current users and water-dependent resources resulting from groundwater withdrawal for water supply wells, pit dewatering, and open pit mining; and (2) potential effects to groundwater and surface water quality from the construction, operation, and closure of the open pit, waste rock and gangue storage facilities, and exploration activities.

The analysis area for the evaluation of direct and indirect effects and cumulative effects to water resources consists of the Mine and Exploration Plan boundaries and adjacent areas within portions of the Kings River Valley and Quinn River Valley hydrographic basins as shown in **Figure 4.3-1 (Appendix A)**. Active water rights within the analysis area are presented in **Figure 4.3-2 (Appendix A)**.

As described in Chapter 2, the proposed Project would be developed in two phases: Phase I (Year 1-Year 4); Phase II (Year 5 to Year 41). The projected water demand for the Project is 2,600 acre-feet/year (equivalent to an average pumping rate of 1,612 gpm) for Phase I; and 5,200 acre-feet/year (equivalent to an average pumping rate of 3,224 gpm) for Phase II. The proposed source of water to supply the Project is pumped groundwater from the Quinn-Production Well located approximately 5 miles east of the main mine facilities (**Figure 2.2, Appendix A**).

A calibrated three-dimensional numerical groundwater flow model was developed to estimate effects to groundwater and surface water resources from the open pit mining under the Proposed Action, Alternative B (Partial Pit Backfill), and Alternative C (No Pit Backfill) (Piteau 2020a). Specifically, the groundwater flow model was developed for the mine site to evaluate the following: (1) passive inflow rates to the open pit throughout the mine life; (2) drawdown and recovery of groundwater levels resulting from passive inflow to the proposed open pit and groundwater withdrawal from the proposed water supply well; (3) potential for pit lake(s) to develop in the post-mining period; (4) potential groundwater outflow from the pit lakes and pit backfill; and (5) groundwater recovery after mining (Piteau 2020a).

For this impact analysis, the area that is predicted to experience a change (decrease) in groundwater elevation of 10 feet or more is defined as the "drawdown area." The 10-foot drawdown contour is used as a frame of reference to identify water dependent water resources within the drawdown area and for comparison of the potential effects between the various pumping scenario alternatives. Considering the regional scale of the model, and unavoidable uncertainty associated with the model predictions, the BLM does not believe that it is reasonable or appropriate to use the regional model to quantify changes in groundwater elevation of less than 10 feet. The model was used to evaluate potential changes to baseflow in perennial stream reaches located outside of the 10-foot drawdown contour (as discussed below).

Simulated groundwater production rates as mining progresses are presented in an addendum to the groundwater model report (Piteau 2020a) provided in **Appendix P** of this EIS. The model results indicate that mining would encounter groundwater seepage into the pit beginning in 2035. From approximately 2035 through 2065, groundwater inflow rates are predicted to increase as mining progresses from less than 8 gpm in 2035 to approximately 55 gpm by the end of mining (2065). Groundwater seepage into the pit would be managed by sump pumps on the floor of the pit.

4.3.1.1 Alternative A (Proposed Action – Preferred Alternative)

4.3.1.1.1 Water Quantity

Effects to Groundwater Levels

Effects to groundwater levels were evaluated using the results of the numerical modeling of the proposed mine development (Piteau 2020a). The projected changes in groundwater levels represent the difference between the model-simulated groundwater elevations at representative points in time with the simulated pre-mine development baseline groundwater elevations. The areas predicted to experience a reduction of groundwater levels (or drawdown) resulting from the proposed Project at

the end of mining, 25-years, 50-years, 100-years, and 300-years post-mining are provided in **Figures 4.3-3, 4.3-4, 4.3-5, 4.3-6, and 4.3-7,** respectively (**Appendix A**).

The results of the modeling predict that at the end of mining (Year 2065) (**Figure 4.3-3, Appendix A**) there would be two separate, localized drawdown areas: one centered on the backfilled pit, and the second centered on the Quinn Production Well. For the backfilled pit area, the 10-foot drawdown contour extends up to a maximum of approximately 1.2 miles outside the backfilled pit perimeter. For the Quinn Production Well, the 10-foot drawdown contour extends up to a maximum of approximately 1.5 miles from the production well.

As shown in **Figures 4.3-4, 4.3-5, 4.3-6, and 4.3-7 (Appendix A),** after mining ceases, the model simulations predict that the area of drawdown defined by the 10-foot drawdown contour is predicted to recover in areas located to the east, and south of the pit; and expand towards the north. The predicted expansion of the drawdown area to the north in the post-mining period is attributable to the breaching of a major east-west oriented fault during mining that is modeled as a strong hydraulic flow barrier (Piteau 2020a). The model simulations also indicate that the drawdown area (defined by the 10-foot drawdown contour) predicted around the Quinn Production Well reaches a maximum at the end of mining (**Figure 4.3-3, Appendix A**) and would fully recover within 25 years after pumping ceases (**Figure 4.3-4, Appendix A).**

The maximum areal extent of the 10-foot drawdown contour under the Proposed Action is presented on **Figure 4.3-8 (Appendix A)**. This figure shows the predicted outer limit of the 10-foot drawdown contour as determined by overlaying a series of 10-foot drawdown contours for representative points in time over the entire mining and 300-year post-mining simulation period. The maximum area of drawdown (defined by the 10-foot contour) associated with the pit extends approximately 1.9 miles outside the backfilled pit. The maximum area of drawdown for the Quinn Production well is the same as previously described for the end of mining (Year 2065).

Surface Waters

The springs and streams in the region have been characterized as either ephemeral, or perennial (Piteau 2019a). Springs and stream reaches characterized as “ephemeral” in the baseline report (Piteau 2019a) denote surface water features that exhibit seasonal flow, or only flow during or after wet periods in response to runoff events. Streams and springs with seasonal flow are typically not controlled by discharge from the regional groundwater flow systems. During the low-flow period of the year, ephemeral springs and stream reaches typically are dry. In contrast, perennial springs and stream reaches generally flow throughout the year. Flows observed during the wet periods in perennial springs and streams include a combination of surface runoff and groundwater discharge, whereas flows observed during the low-flow period are sustained entirely by discharge from the groundwater system. If the flow from the perennial spring or stream is controlled by discharge from the aquifer affected by mine-induced drawdown, a reduction of groundwater levels would likely result in a reduction of the groundwater discharge perennial springs or streams with a corresponding reduction in spring flows, lengths of perennial stream reaches, and their associated riparian/wetland areas.

The maximum areal extent of the 10-foot drawdown contour was used to identify surface water resources within the drawdown area. The area located outside of, but within 1-mile of, the maximum extent of the 10-foot drawdown contour as shown on **Figure 4.3-8 (Appendix A)** is used as a "buffer" to identify springs that may be affected as a result of drawdowns of less than 10 feet. The 1-mile buffer was selected based on review of the hydrographs showing the simulated changes in groundwater elevation at spring locations located outside the 10-foot drawdown contour (Appendix E, Piteau 2020a).

Effects to Perennial Streams

There are no perennial stream reaches within or near the maximum extent of the projected drawdown areas (defined by the 10-foot drawdown contour) associated with the Proposed Action (**Figure 4.3-8, Appendix A**). Thacker Creek is a gaining stream beginning at its headwaters near SP-010 to its discharge point at Thacker Pond. Baseline monitoring has measured flows ranging from 82 gpm to 334 gpm with flows ranging from 186 gpm to 234 gpm measured near the inlet to Thacker Pond (Piteau 2019a). The baseflow in Thacker Creek is controlled by discharge from the groundwater flow system. Several springs in the area, as well as groundwater upwelling in the stream channel contribute flow along the stream reach. Crowley Creek originates north of Indian Springs (SP-035) and is generally perennial north of the confluence with Rock Creek and is ephemeral south of the confluence. Average baseflow conditions are estimated to be 492 gpm from groundwater, all of which is consumed by ET during summer months. A supplemental field investigation conducted on February 19, 2020, delineated three flowing reaches of Pole Creek (characterized as likely perennial reaches) separated by reaches characterized as non-perennial (seasonally dry) (Piteau 2020b) (**Figure 4.3-1, Appendix A**).

Groundwater model simulations were used to evaluate potential effects to baseflow in the perennial stream reaches that occur in the Project study area (i.e., Thacker Creek, Crowley Creek and Pole Creek) located outside the 10-foot drawdown contour (Figure 4.8, Piteau 2020a). The regional model is not considered an appropriate tool to predict small (less than 5 percent) site-specific flow changes. A less than 5 percent reduction of flow would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. For these reasons, for the purposes of this analysis, a flow reduction of 5 percent or greater is used to identify model-simulated springs and streams with the potential to experience measurable flow reductions.

The model simulations predict that drawdown would result in reductions in baseflow of up to approximately 4 percent in Thacker Creek, 3 percent in Crowley Creek and less than 1 percent reduction in the upper and middle reaches of Pole Creek (Piteau 2020a). Therefore, mine related drawdown is not expected to result in a measurable effect to flows in the perennial stream reaches in the Project area including Thacker Creek (or flows into Thacker Pond), Crowley Creek and Pole Creek.

Effects to Seeps and Springs

The locations of springs and seeps within the maximum extent of the drawdown areas (defined by the 10-foot contour) under Alternative A (Proposed Action) are shown on **Figure 4.3-8**

(Appendix A). Three ephemeral springs (SP-001, SP-003, and SP-058) are located within the predicted drawdown area. SP-001 is a man-made ephemeral stock pond located within the pit footprint and therefore, would be directly affected during mining. SP-003 and SP-058 are characterized as man-made surface features (stock ponds) that are typically dry. The site survey data strongly suggest that these features are man-made surface features intended to capture seasonal flows and not controlled by discharge from the groundwater water system (Piteau 2019a). Therefore, SP-003 and SP-058 are not anticipated to be affected by drawdown associated with the open pit mining.

There is also one developed spring and seven perennial springs located outside of, but within one mile of, the maximum extent of the projected 10-foot groundwater drawdown contour (**Table 4.2**).

The actual effects on an individual perennial seep or springs would depend on the source of groundwater that sustains the perennial flow (perched or hydraulically isolated aquifer versus regional groundwater system) and the actual extent of mine-induced groundwater drawdown that would occur in the area. The interconnection (or lack of interconnection) between the perennial surface waters and deeper groundwater sources is largely controlled by the specific hydrogeologic conditions that occur at each site. Considering the uncertainty between the actual groundwater elevations and model-simulated groundwater elevations in this area, and the absence of data to define if these springs are perched or connected to the deeper groundwater aquifer system, the EIS analysis conservatively assumes that there is a potential risk that drawdown associated with the mine could reduce baseflow to perennial springs located within (or within one mile of) the maximum extent of the 10-foot drawdown contour. Depending on the severity, a reduction in baseflow could result in a spring drying up. Springs affected by drawdown and located in areas where the drawdown is predicted to persist over the model simulated post-closure period would not likely recover.

LNC has proposed monitoring groundwater levels between the open pit and springs and Pole Creek located north of the mine; and contingency mitigation measures to minimize drawdown effects to perennial surface waters as summarized in Section 4.3.3. Implementation of the monitoring and mitigation plan is expected to detect and minimize effects to perennial surface water resources.

Table 4.2. Perennial Springs Located Within (or Near) Drawdown Area[1] (Proposed Action, Alternatives B and C)

Spring ID	Spring Type	Perennial Springs Located Within the Maximum Extent of 10-foot Drawdown Contour (Shown with an X); or Within the 1-mile Buffer[1] (Shown with a B).		
		Proposed Action (Alternative A)	***Partial Pit Backfill (Alternative B)***	***No Pit Backfill (Alternative C)***
BLM-02	Perennial			B
SP-004	Perennial			B
SP-006	Perennial			B
SP-008	Developed	B	B	X
SP-010	Perennial	B	B	B
SP-011	Perennial	B	B	B
SP-012	Perennial		B	B
SP-028	Perennial	B	B	B
SP-029	Perennial	B	B	B
SP-030	Perennial		B	B
SP-031	Perennial		B	B
SP-032	Perennial	B	B	B
SP-033	Perennial	B	B	X
SP-035	Perennial			
SP-041	Perennial	B	B	B
SP-042	Perennial			
SP-047	Perennial			B
SP-048	Perennial			
SP-049	Perennial			
SP-050	Perennial			
SP-051	Perennial			
SP-057	Perennial		B	B
Total Within the 10-Drawdown Area		**0**	**0**	**2**
Total Located Within the 1-mile Buffer[1]		**8**	**12**	**14**
Total		**8**	**12**	**16**

Source: Piteau 2020a

[1] Spring located within the 1-mile buffer area that extends outside of the 10-foot drawdown contour.

Effects to Water Rights

Active water rights within the hydrologic study area were inventoried to identify the location and status of water rights. The inventory was based on water rights records on file with NDWR. Water rights located within or near the predicted drawdown areas that would develop in the vicinity of the proposed open pit mine and Quinn Production Well are summarized in **Table G.1** (**Appendix G**),

and their locations are shown in **Figure 4.3-2 (Appendix A).** For the purpose of this evaluation, all water rights owned by LNC were excluded.

The BLM is listed as the owner of record for two surface water rights (Map ID #6, and #67) and a "underground" water right (Map ID #88). The Map ID #6 water right is listed as having a spring source, "Reserved" status, with a priority date of 04/17/1926. The priority data of 04/17/1926 indicates that this specific water right was established through a Presidential Executive Order of April 17, 2026 that created Public Water Reserve (PWR) No. 107. PWR 107 reserved water yields from springs and natural water holes for human and animal consumption. The Map ID #67 water right is listed as having a stream source, "certificate" status, priority date of 9/04/1915 and irrigation use. The Map ID #88 water right is listed as a "underground" water right (i.e., well), with a "certificate" status, priority date of 07/29/1970, and stock water use.

Water rights that occur within the predicted maximum extent of the drawdown areas (defined by the 10-foot drawdown contour) associated with the backfilled pit, or Quinn Production Well are shown on Figure 4.3-8 (Appendix A). No (non-LNC owned) water rights have been identified in the vicinity of the projected mine-induced drawdown area resulting from the proposed open pit. There are two (non-LNC owned water rights) (Map IDs 138 and 139) identified within the projected maximum extent of the drawdown area (defined by the 10-foot drawdown contour) resulting from proposed groundwater pumping from the Quinn Well. The locations of water rights used for this analysis are based on the legal description provided in the NDWR water rights database and has not been surveyed and therefore, should be considered approximate.

The water right associated with Map ID 138 is a vested water right for stock watering owned by a private company. The source of water is listed as underground (i.e., groundwater) from a well identified as the "Borderline Fence Windmill Well". Well construction details are not available. Assuming that the location is correct, the location occurs within a drawdown area that is projected to have more than 10-feet but less than 25-feet of drawdown. An impact to this water supply well (i.e., groundwater rights) could include a reduction in yield, increased pumping cost, or if the water level were lowered below the bottom of the well, the well would be rendered unusable until the water levels recover or the well is deepened.

The water right associated with Map ID 139 is a vested surface water right for irrigation use owned by a private company. The source of water is listed as "stream" with a source description of 'Quinn River". The location of the water right may not be correct since the Quinn River is located approximately 2 miles east of the location of the Quinn River. If the point of diversion for the water right occurs within the projected maximum extent of the drawdown area (defined by the 10-foot drawdown contour) (as shown on **Figure 4.3-8**), there is a potential that drawdown associated with the well could reduce the amount of water available for use by the water right.

Pumping from the Quinn Production Well (and backup well) could result in a reduction in groundwater levels in natural evapotranspiration (ET) areas within the drawdown area. These ET areas include a sub-irrigated hay field located on private land. Therefore, there is potential for production well pumping to effect water rights associated with this agricultural use.

Areas effected by reductions in ET resulting from production well(s) induced drawdown are expected to recover after pumping ceases and groundwater levels rebound to pre-development conditions.

Mitigation for potential effects to water rights would be addressed as outlined in mitigation measure WR4 in Section 4.3.2

Potential Pit Lake Development

Under the Proposed Action, the open pit would be backfilled and would preclude the development of pit lakes. Therefore, there would be no evaporative loss from pit lakes over the closure and post-closure period.

4.3.1.1.2 Water Quality

Pit Backfill Outflow to Groundwater

Under the Proposed Action the backfilled pit would preclude the formation of a pit lake in any of the sub pits. Backfill comprised of 65 percent waste rock and 35 percent gangue would be placed in the open pit. The final backfill elevation would be at least 50 feet above post-closure water levels in each sub-pit (Piteau 2020a). The largest contribution to flow in the backfilled pit is groundwater inflow followed by infiltration. There is no contribution from pit wall runoff or precipitation owing to the backfill placement final elevation being above pit wall grade. The backfilled pit was subdivided into three areas for the purpose of analysis that are referred to as the North sub-pit, West sub-pit, and South sub-pit. The predicted groundwater outflow for each of the sub-pit areas at equilibrium is 8.0 gpm for the North sub-pit area, 14.7 gpm for the West sub-pit area, and 11.0 gpm for the South sub-pit area (Piteau 2020a).

The water quality within the backfill (and therefore, groundwater outflow water quality) was evaluated using a predictive geochemical model to predict water quality within the backfill in each of the sub-pit areas over a 300-year post-closure period. The results of the geochemistry modeling are provided in Piteau 2020a, included in **Appendix P** of this EIS. The modeling results predict that the groundwater quality would be moderately alkaline (pH 7.6-7.8) with concentrations of antimony, arsenic, sulfate, and total dissolved solid (TDS) that would exceed the NDEP Profile I reference values (based on the Nevada Primary and Secondary Drinking Water Standards) in one or more of the sub-pit areas. Sulfate is predicted to exceed the Profile I reference values for approximately 50 years, and TDS for 140 years post-closure (Piteau 2020a). Concentration of both constituents (sulfate, TDS) gradually declines as the backfill is subsequently rinsed by groundwater. The concentrations of arsenic and antimony in the pit backfill pore water are predicted to exceed drinking water standards over the entire 300 years post-closure simulation period in each sub-pit area. The source of arsenic and antimony is waste rock (claystone/ash and ash) placed in the backfill (Piteau 2020a).

Potential effects to downgradient groundwater quality was assessed using two methods: (1) a simple mass mixing analysis to evaluate the changes in sulfate, antimony and arsenic that would likely occur as the groundwater within the backfill migrates downgradient from the pit and mixes

with the background water quality (Piteau 2020a); and (2) fate and transport modeling to more precisely quantify the post-closure concentrations of antimony in the groundwater system (Piteau 2020a).

The mass mixing analysis consisted of mixing the backfill discharge with representative background groundwater quality from existing monitoring wells. The analysis was conservative in that it omits additional processes such as dispersion, diffusion and attenuation which could potentially retard or dilute pore water chemistry (Piteau 2020a). The results of the mixing analysis indicated that sulfate concentration would always remain below the Nevada Secondary Enforceable Drinking Water Standard (of 500 mg/L in the mixed groundwater zone downgradient of the pit). Antimony concentrations are predicted to be above the Nevada Primary Drinking Water Standard (0.006 mg/L) downgradient from the West and South sub-pit areas. The arsenic concentrations in the mixing zone downgradient of each of the three sub-pit areas are predicted to have concentrations that would exceed the Nevada Primary Drinking Water Standard (0.01 mg/L). However, the baseline background groundwater chemistry for the area has average arsenic concentrations ranging from 0.016 to 0.026 mg/L that naturally exceed the 0.01 mg/L Primary Drinking Water Standard. Piteau (2020a) concluded that the arsenic concentrations from the pore water within the pit backfill would not degrade groundwater because the concentrations within the pore water would be within the range of concentrations that naturally occur within the downgradient groundwater system.

The results of the mass mixing analysis prompted subsequent fate and transport modeling to more precisely quantify the post-closure concentrations of antimony in the groundwater system and to support the development of an appropriate monitoring and mitigation plan (Piteau 2020a). The fate and transport analysis is a more rigorous evaluation of solute transport because the analysis incorporates additional physical processes such as dispersion, diffusion, and advection. The results of the fate and transport modeling predict that the pit backfill outflow with concentrations of antimony that exceed the 0.006 regulatory threshold would migrate up to approximately one mile east-southeast of the pit over the simulated 300-year post-closure period; and, the magnitude of antimony concentrations decreases over time. The outflow with elevated antimony concentrations is not predicted to migrate west of the backfilled pit. In addition, the extent of the elevated antimony concentrations would not extend outside the Plan boundary. LNC has proposed groundwater quality monitoring downgradient of the backfilled pit coupled with mitigation options (Piteau 2020a) in the event that antimony concentrations exceed the Nevada Primary Drinking Water Standard at downgradient compliance points as summarized in Section 4.3.3. Implementation of the monitoring and mitigation plan is expected to effectively mitigate potential effects to groundwater quality resulting from groundwater outflow from the backfilled pit.

WRSF and CGS Facilities

The WRSFs and CGS facilities would directly overlie native clay soils. During reclamation, the slopes would be covered with 12-inches of growth media and revegetated. The vegetated cover is designed to capture water and reduce infiltration through the facilities (Piteau 2020a).

Geochemical testing of the waste rock and coarse gangue material confirms that acid rock drainage is not anticipated for the Project. However geochemical characterization testing indicates that neutral pH drainage from the waste rock and coarse gangue material have the potential to generate leachate with concentrations of arsenic, antimony, fluoride, iron, magnesium, sulfate, and uranium that exceed NDEP Profile I reference values (i.e., based on the Nevada drinking water standards) (SRK 2020a, SRK 2020b).

Piteau (2020a) conducted hydrogeochemical modeling to evaluate equilibrium groundwater quality beneath the unlined WRSFs and CGSF. The modeling approach accounted for long-term infiltration through the facilities under average precipitation conditions. Geochemical effects to groundwater quality were simulated using a mass mixing approach, in which infiltration and groundwater mixing are evaluated across each facility's individual footprint (Piteau 2020a).

The results of the modeling indicate that no new exceedances of NDEP Profile I reference values would occur within the West and East WRSF or CGSF footprints (Piteau 2020a). The only exceedance of NDEP Profile I reference values that is expected to occur is for arsenic, which is the result of elevated background concentrations rather than infiltration from the WRSFs (Piteau 2020a). The sensitivity analysis confirms that no groundwater effects associated with the WRSFs are anticipated, even in the event that infiltration increases, or groundwater flow is reduced (Piteau 2020a).

Clay Tailings Filter Stack

The proposed design, operation, and closure for the CTFS are described in the Mine Plan (LNC 2019a) included in **Appendix B**, and in Section 2.2.5.11.

Final details regarding stabilization and closure of the facility would be developed at least 2 years prior to closure in accordance with the requirements of NAC 445A.350 through NAC 445A.447. Under the preliminary closure plans for the CTFS, the tailings would be covered with a compacted clay cap overlain by a layer of cover soil and revegetated. Initial drain down would be managed in the reclaim ponds. As the pond storage is reduced, the reclaim ponds would be converted to evaporation cells to manage any long-term seepage from the CTFS in accordance with NDEP and Nevada BLM Reclamation/Closure requirements such that closure of the facilities would not present the potential to degrade waters of the State. Based on the site conditions, and planned design, and operation and closure plans, effects to groundwater or surface water quality from construction, operation, and closure of the proposed CTFS are not anticipated.

Exploration Activities

Proposed exploration areas and exploration activities are summarized in Section 2.2.8. Under the Proposed Action, LNC would submit a plan describing exploration activities for the upcoming season (or as often as changes are made to the authorized work plan), including a map showing specific locations of drill sites, road alignments, water conveyance and storage, monitoring locations, or ancillary facilities, to the BLM prior to construction of drill sites or access roads. Water required for dust suppression and for drilling would be obtain water from the existing well located in the Project site or from the Quinn Production well located in the Quinn River Valley.

There are no perennial streams in the Exploration Plan boundary exploration areas (**Figure 4.3-1**). There is one perennial spring, SP-033 located in the western portion of the Southern Exploration area. All other springs and seeps identified in the Exploration area are classified as ephemeral or dry. The Northern Exploration area encompasses the lower, ephemeral reach of Pole Creek (Piteau 2019a 2020b). The eastern boundary of the Northern Exploration area extends to the lower section of Crowley Creek that flows seasonally (Piteau 2020a).

Exploration drill holes would be surveyed and plugged immediately after completion of drilling in accordance with NAC 534.421 and 534.425. Drill cuttings would be contained on site and fluids managed utilizing appropriate control measures. Stormwater BMPs will be used at exploration sites to minimize stormwater erosion. Exploration activities would avoid stream reaches, and would use existing roads that cross Pole Creek to avoid disturbance of the stream bed. Implementation of the water management plans as outlined in the Mine and Exploration Plans are expected to minimize effects to groundwater and surface water resources in the exploration areas.

Dust Suppression

Application of chemical treatments to suppress the generation of fugitive dust on access and haul roads may include the use of magnesium chloride. Water quality effects from the application of chemical treatments may occur along Thacker Creek and its tributaries although the severity of potential effects are diminished with increasing distance from roads.

4.3.1.2 Alternative B (Partial Pit Backfill)

4.3.1.2.1 Effects to Groundwater Levels

As described for the Proposed Action, effects to groundwater levels were evaluated using the results of the numerical modeling of the proposed mine development (Piteau 2020a). The areas predicted to experience a reduction of groundwater levels (or drawdown) resulting from Alternative B at the end of mining, 25-years, 50-years, 100-years, and 300-years post-mining are provided in **Figures 4.3-9, 4.3-10, 4.3-11, 4.3-12, and 4.3-13,** respectively (**Appendix A**).

The results of the modeling predict that at the end of mining (Year 2065) the drawdown would be similar to the Proposed Action with two separate, localized drawdown areas: one centered on the backfilled pit, and the second centered on the Quinn Production Well. For the backfilled pit area, the 10-foot drawdown contour extends up to a maximum of approximately 1.2 miles outside the backfilled pit perimeter. In contrast to the Proposed Action, in the post-closure period, the drawdown area is predicted to gradually expand in the areas to the south, and east of the pit. The areal extent of the predicted expansion of the drawdown area to the north in the post-mining period is similar to the prediction under the Proposed Action. The post-closure model simulations for the Quinn Production Well are identical to the Proposed Action.

The maximum areal extent of the 10-foot drawdown contour under the Partial Pit Backfill scenario (Alternative B) is presented on **Figure 4.3-14 (Appendix A)**. This figure shows the predicted outer limit of the 10-foot drawdown contour as determined by overlaying a series of 10-foot drawdown contours for representative points in time over the entire mining and 300-year post-mining

simulation period. The maximum area of drawdown (defined by the 10-foot contour) extends approximately 2.0 miles outside the pit perimeter; and encompasses a larger area than under the Proposed Action (Alternative A) (**Figure 4.3-21, Appendix A**).

4.3.1.2.2 Effects to Perennial Streams

Potential effects to perennial stream reaches would be similar to those described under the Proposed Action. There are no perennial stream reaches within or near the maximum extent of the projected drawdown areas (defined by the 10-foot drawdown contour) associated with the Proposed Action (**Figure 4.3-14, Appendix A**). Groundwater model simulations were used to evaluate potential effects to baseflow in the perennial stream reaches that occur in the project study area (i.e., Thacker Creek, Crowley Creek and Pole Creek) located outside the 10-foot drawdown contour (Figure 4.29, Piteau 2020a). The methodology and assumptions used for evaluating effects to baseflow are the same as described under the Proposed Action. The model simulations predict that drawdown would result in a small reduction in baseflow in Thacker Creek (i.e., approximately 5 percent); a negligible reduction in Crowley Creek (approximately 2 percent) and no reduction of flow in Pole Creek. The predicted reduction in baseflow for Thacker Creek (compared to the Proposed Action) is attributable to the increased sustained residual drawdown in the post-mining period resulting from the increased evapotranspiration of groundwater from the shallow groundwater and seasonal pond that would develop under the Partial Backfill alternative. This reduction in baseflow would result in a small reduction in baseflow into Thacker Pond. Reductions in baseflow to Thacker Creek (and reductions in flow into Thacker Pond) are not predicted to recover to pre-mining conditions during the post-mining period.

The model simulations predict that drawdown would have a negligible effect on baseflow (i.e., approximately 4.8 percent reduction in Thacker Creek, 3 percent reduction in Crowley Creek and less than 1 percent reduction in Pole Creek) in these perennial stream reaches. Therefore, mine related drawdown is not expected to result in a measurable effect to flows in Thacker Creek (or into Thacker Pond), Crowley Creek or Pole Creek.

4.3.1.2.3 Effects to Seeps and Springs

The locations of springs and seeps within the maximum extent of the drawdown areas (defined by the 10-foot contour) under the Partial Pit Backfill Alternative are shown on **Figure 4.3-14 (Appendix A)**. Three ephemeral springs (SP-001, SP-003, and SP-058) are located within the predicted drawdown area. Potential effects to these three sites would be the same as described under the Proposed Action.

There is also one developed and 11 perennial springs located outside of, but within one mile of, the maximum extent of the projected 10-foot groundwater drawdown contour (**Table 4.2)**. Changes in groundwater levels of less than 10 feet often are difficult to distinguish from natural seasonal and annual fluctuations in groundwater levels. The area located outside of, but within one mile of, the maximum extent of the 10-foot drawdown contour shown on **Figure 4.3-14 (Appendix A)** is used as a "buffer" to identify surface water resources that may be affected as a result of drawdowns of

less than 10 feet. Potential effects to perennial springs would be the same as described under the Proposed Action.

LNC has proposed monitoring groundwater levels between the open pit and springs and Pole Creek located north of the mine; and contingency mitigation measures (including flow augmentation and guzzlers) to minimize drawdown effects to perennial surface waters as summarized in Section 4.3.3. Implementation of the monitoring and mitigation plan is expected to detect and minimize effects to perennial surface water resources.

4.3.1.2.4 Effects to Water Rights

Water rights located within or near the predicted drawdown areas that would develop in the vicinity of the proposed open pit mine and Quinn Production Well are shown in **Figure 4.3-14 (Appendix A).** Potential effects to water rights are the same as Alternative A (Proposed Action).

Seasonal Pond Development

The numerical groundwater flow model developed for the proposed Project was used to predict the rate of groundwater recovery and seasonal pond development for the final open-pit configuration under the Partial Pit Backfill alternative. The model simulations predict the surface configuration of the backfilled pit would result in the development of an intermittent wet depression area in the South sub-pit. The intermittently wet area would develop on the backfill surface during winter and spring when evaporative demands are low and may develop surface water ponding. During summer months the water levels would decline below the backfill surface. Seasonal variation is anticipated to be less than one foot of the backfill surface (Piteau 2020a). The predicted average evapotranspiration from the wet area is approximately 56 gpm and would form a permanent hydraulic sink (**Table 4.3**) (Piteau 2020a).

Table 4.3. Predicted Seasonal Pond (Partial Pit Backfill) and Pit Lake Development (No Backfill Alternative) Summary

Alternative	Pit Lake or Seasonal Wetland	Pit Floor Elevation (deepest) (feet amsl)	Max. Lake Surface Elevation (feet amsl)	Max. Depth (feet)	Approximate Time to Reach Max. Elev. (years post-mining)	Average Annual Net Evaporation Rate 100 years Post-mining (gpm)	Groundwater Outflow (Yes/No)
No Backfill Alternative	North Sub-pit Lake	4,754	4,779	25	~ 80	29.6	Yes (to South Sub-pit)
No Backfill Alternative	West Sub-pit Lake	4,774	4,827	53	~ 80	37.8	Yes (to South Sub-pit)
No Backfill Alternative	South Sub-pit Lake	4,596	4,677	81	~ 80	56.7	No
Total						**124.1**	
Partial Pit Backfill	Seasonal Ponding –	4,709	Seasonal Ponding	-	~30	56.2	No

Alternative	Pit Lake or Seasonal Wetland	Pit Floor Elevation (deepest) (feet amsl)	Max. Lake Surface Elevation (feet amsl)	Max. Depth (feet)	Approximate Time to Reach Max. Elev. (years post-mining)	Average Annual Net Evaporation Rate 100 years Post-mining (gpm)	Groundwater Outflow (Yes/No)
	South Sub-pit						

Source: Piteau 2020a

Exploration Activities

Effects to water resources from exploration activities would be the same as described under the Proposed Action.

4.3.1.2.5 Water Quality

Seasonal Pond Water Quality

As described above, the surface configuration of the partially backfilled pit would result in the development of a seasonal wet area (or pond) in the South sub-pit (**Table 4.3**). The water quality of the intermittent wet or pond area was evaluated using a predictive geochemical model to predict water quality over a 300-year post-closure period. The results of the geochemistry modeling are provided in **Appendix P** (Table 5.26) of this EIS.

The predictive water quality results indicate that the ponded water would be moderately alkaline with pH ranging from 7.5-7.8. TDS concentrations (i.e., salinity) of the pit are predicted to gradually decrease from approximately 1,700 mg/L in Year 1 to 480 mg/L at Year 21, and then remain relatively steady (i.e., in the 460- to 480-mg/L range) for the remainder of the 300-year post-closure simulation period. The South Pit seasonal wetland pond is predicted to behave as a hydraulic sink (i.e., no groundwater outflow) such that the backfilled pore fluid and pond water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries.

Profile III reference values were developed by NDEP to screen pit lake water quality for possible further evaluation for possible risk of adverse effects to avian or terrestrial life through ingestion (NDEP 2018). Comparison of the predicted water quality in the South Pit seasonal wetland pond to NDEP Profile III reference values indicates concentrations of the constituents of concern in the seasonal pond are not projected to exceed their respective reference values over the post-mining simulation period. Therefore, adverse effects to avian or terrestrial life through ingestion are not anticipated.

Pit Backfill Outflow to Groundwater

The analysis methodology used to evaluate the potential effects to downgradient water quality resulting from outflow from the partially backfilled pit is the same as described under the Proposed Action. The predicted net equilibrium groundwater outflow (that would not be captured by flow into the South sub pit area) at equilibrium is 7.0 gpm for the North sub-pit area and 14.5 gpm for

the West sub-pit area (Piteau 2020a). No outflow is predicted from the South sub-pit area. Effects to water quality associated with outflow from the partially backfilled North and West sub-pit areas would be similar to those described under the Proposed Action.

WRSFs and CGSFs

Under the Partial Pit Backfill alternative, the disturbance footprint East and West WRSFs and CGSF would be the same as the Proposed Action. Therefore, the potential effects to water quality would be the same as described for the Proposed Action.

Clay Tailings Filter Stack

Potential effects to water resources resulting from the construction, operation and closure of the CTFS would be the same as described under the Proposed Action. Based on the site conditions, planned design, and operation and closure plan, effects to groundwater or surface water quality from construction, operation and closure of the proposed CTFS are not anticipated.

4.3.1.3 Alternative C (No Pit Backfill)

4.3.1.3.1 Effects to Groundwater Levels

As described for the Proposed Action, effects to groundwater levels were evaluated using the results of the numerical modeling of the proposed mine development (Piteau 2020a). The areas predicted to experience a reduction of groundwater levels (or drawdown) resulting from the No Backfill at the end of mining, 25-years, 50-years, 100-years, and 300-years post-mining are provided in **Figures 4.3-15, 4.3-16, 4.3-17, 4.3-18, and 4.3-19,** respectively (**Appendix A**).

The results of the modeling predict that at the end of mining (Year 2065) the drawdown would be similar to the Proposed Action with two separate, localized drawdown areas: one centered on the open pit area, and the second centered on the Quinn Production Well. For the open pit area, the 10-foot drawdown contour extends up to a maximum of approximately 1.1 miles outside the pit perimeter at the end of mining. In contrast to the Proposed Action, in the post-closure period, the drawdown area is predicted to gradually expand in the areas to the west, south and east. The areal extent of the predicted expansion of the drawdown area to the north in the post-mining period is also predicted to expand further to the north than under the Proposed Action. The post-closure model simulations for the Quinn Production Well are identical to the Proposed Action.

The maximum areal extent of the 10-foot drawdown contour under the No Pit Backfill scenario is presented on **Figure 4.3-20 (Appendix A)**. The maximum area of drawdown extends up to 2.7 miles outside the pit perimeter and encompasses a larger area than predicted under both the Proposed Action (Alternative A), and Partial Pit Backfill (Alternative B) (**Figure 4.3-21, Appendix A**).

4.3.1.3.2 Effects to Perennial Streams

There are no perennial stream reaches within or near the maximum extent of the projected drawdown areas (defined by the 10-foot drawdown contour) associated with the No Pit Backfill scenario (**Figure 4.3-19, Appendix A**). The methodology and assumptions used for evaluating effects to baseflow are the same as described under the Proposed Action. The model simulations

predict that drawdown would result in a small reduction in baseflow in Thacker Creek (i.e., approximately 8 percent); a negligible reduction (approximately 1 percent) in Crowley Creek; and no reduction of flow in Pole Creek (**Figure 4.19, Appendix A**) (Piteau 2020a). The predicted reduction in baseflow for Thacker Creek (compared to the Proposed Action) is attributable to the increased sustained residual drawdown in the post mining period resulting from the increased evaporation of groundwater from the pit lakes that would develop under the No Backfill alternative. This reduction in baseflow would like result in a small reduction in baseflow into Thacker Pond. Reductions in baseflow to Thacker Creek (and reductions in flow into Thacker Pond) are not predicted to recover to pre-mining conditions during the post-mining period.

4.3.1.3.3 Effects to Seeps and Springs

The locations of springs and seeps within the maximum extent of the drawdown areas (defined by the 10-foot contour) under the No Backfill Alternative are shown on **Figure 4.3-19 (Appendix A)**. Ten springs (SP-001, SP-002, SP-003, SP-008, SP-015 SP-033, SP-058, SP-059, SP-060, and SP-061) are located within the maximum extent of the 10-foot drawdown contour. SP-059 is a man-made livestock water feature that would be covered by the East WRSF. The remaining springs identified in the 10-drawdown contour are characterized as "dry" or "ephemeral" and are controlled by runoff. Therefore, springs characterized as dry or ephemeral are not expected to be affected by groundwater drawdown.

SP-033 is a perennial spring that is likely controlled by discharge from the groundwater flow system. SP-008 is a developed spring that may be controlled in part by groundwater discharge. There are also 14 additional perennial springs located outside of, but within one mile of, the maximum extent of the projected 10-foot groundwater drawdown contour (**Table 4.2**) as shown on **Figure 4.3-19 (Appendix A).** Potential effects to perennial springs would be the same as described under the Proposed Action. Springs with baseflow that are affected by the expansion of the drawdown area during the post-closure period would not likely recover for the foreseeable future.

LNC has proposed monitoring groundwater levels between the open pit and springs and Pole Creek located north of the mine; and contingency mitigation measures to minimize drawdown effects to perennial surface waters as summarized in Section 4.3.3. Implementation of the monitoring and mitigation plan is expected to detect and minimize effects to perennial surface water resources.

4.3.1.3.4 Effects to Water Rights

Water rights located within or near the predicted drawdown areas that would develop in the vicinity of the proposed open pit mine and Quinn Production Well are shown in **Figure 4.3-19 (Appendix A).** Two water rights, Map ID #54 and #56, occur within the maximum extent of the drawdown area associated with the open pit. These two water rights are both vested water rights owned by a private party that are used for stock watering. Map ID # 54 is located within close proximity to a developed spring (SP-008); and, ID #56 is located near SP-044 characterized as an ephemeral spring. The projected groundwater drawdown from the mine development may affect

water right #54; but is unlikely to affect the ephemeral spring that appears to be the source of water for water right #56. Potential drawdown impacts to surface water rights would be the same as described for springs under the Proposed Action.

Potential effects to water rights located within the projected drawdown associated with the Quinn Production Well would be the same as Alternative A (Proposed Action).

Pit Lake Development

The numerical groundwater flow model developed for the proposed Project was used to predict the rate of recovery and pit lake development for the final open-pit configuration under the No backfill alternative. The pit would include three sub-pits incorporated into the overall open-pit boundary that are referred to as the West, North, and South sub-pits.

As summarized in **Table 4.3**, three separate pit lakes (i.e., West, North and South Pit Lake) are predicted to develop after mining ceases as a result of passive inflow of groundwater (see Figure 4.22, Piteau 2020a, included in **Appendix P** of this EIS). The pit lakes are predicted to reach equilibrium approximately 80 years after mining ceases. The North and West Pit Lakes are predicted to be flow through system with all of the discharge from the North Pit Lake, and most of the discharge from the West Pit Lake being captured by the South Pit Lake. The small amount (approximately 1.1 gpm) of flow from the West Pit Lake that does not report to the South Pit Lake is predicted to flow towards the west. The South Pit Lake is predicted to behave as a hydraulic sink. At equilibrium, the predicted cumulative average evaporation rate would be approximately 124 gpm.

Exploration Activities

Effects to water resources from exploration activities would be the same as described under the Proposed Action.

4.3.1.3.5 Water Quality

Pit Lake Water Quality

As summarized in **Table 4.3**, three separate pit lakes (i.e., West Pit Lake, North Pit Lake, and South Pit Lake) are predicted to develop and persist over the post-closure period. The water quality of the three pit lakes was evaluated using a predictive geochemical model developed for each pit lake. The model was used to predict lake water quality during filling and equilibrium conditions over a 300-year post-closure period. The results of the geochemistry modeling are provided in Piteau 2020a that is included in **Appendix P** of this EIS.

The water quality results indicate that all three pit lakes are predicted to be moderately alkaline with pH ranging from 7.7-8.0 with the alkalinity predicted to gradually increase over the simulated post-closure period. The North and West Pit Lakes are predicted to be flow-through systems with nearly all of the flow captured in the South Pit Lake. The TDS concentrations (i.e., salinity) of the pit are predicted to range from approximately 1,300- to 2,400-mg/L for the North Pit Lake; and, 480- to 2,100-mg/L in the West Pit Lake with the concentrations predicted to gradually decrease after the early stage filling (i.e., first 10-20 years). The South Pit Lake is predicted to behave as a

hydraulic sink (i.e., no groundwater outflow) such that the pit lake water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries. After the lake level in the South Pit Lake reaches equilibrium, groundwater would continue to flow into the pits to replace water lost by evaporation, and the solutes in the water would accumulate over time through evapoconcentration. As a result, the salinity of the South Pit Lake is predicted to steadily increase from approximately 1,100 mg/L at Year 1 to approximately 4,300 mg/L at Year 300.

Comparison of the predicted pit lake water quality to NDEP Profile III reference values indicates concentrations of arsenic, fluoride, molybdenum, and vanadium are projected to exceed their respective reference values in the North, West and South Pit lakes at some point over the post-mining simulation period. Concentrations of antimony are also predicted to exceed the NDEP Profile III reference values for the South Pit Lake. An Ecological Risk Assessment (ERA) was used to evaluate risk to terrestrial and avian life from potable consumption and interaction with the pit lake water quality. The results of the ERA and the evaluation of potential effects to terrestrial and avian life are summarized in the Section 4.5, *Wildlife and Special Status Species including Migratory Birds*.

Pit Lake Outflow to Groundwater

Pit lake water from the North and South Pit Lake is not predicted to discharge to the groundwater system. Therefore, pit water quality from the North and South Pit lakes is not predicted to result in effects to surface or groundwater quality beyond the pit boundaries. However, the model predicts a small amount of outflow from the West Pit Lake into the groundwater system. The geochemistry modeling indicates that this outflow to the groundwater system would have concentrations of antimony, arsenic, fluoride, manganese, molybdenum, sulfate, TDS that would exceed the NDEP Profile I reference values. Although outflow from the West Pit Lake would have the potential to degrade groundwater quality, it is unlikely that this small amount of flow (1.1 gpm) would result in measurable degradation (new exceedances of groundwater quality standards) at a compliance point located downgradient of the pit. Therefore, effects to groundwater quality resulting from the potential outflow from the West Pit Lake are not anticipated.

Waste Rock Storage and Coarse Gangue Storage Facilities

Under the No Pit Backfill Alternative, all of the waste rock and coarse gangue material would be stored outside of the pit. Compared to the Proposed Action, the disturbance footprint of the East WRSF would be expanded to accommodate the permanent storage of an additional 207.2 million cubic years of material. The East WRSF would be used for the disposal of both waste rock and coarse gangue material. The WRSFs would directly overlie native clay soils. During reclamation, the slopes of the facilities would be regraded to 3.5:1 and covered with a 12-inch thick layer of growth media and vegetated cover designed to capture water and reduce infiltration through the facilities. Effects to groundwater quality are expected to be similar to those described for the Proposed Action.

Clay Tailings Filter Stack

Potential effects to water resources resulting from the construction, operation and closure of the CTFS would be the same as described under the Proposed Action. Based on the site conditions, planned design, and operation and closure plan, effects to groundwater or surface water quality from construction, operation and closure of the proposed CTFS are not anticipated.

4.3.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.3.2 Recommended Mitigation and Monitoring

LNC has prepared a proposed monitoring and mitigation plan to address potential effects to surface and groundwater resources from the Proposed Action. The monitoring plan is included in the Thacker Pass Project, Water Quantity and Quality Impacts Report-Addendum I (Piteau 2020a) that is included in **Appendix P** to this EIS. Key elements of the monitoring and mitigation plan are briefly summarized below (see **Appendix P** for additional detail):

- Monitor groundwater levels between the Thacker Pass open pit and water resources in the Montana Mountains (springs and Pole Creek) during and after mining operations. Groundwater monitoring would serve as a warning system to trigger potential supplemental water mitigation to affected surface water features.
- Provide for flow augmentation if necessary to offset unanticipated effects to perennial surface water features located in the southern portion of the Montana Mountains (north of the pit).
- Monitor groundwater quality down-gradient of the Proposed Action backfilled pit and mine facilities.
- Provides mitigation options in the event that antimony concentrations exceed the Nevada Drinking Water Standards at downgradient compliance points. Options include measures to capture and treat the contaminated groundwater including groundwater extraction (i.e., pumping) at the downgradient compliance point; extraction of pore water from the backfill (i.e., source control); and treatment options to manage contaminated water from extraction wells. Other possible measures to mitigate the potential for groundwater contamination include modifying the open pit closure design to include a wetland in the South sub-pit to function as a hydraulic sink; and, adding an amendment to the backfill to mitigate antimony mobilization.

The following additional BLM recommended monitoring and mitigation measures would apply to the Proposed Action (Alternative A), and Alternative B and C.

Issue WR1: Mine induced drawdown of groundwater levels could affect baseflow in perennial springs or streams located in the area affected by drawdown. Perennial surface water resources located either: (1) within the predicted maximum extent of the 10-foot drawdown contour; or

(2) within the one-mile buffer zone located outside the 10-foot drawdown contour are listed in **Table 4.2** for each of the action alternatives.

Monitoring and Mitigation Measure WR1: LNC would expand the monitoring and mitigation plan to include quarterly monitoring of flow at all of the identified perennial spring sites identified by alternative in **Table 4.2**. Effects to flow at any perennial surface water site that is attributable to the mine-induced drawdown would be mitigated in accordance with the measures specified for the LNC monitoring and mitigation plan; or required by BLM through an adaptive management process as outlined below. A draft of the comprehensive water resources monitoring plan would be provided by LNC to the BLM, NDWR, and NDOW for review and approval prior to project initiation. LNC would be responsible for continued monitoring and reporting of changes in groundwater levels and surface water flows throughout the life of the project and for a period of time in the post-reclamation period as described below.

LNC would provide the results of the surface and groundwater monitoring in an annual report to the BLM and NDWR. The report would describe any deviations from the original predictions, evaluate if changes in surface flow are attributable to mine-induced drawdown and propose modifications to the monitoring plan, as necessary. LNC would provide a detailed, site-specific plan to mitigate any affected perennial water source.

The BLM would use an adaptive management approach to modify and adjust the monitoring program or implement any necessary water resource related mitigation measures that may be required to minimize effects to surface water or groundwater resources attributable to the Thacker Project. To assist in this effort, the BLM would organize and manage a Water Resources Technical Advisory Group (WRTAG) for the life of the project that would include water resource specialist from the BLM and LNC's water resource consultant, and may include water resource specialists from other state and federal agencies, as directed by the BLM. The WRTAG would be responsible for annual reviews of water resources monitoring results; and, establishing reasonable mitigation trigger thresholds. The WRTAG would also be responsible for providing recommendations for (1) the design and implementation of any modifications to the monitoring plan; (2) site-specific mitigation plans; or (3) modifications to any implemented mitigation measures, if necessary. The design of the monitoring and mitigation plans and recommendations from the WRTAG would allow for the BLM to require reasonable modifications and adjustments to monitoring locations and mitigation plans over the project life to account for the results of monitoring and updated groundwater model predictions. Monitoring and any necessary mitigation would continue during the post-closure period for as long as necessary (as determined by the BLM and NDWR) during the closure and post-closure period to track drawdown and potential effects to surface water resources. In the event that flow augmentation is required to sustain a minimum baseflow in a spring or stream that is impacted by drawdown, LNC would be responsible for providing the required flow rate under their existing (or future) water rights.

Effectiveness: The adaptive management approach outlined in WR1 is appropriate for the project because this is a new project and there are acknowledged uncertainties associated with the groundwater model predictions. Monitoring during the early stages of the project would provide

opportunities to refine the understanding of the groundwater and surface water system in advance of when the open pit is expected to encounter groundwater (approximately Year 2035). The groundwater monitoring network (that would include monitoring locations between the project and perennial water sources) would provide an early warning system for detecting the propagation of drawdown towards sensitive perennial water sources and allow for the early implementation of appropriate mitigation measures as specified in the LNC Monitoring and Mitigation Plan or as required by the BLM through the adaptive management process. These monitoring and mitigation measures are expected to be effective at detecting and mitigating potential adverse impacts to baseflow in perennial springs and streams.

Issue WR2: There is uncertainty regarding the groundwater modeling predictions.

Mitigation Measure WR2, Numerical Groundwater Flow Modeling Requirements. The groundwater model developed for the project would be updated and recalibrated at least every 5 years or sooner if the BLM identifies major differences between the model simulations and monitoring results and determines that model recalibration is necessary. The model updates and recalibration would be based on the actual observed changes in groundwater elevation and additional hydrogeologic, surface water, and groundwater-related data collected during operation.

Effectiveness: It is anticipated that BLM's annual review of monitoring results combined with the updated groundwater modeling predictions would provide early warning of potentially undesirable (and unanticipated) impacts to water-dependent resources to allow for possible implementation of appropriate adaptive management measures to mitigate their effects. Implementation of these measures would likely reduce or minimize potential impacts to water dependent resources.

Issue WR3: Groundwater outflow from the pit backfill is predicted to contain antimony at concentrations that would exceed the Nevada Primary Drinking Water Standard and migrate up to approximately one-mile from the backfilled pit. LNC has proposed groundwater quality monitoring downgradient of the backfilled pit coupled with mitigation options (Piteau 2020a included in **Appendix P** to this EIS) in the event that antimony concentrations exceed the Nevada Primary Drinking Water Standard at downgradient compliance points.

Mitigation WR-3, Groundwater Quality Monitoring and Groundwater Quality Management Plans. LNC would submit a comprehensive groundwater quality monitoring plan to the BLM and NDEP for review and approval prior to commencement of mining. The plan would include compliance monitoring points, a list of constituents to be monitored; sampling frequency; and reporting requirements. LNC would be responsible for continued monitoring and reporting of changes in groundwater quality during mining operations and for a period of time in the post-reclamation period as required or approved by the BLM and NDEP. The results of the groundwater quality monitoring would be provided in an annual report submitted to the BLM and NDEP. In the event that constituent concentrations exceed established regulatory thresholds at one or more established compliance monitoring points, and the exceedance is attributable to contamination originating from mine facilities or operations, LNC would provide the BLM and NDEP with a groundwater quality management plan for review and approval. LNC would be responsible for

implementation of any approved groundwater quality management plans; and any required supplemental verification monitoring.

Effectiveness: Implementation of the BLM and NDEP approved groundwater quality monitoring plan, and groundwater quality management plans that may be required during the operation or closure period is expected to effectively mitigate impacts to groundwater quality downgradient from the pit.

Issue WR4: Project induced drawdown could reduce flow at the point of diversion for surface water rights, or reduce water levels in water supply wells.

WR-4 Water Rights Monitoring and Mitigation: The mine operator would be responsible for monitoring groundwater levels between the model simulated mine-induced drawdown areas (associated with the open pit and production water supply wells) and surface water rights and groundwater rights located within the model predicted drawdown areas or 1-mile buffer areas as part of the water resources monitoring program (Monitoring Measure WR1). Adverse impacts to water rights would be mitigated, as required by the NDWR. Mitigation for impacts to water rights would depend on the actual impacts and site-specific conditions and could include a variety of measures as determined by the NDWR. Methods for addressing impacts to water rights may include but would not be limited to the following:

- 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 require providing a replacement water supply of equivalent yield and general water quality.

Effectiveness: Mitigation for impacts to water rights would be addressed on a case-by-case basis as determined by the NDWR. Implementation of appropriate mitigation measures required by NDWR would likely effectively mitigate impacts to water rights in accordance with applicable state laws addressing protection of existing water rights.

4.3.3 Residual Effects

Successful implementation of applicant committed monitoring and mitigation measures and BLM recommended monitoring and mitigation measures would minimize or eliminate most residual effects. However, as described above, an area of residual mine-related groundwater drawdown is predicted to persist for the foreseeable future around the pit. This is considered an unavoidable residual effect to the water table around the pit. Pumping from the Quinn Production Well (and backup well) could result in a reduction in groundwater discharge to evapotranspiration (ET) areas located within the drawdown area. Areas effected by reductions in ET resulting from production well(s) induced drawdown are expected to recover after pumping ceases and groundwater levels rebound to pre-development conditions. It may not be feasible to mitigate all impacts to ET areas resulting from the reduction in groundwater discharge. Therefore, reductions in ET areas (located

within the production well drawdown area) is a potential unavoidable residual impact associate with groundwater pumping required to meet the water demands for the project.

4.4 VEGETATION AND WETLANDS

4.4.1 Issue – Ground Disturbance

4.4.1.1 Alternative A (Proposed Action – Preferred Alternative)

Alternative A would result in a Mine Plan boundary of 10,468 acres with 5,545 acres of surface disturbance. The Exploration Plan boundary would be an additional 7,465 acres; 1,589 acres represents the North Exploration area and 5,876 acres represents the South Exploration area. Exploration related surface disturbance is estimated to total 150 acres.

Vegetation

Direct effects on vegetation under the Proposed Action would include reduction of vegetation cover, forage production, and wildlife habitat from the disturbance and removal of vegetation, plant mortality, invasive plant species and noxious weed establishment and spread, trampling and/or clearing of aboveground vegetation and removal of vegetation substrate (topsoil and subsoil) during construction and operation of Project related activities. Short-and long-term effects would occur in areas where vegetation is disturbed or removed during construction and operation. Reclamation would minimize long-term effects on vegetation resources by reestablishing vegetation in disturbed areas; however, long-term effects on vegetation community composition and structure would likely persist after reclamation, especially in sagebrush communities where it would take up to several decades for pre-disturbance sagebrush vegetation community characteristics to return.

Table 4.4. Disturbance Acreages within Landcover Sites

Landcover	Disturbance Acres[1]	Percentage
Great Basin Xeric Mixed Sagebrush Shrubland	19.9	0.4
Inter-Mountain Basins Big Sagebrush Shrubland	2,866.1	53.1
Inter-Mountain Basins Cliff and Canyon	323.4	6.0
Inter-Mountain Basins Greasewood Flat	5.5	0.1
Inter-Mountain Basins Mixed Salt Desert Scrub	201.8	3.7
Inter-Mountain Basins Semi-Desert Grassland	8.0	0.1
Inter-Mountain Basins Semi-Desert Shrub Steppe	17.3	0.3
Invasive Annual Biennial Forbland	746.2	13.8
Invasive Annual Grassland	1,206.6	22.4
Total	**5,394.9[2]**	**100.0**

[1] Clay tailings, filter stack, coarse gangue stockpile, emergency pond, GMS, mine facilities, pit, reclaim pond, ROM ore stockpile, sediment pond, septic system, WRSF, and other disturbance.
[2] Does not include the 150 acres in the exploration areas.

Effects on vegetation from mine construction, mining operations and exploration activities would result in indirect effects on vegetation. Indirect effects occur individually or in conjunction with other indirect effects. Multiple project-related activities would likely cause indirect effects, including the following:

- Reduced photosynthesis, lowered respiration, and inhibited pollination from fugitive dust (Farmer 1993; McCrea 1984; Thompson et al. 1984);
- Accidental spills of fuels, lubricants, or other chemicals harmful to vegetation, and drift from dust suppressants (Goodrich et al. 2008);
- Increased soil erosion and risk for invasive plant species and noxious weed establishment resulting from the removal of vegetation;
- Changes in plant community composition, diversity, and structure from the removal and reclamation of native plant communities; unsuccessful reclamation; and removal of vegetation would cause increased soil erosion, which would result in short-term sediment and dust transport and deposition;
- Increased risk of human-caused wildland fire from increased public access and project-related mine operation activities, resulting in changes in plant community composition, diversity, and structure of plant community from the removal and reclamation or possible unsuccessful reclamation of native plant communities.

Long-term effects would result from indirect effects on vegetation. Increased risk for long-term indirect effects would occur in:

- Mine operations and facilities to include pits and stockpiles, haul roads and overhead power line poles;
- Reclaimed and undisturbed areas adjacent to long-term project features;
- Disturbed and reclaimed areas with sodic, alkaline, shallow, high coarse fragment content and/or high erosion potential soils or other low reclamation potential (LRP) characteristics; and/or
- Disturbed areas where soil characteristics and seedbanks have been altered by existing invasive plant species and noxious weed populations prior to surface disturbance.

Short and long-term vegetation disturbance and short-term (phased) vegetation removal and concurrent reclamation would result in reduced vegetation cover and production. Successful interim reclamation would limit the extent of short-term reductions in vegetation cover and production. Long-term reductions would likely occur within the mine operations boundary to include facilities, stockpiles and pits, haul roads, reclaimed areas adjacent to roads and in reclaimed areas with limited reclamation potential.

Plant communities recover at varying rates and relative to pre-disturbance site conditions and the magnitude of disturbance. Effects on plant community composition and structure in shrub dominated plant communities resulting from surface disturbance (including fire), reclamation, and in areas adjacent to both would be long term because of the slow growth rate of these life forms.

Long-term composition and structure changes could occur as a result of low precipitation, limiting physical and chemical soil properties, and repeated disturbance that prevent successful reclamation. Changes in diversity would be long term because of limited diversity of reclamation seed mixes and the slow rate of plant encroachment from surrounding undisturbed areas.

Wetland and Riparian Areas

In addition to direct effects on vegetation within riparian areas and wetlands as discussed in the section above, the following indirect effects would likely also occur to wetlands and riparian areas where construction and implementation of mining operations would occur:

- Alteration of hydrologic processes from project-related features, mine operations, and soil compaction.
- Altered surface water runoff patterns.
- Localized alteration in surface water hydrology would likely result in reduced water availability to downstream features. Culvert placement associated with access roads would result in diverted and concentrated surface water flows. Alterations of riparian areas and wetlands would occur when surface water has been diverted from riparian areas and wetlands because of culvert placement.
- Mining operations and creation of the pit would result in dewatering of subsurface hydrology sources for the wetlands and riparian areas. This would also affect springs located within the Project area and outside the Project area that could be contributing to the hydrology of the wetlands and riparian areas.
- Surface disturbance of uplands would result in increased surface flows contributing sediment and debris into riparian areas and wetlands. However, proper implementation of stormwater pollution prevention plans (see Thacker Pass Project – Plan of Operations and Reclamation Plan) would reduce the amount of sedimentation reaching a stream channel or wetland area. Effects on riparian areas and wetlands resulting from increased sediment and debris loading likely would be long term.

Potential groundwater effects under the Alternative A could result in a lowering of the local groundwater table as discussed in Section 4.3.1.1.1, *Water Quantity*. Table 4.5 presents the acreages of wetland areas located within the anticipated maxim 10-foot groundwater drawdown area that could be adversely affected.

Table 4.5. Acreages of Wetlands within the Anticipated Maximum 10-foot Drawdown Contour Area

Alternative	Wetland Acres within the Maximum 10-foot Drawdown Area
Alternative A (Proposed Action)	0.55
Alternative B (Partial Pit Backfill)	0.76
Alternative C (No Pit Backfill)	1.14
Alternative D (No Action)	0

Source: Redhorse 2018

4.4.1.2 Alternative B (Partial Pit Backfill)

Vegetation

Effects to vegetation from surface disturbance and project facilities under Alternative B would include those described under the Proposed Action except for the partial backfilling of the South Pit resulting in the creation of a wetland area. Reclamation of the South Pit interior may be a challenge due to lack of proper amounts of topsoil due to removal and the sheer steepness of the post mining slope (SRK 2020a). Providing a suitable seedbed for plant germination and controlling erosion of the pit interior would be determining factors of vegetation reclamation success.

Wetland and Riparian Areas

Effects to wetland and riparian areas from surface disturbance and project facilities under Alternative B would include those described under the Proposed Action except the partial backfilling of the South Pit resulting in the creation of a wetland area. The creation of wetland and riparian areas by allowing water to pond may result in the development of wetland characteristics; hydrophytic vegetation, hydric soils, and wetland hydrology.

The partial backfilling of the South Pit is expected to balance pit inflows with evaporative and transpirative losses resulting in little to no surface water (SRK 2020a). The pit walls in areas where backfill is not placed may hinder development of wetland or riparian vegetation.

4.4.1.3 Alternative C (No Pit Backfill)

Vegetation

Under Alternative C, construction and operation of the Project would include an addition of 482 acres surface disturbance. The additional 482 acres of disturbance would occur primarily in shrubland and introduced annual-dominated grassland vegetation communities.

Under Alternative C, the West, North, and South Pits permanent pit lakes would develop. This would result in a permanent loss of pre-mining vegetation communities since the three pit lakes would not be reclaimed to pre-mining land features. Providing a suitable seedbed for plant germination and controlling erosion of the pit interior would be determining factors of vegetation reclamation success.

Wetland and Riparian Areas

Under Alternative C, the West, North, and South Pits permanent pit lakes would develop. Wetland and riparian characteristics may develop within the pit lakes by allowing water to pond resulting in the development of wetland characteristics; hydrophytic vegetation, hydric soils, and wetland hydrology.

4.4.1.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the Project and there would be no effects to vegetation, wetlands, or riparian areas, other than those related to the reclamation of existing disturbance under previous authorizations.

4.4.2 Issue – Water Quality and Quantity

4.4.2.1 Alternative A (Proposed Action – Preferred Alternative)

In addition to direct and indirect impacts on vegetation and riparian areas and wetlands as discussed above, the following impacts would likely also occur where construction and implementation of mining operations will occur:

- Localized alternations in surface water hydrology would likely result in reduced water availability to downstream features.
- Alternations of riparian areas and wetlands would occur when surface water has been diverted from riparian areas and wetlands because of culvert placement.
- Mining operations and creation of the pit would result in dewatering of subsurface hydrology sources for the wetlands and riparian areas. This would also affect the springs located within the Project area that could be contributing to the hydrology of the wetlands and riparian areas.
- Groundwater drawdown would affect evapotranspiration rates of the vegetation at the Project area and would likely result in changes in the current vegetation communities (Cooper et.al. 2005).
- Groundwater drawdown and surface water hydrology changes in the wetland and riparian areas would likely result in vegetation changes from hydrophytic to upland vegetation encroachment (Cooper et.al. 2005).
- Drought tolerant plants in the Project area may not be affected by groundwater or surface water changes (Cooper et.al. 2005).

4.4.2.2 Alternative B (Partial Pit Backfill)

Effects to vegetation and riparian areas and wetlands under Alternative B are anticipated to be the same as described under Alternative A (Proposed Action), with the exception of the development of an ephemeral wetland. This wetland would be established in the southeastern portion of the pit with the seasonal ponding of water in this area. The artificially created wetland would act as a hydrologic sink over the long term. Water quality in the South Pit wetland could be degraded and may adversely affect living organisms exposed to surface water that may pool in the wetland. Groundwater quality could also be adversely affected though increase infiltration in the exposed pit areas.

4.4.2.3 Alternative C (No Pit Backfill)

Effects to vegetation and riparian areas and wetlands under Alternative C are anticipated to be the same as described under Alternative A (Proposed Action), with the exception of the creation of three pit lakes. The development of the pit lakes is the result of not backfilling the West, North, and East Pits. The pit lakes would remain open and become a permanent part of the landscape. The North and West Pit Lakes would be flow-through pit lakes and the South Pit would be a hydrologic sink. Pit lake water quality would result in NDEP Profile III exceedances for fluorine and molybdenum.

4.4.2.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the Project and there would be no impacts to vegetation, wetlands, or riparian areas, other than those related to the reclamation of existing disturbance under previous authorizations.

4.4.3 Recommended Mitigation and Monitoring

No additional mitigation measures are proposed beyond the best management practices committed to by the applicant in the mine plan and other supporting documents.

4.4.4 Residual Effects

Vegetation

Residual effects on vegetation within the Project area include the direct and indirect effects from Project area activities as described in sections 4.4.1 and 4.4.2 above.

In general, these effects would result from activities that remove vegetation, change plant community composition, increase fugitive dust, increase habitat fragmentation, and increase invasive plant and noxious weed establishment and spread. Fragmentation of plant species could result in lowering plant reproductive capabilities.

Activities primarily associated with livestock forage production, wildlife usage, recreation, and mineral exploration and development would continue to affect vegetation in the cumulative effects area.

Wetland and Riparian Areas

Residual effects on wetland and riparian areas in the Project area and areas downstream from the Project area would result from activities that disturb or alter wetland and riparian areas. The residual effects on wetlands and riparian areas would be similar in nature to the direct and indirect effects described in sections 4.4.1 and 4.4.2 above.

Activities primarily associated with livestock forage production, wildlife usage, recreation, and mineral exploration and development would continue to affect wetland and riparian areas in the cumulative effects area.

4.5 WILDLIFE AND SPECIAL STATUS SPECIES, INCLUDING MIGRATORY BIRDS

This section presents and compares the potential effects on general wildlife (terrestrial and aquatic) and special status wildlife species that could result from implementation of the Alternatives. This analysis is focused on specific issues that were determined through the scoping process and in consultation with the BLM, NDOW, and USFWS, and as summarized in Section 4.1.

Applicant Committed Design Features

LNC would commit to best management practices (BMPs) and Applicant Committed Design Features (ACDFs) to prevent unnecessary and undue degradation during the life of the Project.

ACDFs and BMPs are described in the Mine Plan and Exploration Plan (LNC 2019a; 2019b). In addition, LNC has developed a Bird and Bat Conservation Strategy (BBCS) (Cedar Creek 2020a) and an Eagle Conservation Plan (ECP) (Cedar Creek 2020b) that it would implement for the Mine and Exploration Plans to ensure that appropriate environmental protection measures are adequately developed to minimize risks to bats and avian species, including Golden Eagles. The practices are derived from the general requirements established in the BLM's surface management regulations at 43 CFR § 3809 and NDEP Bureau of Mining Regulation and Reclamation mining reclamation regulations, as well as other regulations and guidance documents, including the Golden Eagle Protection Best Practices for the Nevada Mineral Exploration and Mining Industry (NVMA 2018) and 2018 Nevada Greater Sage-grouse Conservation Plan (SEC 2018). These measures are to be considered part of the operating plan and procedures.

The magnitude and spatial extent of effects to wildlife would be minimized, and in some cases avoided, by LNC's proposed ACDFs. The proposed ACDFs were incorporated into the following effects analysis.

4.5.1 Issues – Ground Disturbance and Project Infrastructure

4.5.1.1 Alternative A (Proposed Action – Preferred Alternative)

Under the Proposed Action, ground disturbance would total approximately 5,695 acres of new surface disturbance, including up to 150 acres for exploration purposes. Total disturbance would not occur at once, but would incrementally increase as mine development occurs over the 41-year life-of-mine.

Surface disturbance associated with mining activities and development of mine facilities, including the open pits, WRSF, CGS and GMSs, CTFS, process plant and ancillary facilities, and roads, water lines, and power lines would directly affect wildlife through the loss of potentially suitable habitat by vegetation removal, and removal of seeps and springs and seasonal water sources for wildlife. For some species, disturbance would remove available habitat for the life of the mine, or longer depending on the success of reclamation. Habitat loss or alteration would result in direct losses of some species, particularly smaller, less mobile species, or species requiring specific resources or habitat within the Project area. Habitat loss could cause displacement of more mobile species (e.g., bats, birds), or generalist species into adjacent habitats. Most disturbance would occur within sagebrush communities, shrublands (e.g., greasewood, saltbush), native grassland, and invasive annual-dominated vegetation **(Figure 4.5-2, Appendix A)**.

Surface disturbance would also result in habitat fragmentation. Habitat fragmentation can affect species use of the area by reducing the landscape size for species that require large breeding or foraging ranges, increasing barriers to migration or movement, changing abiotic and biotic factors making the habitat less suitable, and reducing access to resources and potential mates. More mobile species may be able to move adjacent habitats as a result of habitat fragmentation. This displacement could result in the indirect effect of increased inter- and intraspecies competition for resources, and increased predation, potentially leading to population decline.

Under the Proposed Action, exploration activities would occur as needed throughout the operational phase of the mine in the north and south Exploration Plan areas as described in Section 2.2.8, *Exploration*. Exploratory drilling or activity could occur at any location within the exploration areas at any time during the day or night.

Mining activities and facility construction would disturb wildlife year-round through increased human presence, noise, and dust production. The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance acreage footprint. After initial avoidance of human activity and noise-generating activities, some species may acclimate to the activities and begin to reoccupy areas formerly avoided. The effects of noise on wildlife are discussed further under Section 4.5.2, *Noise*.

Habitat loss for most species would be sustained over the life of the Project, or longer depending on the success of reclamation. Some species may be able to utilize concurrent reclamation areas, but others would be restricted due to factors such as human avoidance, noise or exclusionary fencing. Revegetation of disturbed areas may prove challenging in the arid northwestern Nevada climate, and loss of certain habitats may be permanent or extend far beyond final reclamation. Goals and objectives of reclamation are outlined in Section 2.2.1. Refer to **Appendix B** for the Project's Reclamation Plan.

Other direct effects to wildlife under the Proposed Action include potential mortality from vehicular collisions associated with increased traffic on SR 293 and on new access roads within the Project area, crushing from construction vehicles and equipment, and abandonment of eggs or young due to increased noise or loss of habitat. Direct mortality associated with collisions would be more frequent for young individuals, or low mobility species, and during migration or breeding seasons, which would vary depending on the species.

Installation of transmission structures would follow Avian Power Line Interaction Committee (APLIC) guidelines and would minimize risk of potential mortality due to collision or electrocution with structures. The installation of transmission lines also increases the risk of predation for some smaller wildlife and rodent species by providing perching structures for raptors. Following Project decommissioning, elevated structures including utility poles would be removed from the Project site to avoid creation of perch structures.

LNC's BBCS includes ACDFs to minimize risks for mortality or injury from exposure to waste products and other potential food sources generated during construction and operations that could attract wildlife to the project site. Toxicological risks from exposure to or ingestion of chemicals involved in mineral processing also would be minimized through LNC's BMPs and ACDFs. A Solid and Hazardous Waste Management Plan would be developed for the proposed Project that would outline proper storage, handling, and disposal methods to prevent exposure of substances to wildlife and the environment. Any spills associated with wastes or chemicals would be managed under the Spill Contingency Plan to minimize exposure to wildlife.

Existing water sources in the region are relatively scarce, and the emergency, reclaim, and stormwater ponds developed under the Proposed Action could temporarily attract wildlife species, causing increased mortality from drowning. All reclaim ponds and emergency ponds would be fenced in accordance with applicable NDOW regulations to restrict access to wildlife. Stormwater ponds would not be fenced. These ponds would be kept dry under normal operations. Upon final closure and reclamation, open pits would be backfilled and a final pit lake is not expected to form. See Section 2.2.12 for more information about ACDFs to protect wildlife.

Migratory Birds

The Proposed Action would disturb approximately 5,695 acres of potential migratory bird habitat, including the permanent removal of approximately 0.11 acres of wetlands and any associated riparian habitat (**Figure 4.5-3, Appendix A**). Based on results of field surveys, calculations provided by SWCA show that migratory bird densities in the Project area are greatest in grassland and shrubland habitats, and habitats associated with waterways, stock ponds, and undisturbed by wildfires. Preliminary density calculations (mean estimates/acres)ranged from 0 birds (e.g., Bullock's Oriole) to 0.069 birds (e.g., European Starling) per acre for small birds, and 0 birds (e.g., Ferruginous Hawk) to 0.000026 birds (e.g., Canada Goose) per acre for large birds (SWCA 2019a). Horned Lark, Cliff Swallow, Western Meadowlark, Brewer's Blackbird, Mourning Dove, and Sagebrush Sparrow were calculated to have the greatest densities in the Project area (SWCA 2019a). Surface disturbance, especially in grassland, shrubland, and wetland/riparian habitats, would affect these and other migratory bird species by removing potential breeding and foraging habitat, and permanently removing scarce water sources. Following reclamation, and depending on reclamation success, the types of vegetation re-established, and species, some areas may provide more or less adequate breeding and foraging habitat than the existing vegetation communities (i.e., invasive annual-dominated vegetation).

Direct mortality through nest destruction would be minimized through implementation of mitigation measure SSS-1, which would require LNC to conduct breeding bird pre-construction surveys for surface-disturbing activities occurring between March 1 and August 31 and establish appropriate protection measures to avoid or restrict activities near active nests, in adherence with BLM and NDOW recommended nest buffer distances.

Lights used for nighttime operations of mining facilities could interfere with the navigation of night-migrating birds and would attract aerial insects, as well as insectivorous birds, to project infrastructure. Long-term nighttime lighting would be directed and shielded downward to avoid interference with the navigation of night-migrating birds and to minimize the attraction of insects as well as insectivorous birds.

LNC would reduce attraction of birds to the Project area by limiting the availability of created water sources. Access to standing water on the Project site would be limited during construction and operation. When possible, LNC would ensure truck wash areas are kept free of standing water during construction. Water used for dust suppression during construction would be applied at a rate that discourages puddling (Cedar Creek 2020a). The creation of the reclaim, emergency, and stormwater management ponds could intermittently attract birds to the Project site during

intermittent periods when the ponds may contain water. These ponds would remain dry under normal mine operations and the emergency and reclaim ponds would be fenced to deter wildlife. Stormwater ponds would not be fenced. The installation of avian exclusionary devices at pond locations would be consistent with requirements of the NDOW Industrial Artificial Pond permit for the Project.

Under the Proposed Action, LNC would incorporate APLIC guidelines for construction of transmission and power lines, and communication towers to reduce risk of electrocution or collision with birds and minimize attraction of birds to electrical structures (APLIC 2006; 2012). LNC would conduct visual inspections of mining facilities that pose hazards to avian species, such as the processing and storage facilities and administration buildings, on a daily basis (Cedar Creek 2020a). Other facilities (e.g., borrow areas, storage facilities) would be inspected quarterly.

Indirect effects to migratory birds would include a decrease in quality of foraging or breeding habitat due to changes in vegetation community composition and/or an increase in invasive species during Project development, increased habitat fragmentation, and avoidance and displacement of habitat associated with mine-related noise and human presence.

LNC has developed a BBCS that it would implement for the Project (Cedar Creek 2020a). The BBCS would serve to reduce potential mortality or injury to bat and avian species resulting from Project related activities through the application of ACDFs, establish monitoring and adaptive management strategies to evaluate ACDFs, and assist in compliance with state and federal regulations regarding avian and bat species.

Raptors

Under the Proposed Action, approximately 5,695 acres of raptor, including eagles, foraging and breeding habitat would be affected. Direct loss of habitat, and habitat fragmentation, would be caused by the development of mine facilities. Construction and operation of these facilities, and use of roads during construction and operations, would increase noise and human activity in the Project area. Surface disturbances would cause the direct loss of foraging and prey sources associated primarily with upland habitats. Wetland and riparian habitat within the disturbance footprint would be permanently removed. Decreased habitat use would occur immediately surrounding the Project footprint and new roads.

The Project area contains suitable nesting habitat for several raptor species. One active raptor nest was identified within the Project area in 2019 (not including Burrowing Owl nests) (**Figure 4.5-4, Appendix A**). Additional raptor nests within the Project area and a 1-mile buffer could become occupied in the future. To minimize risks of disruption to raptor breeding and nesting activities, recommended mitigation measure SSS-3 would require LNC to conduct raptor nest surveys prior to any initial surface-disturbing activities, and establish appropriate protection measures to avoid or restrict activities near active nests, in adherence with BLM and NDOW recommended nest buffer distances.

Raptor, including eagle, mortalities could increase under the Proposed Action due to vehicular collisions with trucks and equipment associated with construction and operation of the Project.

Risk of vehicle collision to raptors can also increase when carcasses are left on the road. To reduce this risk, carcasses the size of a rabbit or larger (unless the carcass is a Bald or Golden Eagle) would be removed and disposed of, when feasible and safe to do so by LNC's trained environmental personnel. LNC's personnel would obtain all required permits from the appropriate agencies prior to collection or removal of wildlife carcasses, as necessary.

As described under migratory birds, risks from electrocution or collision with project facilities, such as transmission lines could increase. Collision risk would be minimized through LNC's adherence to APLIC guidelines (APLIC 2006). LNC would reduce raptor attraction to the Project area by limiting the availability of created water sources, and by installing exclusionary devises around reclaim and stormwater management ponds. Mining facilities that pose hazards to raptors would be inspected on a daily or quarterly basis (Cedar Creek 2020a). To minimize risks posed by Project facilities, recommended mitigation measure SSS-4 would require LNC to develop a monitoring plan that would help identify problem areas or facilities on-site that pose threats to raptors, migratory birds, and other wildlife, and may require additional mitigation or adaptive management.

Some raptor species could potentially utilize the open pit and may find the uneven pit walls suitable for nesting or perching. Since mining activities are continuous (24 hours a day, seven days a week), and considering the pit would be concurrently backfilled starting in year seven, long-term nesting attempts within the pit by raptors or other species are minimized and unlikely to occur.

Indirect effects to raptors would be similar to those described for migratory birds. As previously discussed, LNC has developed a BBCS that it would implement for the Project, with the intent of reducing project related impacts to raptors.

Big Game

Construction activities associated with the Proposed Action would disturb approximately 852 acres of year-round mule deer habitat primarily consisting of shrub dominated vegetation communities over the life of the mine (**Figure 4.5-6, Appendix A**). This would account for approximately 0.04 percent of the total mapped year-round range in the Game Management Unit (GMU). Construction activities are not likely to prohibit or exclude movement of the local mule deer population.

Potential direct effects to pronghorn under the Proposed Action include the loss of 427 acres of summer range and 4,960 acres of winter range over the life of the mine or longer, depending on the success of reclamation (**Figure 4.5-7, Appendix A**). Two pronghorn movement corridors lie within the Project area. These corridors facilitate access between limited use and winter range habitat to the south of the Project area and winter range, summer range, and year-round habitat to the north of the Project area. Mapped pronghorn antelope winter range distribution within the Project area constitutes approximately 1.26 percent of the total winter range mapped distribution within Hunt Unit 31. The construction of Project facilities and the associate loss of habitat is likely to prohibit or impeded pronghorn movement between seasonal habitats.

Bighorn Sheep mapped habitat exists within portions of the mine and exploration Plan boundaries. Effects on Bighorn sheep resulting from the Proposed Action are discussed in the Special Status Species section below. Indirect affects to big game species include habitat fragmentation and additional loss of habitat from avoidance responses to human activity and noise. Studies have shown that increased construction activities could result in big game species traveling farther to meet their nutritional and energy needs (Sawyer et al. 2009; Sawyer et al. 2005; Rost and Bailey 1979). During the initial development phase of the Project, it is likely that big game would be displaced from a larger area than the actual disturbed sites due to an avoidance response (Sawyer et al. 2009; Sawyer et al. 2005; Rost and Bailey 1979). It is possible that big game species may acclimate to human activity, however; studies have shown that a decision of whether to relocate to disturbed habitat is complex, and a range of patterns and factors in wildlife responses to human disturbance may be observed (Bejder et al. 2009).

Big game may experience higher levels of mortality due to increased vehicular traffic on SR 293 during construction, expansion, and development, or with construction trucks and equipment on new haul and access roads developed under the Proposed Action. Vehicular traffic collisions may injure or kill individuals, and the local populations may experience higher levels of mortality. Collisions would more likely occur during seasonal migration periods, when big game may be more likely to cross SR 293. Under the Proposed Action LNC would implement and post speed limits to decrease the likelihood of vehicular collisions with wildlife on Project access roads.

LNC would fence proposed ancillary facilities and other areas to exclude big game and other wildlife from accessing Project facilities as required by BLM, NDEP, and NDOW, and as needed. Fencing would be phased throughout the mine life, increasing as the Project develops, with ultimate fence build-out for the mine life shown on **Figure 2.2 (Appendix A)**. During exploration activities, LNC has committed to installing wildlife escape ramps in all open trenches, drilling sumps, and excavated areas where wildlife could become trapped. LNC would coordinate with BLM to minimize any potential mortality associated with drilling sumps.

Non-Game

Effects to nongame species (e.g., small mammals, reptiles, and amphibians) would be similar to those described above for big game species. Direct effects to nongame species would include the loss of 5,695 acres of potentially suitable breeding and foraging habitat, and direct mortality or injury due to Project-related vehicle collisions. Refer to **Table H.1** in **Appendix H** for a list of species potentially occurring in the Project area.

Effects would also include displacement from the disturbed areas and increased habitat fragmentation until vegetation is re-established. Displacement would increase competition and could result in some local reductions in wildlife populations if adjacent habitats have a higher density of species competing for similar resources. Habitat fragmentation would have a greater effect on small mammals where roads and other disturbed areas lacking vegetation would present a formidable barrier to movement due to lack of cover and vulnerability to predation.

Direct effects on amphibian and reptile species would be similar to those described for small mammals. Mortalities due to vehicular collisions would likely be higher for reptiles than for amphibians because reptiles spend more of their life cycle in terrestrial systems, as opposed to aquatic systems. Amphibians may be prevented from moving through disturbed upland habitats located between the limited amounts of aquatic habitat in the Project area.

Special Status Species (SSS)

SSS – Bighorn Sheep

Direct effects of construction associated with the Proposed Action include the loss of 753 acres of mapped bighorn sheep year-round range over the life of the mine, or longer, depending on the success of reclamation (**Figure 4.5-5, Appendix A**). No bighorn sheep critical habitat or parturition (lambing) areas designated by NDOW would be affected by the proposed Project. Bighorn sheep habitat occurs in the northern and northwester, western, and southwestern portions of the Project area.

Bighorn sheep may avoid an area larger than the proposed Project disturbance footprint during implementation of the Proposed Action. Increased noise and human presence associated with construction and operation of the Proposed Action would likely result in additional habitat avoidance due to displacement. Bighorn sheep may avoid habitat adjacent to the Project area and movement corridors along the slopes of the western portion of the Project area. However, the Project would not create a physical barrier that would completely impede movement for the herd in the Double H Mountains between seasonal ranges located north and south of the Project area. Bighorn sheep would still be able to move between the Montana and Double H Mountains in the unobstructed area located to the west of the proposed Project.

The Double H Mountain herd may experience higher levels of injury or mortality due to increased vehicular traffic on SR 293 during construction and operation of the proposed Project. Collisions would more likely occur during seasonal migration periods, when sheep may be more likely to cross SR 293 to move into the Montana Mountains.

Project related fencing installed around mining and facility areas would exclude Bighorn Sheep from accessing the active mine facilities. All fencing would be built according to BLM, NDEP, and NDOW specifications, and only installed as needed per MSHA standards.

During exploration activities, LNC has committed to installing wildlife escape ramps in all open trenches and drilling sumps or areas where wildlife could become trapped. LNC would coordinate with BLM to minimize any potential mortality associated with drilling sumps.

SSS – Pygmy Rabbit

Potential direct effects to pygmy rabbit would include the loss of up to 3,561 acres of suitable (sagebrush dominated) habitat and the potential for mortality from vehicle related collisions, crushing of adults or young in burrows, or abandonment of young in burrows, if present (**Figure 4.5-8, Appendix A**). Pygmy rabbits demonstrate limited movement within their home range and spend most of their time within 30 to 100 meters of a burrow system during spring and

winter months (Lee et al. 2010). Destruction of burrow systems during spring and winter months would have the greatest effect on populations within the Project area.

Indirect effects to pygmy rabbit from construction activities include decreased quality of habitat and increased habitat fragmentation following concurrent reclamation, due to the prolonged time required to establish high quality, mature sagebrush habitat with vertical and horizontal structural diversity and the increased likelihood for the establishment and spread of non-native invasive species and noxious weeds. Literature demonstrates that sagebrush fragmentation for pygmy rabbit is a significant issue for the species (Pierce et al. 2011). Human activity and noise associated with mining and operations activities could result in increased avoidance and displacement from areas with lighting, vibration, noise, dust, or human presence. Pygmy rabbits may have difficulty establishing new home range territories considering the declining availability of high-density sagebrush stands characteristic of quality pygmy rabbit habitat outside of the Project area (Sanchez et al. 2009).

Because exact locations of exploration activities are unknown and could occur anywhere within the north and south exploration areas, direct effects would be proportional to the amount of surface disturbance activities that occur within delineated pygmy rabbit habitat. The loss of suitable habitat by exploration activity could include up to 150 acres if disturbance occurred within delineated habitat. Direct effects from exploration activities would be more likely to occur in the south exploration area, where the majority of suitable habitat and burrows were identified, although direct effects could also occur from activities in the north exploration area.

No pygmy rabbits or signs of activity at burrows were observed during summer and winter field surveys; however, 39 inactive burrows and 10 pellets unassociated with burrows were identified (SWCA 2019a). Suitable habitat does exist within the Project area, and the loss of suitable habitat from surface disturbance or degradation, and the potential for mortality under the Proposed Action could be a significant effect to local populations. Proposed mitigation measure SSS-5 presented in Section 4.5.4 would require LNC to conduct clearance surveys within delineated habitat prior to surface disturbing activities or removal of suitable habitat and establish protection and mitigation measures in coordination with BLM and NDOW in order to reduce potential effects to pygmy rabbits from construction activities.

SSS – Western Burrowing Owl

Direct effects to Burrowing Owls from construction activities would include the loss of 5,695 acres of potential breeding and foraging habitat, especially in low-growing sagebrush or grassland habitat, and a reduction in prey base. Reestablishment of Burrowing Owl habitat may prove challenging following concurrent or final reclamation due to the species dependence on burrows and their prey base. Active Burrowing Owl nests occur within the Project area, as surveyed in 2018 (**Figure 4.5-9, Appendix A**). After nest abandonment, Burrowing Owl nests within the Project footprint would be destroyed due to surface disturbance activities. Recommended mitigation measure SSS-7 would require LNC to develop artificial burrow systems (ABS) to offset the permanent loss of burrows identified within the Project area.

Other potential effects include mortalities or injury due to collisions with vehicles or mining and construction equipment. Mitigation measures SSS-6 outlined in Section 4.5.4 would minimize direct mortality to Burrowing Owls and includes limiting disturbance during the breeding season, performing breeding bird surveys prior to ground disturbance, and implementing appropriate nest buffers to avoid breeding and nesting disruption.

Indirect effects include decreased quality of foraging habitat, increased habitat fragmentation, and avoidance and displacement associated with increased mine-related noise and human presence.

SSS – GRSG

There is one active lek (Montana-10) within 0.96 miles of the Project area, and three active lek sites within 3.1 miles of the Project area (**Figure 4.5-10, Appendix A).** NDOW lek observations have documented birds displaying at this lek within 0.75 miles of the proposed Project area (NDOW 2020). GRSG have been documented within the Project area during field surveys and by NDOW, who reported 63 tracking locations generated by at least 30 radio-marked birds (NDOW 2018). Noise levels would increase under the Proposed Action due to construction and operation activities such as blasting, drilling, and use of large construction equipment and vehicles. The closest lek to the Project area, the Montana 10 lek, was assessed for visual baseline. The visual assessment at KOP-4 showed there would be no direct line-of-site between the Montana 10 lek and Project facilities (LNC 2019g). Noise levels at GRSG leks are analyzed in detail under Section 4.5.2.

Portions of the Project area are identified by the BLM as Priority Habitat Management Area (PHMA), General Habitat Management Area (GHMA), and non-habitat for GRSG (**Figure 4.5-11, Appendix A**). NDOW has also identified seasonal habitat in portions of the Project area that include GRSG winter habitat, GRSG nesting habitat, and GRSG breeding habitat (SWCA 2019b). GRSG would be directly affected as a result of construction and operation disturbance within the Project area. The *2015 GRSG Nevada and Northeastern California Record of Decision and Approved Resource Management Plan Amendment* (2015 ARMPA) includes habitat management categories as delineated by the August 2014 version of the Coates et al. GRSG habitat model for Nevada (Coates et al. 2014). The BLM has been using this August 2014 habitat map to conduct conservation efforts and NEPA analysis under the direction of the 2015 ARMPA. However, the BLM may adopt the 2019 ARMPA habitat model (Coates et al. 2016) with minor revisions to delineations for GRSG habitat management areas including PHMA, GHMA and Other Habitat Management Areas (OHMA) (**Figure 4.5-12, Appendix A**).

Using the 2015 ARMPA habitat mapping, the Proposed Action would remove approximately 5,011 acres of PHMA and 545 acres of GHMA (Table 4.5). Using the 2019 ARMPA habitat mapping, approximately 5,695 acres of PHMA would be removed. (Table 4.5).

Disturbance of PHMA represents less than two percent of PHMA in the Population Management Unit (PMU). LNC would conduct reclamation activities concurrently with mining activities to reduce impacts to GRSG habitat; however, decreased quality of habitat and increased habitat fragmentation following concurrent reclamation are likely due to the prolonged time required to

establish high-quality mature sagebrush habitat, and the increased likelihood for establishment and spread of invasive species and noxious weeds.

The proposed Project area is located within the Lone Willow population management unit (PMU) as designated by NDOW. This unit has experienced recent population declines due to wildfire and fragmentation of suitable habitat (NDOW 2014). The PMU includes the Kings River Valley and all of the Double H, Montana, and Bilk Creek Mountains. According to the 2014 Nevada Greater Sage-grouse Management Plan, the most significant risk factor to the Lone Willow population is the large acreage of sagebrush habitat lost to wildfire and converted to invasive species such as cheatgrass as well as the immediate threat of loss of the remaining winter habitat for GRSG within the PMU. The 2014 plan includes an adaptive management process which includes both warnings and triggers associated with sage grouse habitat and populations and identifies the Lone Willow PMU as having crossed a population threshold that may trigger the need for adaptive management approaches. The 2019 Sagebrush Ecosystem Technical Team also assigned triggers to GRSG PMUs in 2019, consistent with the 2014 Nevada Greater Sage Grouse Conservation Plan adaptive management process. The SETT identifies the Lone Willow PMU as having crossed a habitat trigger in the North Central conservation planning area, primarily resulting from habitat loss due to fire occurrence (SETT 2019).

Table 4.6. Total Proposed Habitat Removal of GRSG Management Categories under the 2015 GRSG Amendment Habitat Mapping

GRSG Management Area Category	Disturbance Area		Plan Boundary	
	Acres	***Percent (%)***	***Acres***	***Percent (%)***
PHMA	5,011	88.0	11,410	63.6
GHMA	545	9.6	4,414	24.6
OHMA	0	0	0	0
Non-habitat	139	2.4	2,109	11.8
Total	**5,695**	**100**	**17,933**	**100**

Source: BLM 2015b (https://www.blm.gov/services/geospatial/GISData/nevada)

Table 4.7. Total Proposed Habitat Removal of GRSG Management Categories under the 2019 GRSG Amendment Habitat Mapping

GRSG Management Area Category	Disturbance Area		Plan Boundary	
	Acres	***Percent (%)***	***Acres***	***Percent (%)***
PHMA	5,510	96.8	15,422	86.0
GHMA	0	0	0	0
Non-habitat	185	3.2	2,511	14.0
Total	**5,695**	**100**	**17,933**	**100**

Source: Coates et al. 2016

Additional potential indirect effects to GRSG include increased avoidance by, displacement of, and disruption of life-history requirements of GRSG individuals or groups from suitable habitat proximate to development due to lighting, vibration, noise, dust, or human presence. Increased habitat fragmentation could result in barriers to movement by GRSG to preferred habitat areas which could lead to diminished health of this species. Surface disturbance associated with construction of the proposed Project could also result in decreased quantity of insect species which GRSG consume during spring and summer months. The construction of Project facilities may cause the interruption of "bird foot traffic" created by aboveground linear features that may block passage, or causes collision with fences or other structures.

New roads would be constructed during the construction and implementation phase of Project. GRSG may be more sensitive to traffic increases than other wildlife species. Male and female GRSG breeding behavior was shown to be altered by road traffic located within 1.9 miles of a lek (Johnson et al. 2011). Female hens that bred on leks within 1.9 miles of roads associated with oil and gas development traveled twice as far to nest as did hens that bred on leks greater than 1.9 miles from roads, resulting in indirect effects on GRSG health and ultimately mating productivity.

The Proposed Action could result in GRSG avoiding suitable habitat in the Project area if they perceive they are at risk from predation. The construction of transmission line structures could increase predation by enhancing local raptor and corvid (raven) populations. Subsidized food sources such as garbage and roadkill, elevated nest platforms provided by transmission lines, and landscape alterations such as transitions to annual grasses, can also increase raven populations.

Transmission infrastructure would be built and installed in accordance with guidelines suggested by the APLIC guidelines (APLIC 2012) to deter establishment of raven (or raptor) nests. LNC would regularly monitor usefulness of the deterrence measures, and implement alternative measures if determined necessary.

A raven control plan would be developed in coordination with BLM and NDOW and implemented to deter raven predation of GRSG so that overall numbers of sage-grouse and the recruitment of young sage-grouse into the local breeding population does not decrease due to conditions enabled by the construction and operation of the Project. Measures such as carcass removal, perch deterrence, garbage removal, and facility fencing help to prevent the attraction GRSG predators to the Project area.

In accordance with the *2018 Nevada Greater Sage-grouse Conservation Plan* (SEC 2018), LNC would minimize effects to GRSG by limiting disturbance areas, performing breeding bird surveys before ground disturbance, fencing areas surrounding the plant emergency pond and the CTFS reclaim ponds, and conducting concurrent reclamation. Additionally, LNC is working with the Sagebrush Ecosystem Technical Team (SETT) to utilize the Conservation Credit System (CCS) to offset effects of the proposed Project's surface disturbance to GRSG and sagebrush habitat (GRSG Amendment, Mitigation MD MIT1). Mitigation developed under the CCS is intended to meet regulatory requirements under State of Nevada NRS 232.162 and is administered solely by the

SETT. The BLM does not administer the development of credits or debits under the CCS and is not responsible for enforcement of program requirements. Mitigation pursued by the applicant through the CCS program is used to offset impacts to GRSG (including noise) and sagebrush habitat only, and is not intended to offset effects to other resources, such as impacts to riparian and water resources. The final number of credits purchased would be determined based on proximity to the Project. The applicant used the CCS Habitat Quantification Tool (HQT) to quantify habitat function for GRSG in the proposed Project area (SWCA 2019b). The HQT quantifies habitat function for a range of purposes including determination of potential temporary and permanent effects of a proposed project. The SETT has completed a formal quality assurance review of the results of the HQT (SWCA 2019b). The CCS provides a regulatory mechanism for GRSG habitat protection that ensures habitat effects from anthropogenic disturbances (debits) are fully compensated by long-term enhancement and protection of habitat that result in a net benefit for the species (credits). The CCS works within a mitigation hierarchy where anthropogenic disturbance effects are first avoided, minimized, and then mitigated using the CCS (State of Nevada 2018).

The current Project would yield a total number of 1,375 term debits, and 0 permanent debits, to fully offset the anticipated temporary effects during the life of the Project. If the entire credit obligation is not satisfied before Project construction, a mitigation plan would be developed in coordination with the SETT. If a mitigation plan is developed, it must be approved by the Sagebrush Ecosystem Council, and at least 1/3 of the total required compensatory mitigation must be offset prior to receiving a Notice to Proceed in accordance with the State Mitigation Regulation (NAC 232.400-232.480). The SETT has conducted a review of the HQT analysis for the Exploration Plan and determined that 0 credits would be required.

Under Management Decision SSS 2A of the 2015 GRSG Amendment the BLM is required to conduct analysis of the area of disturbance at the local or project scale, in addition to analysis of disturbance densities across the biologically significant unit (BSU) according to the methodology presented in 2015 GRSG Amendment Appendix E. The disturbance cap analysis results are provided in NEPA analyses, but any exceedances of the cap (at both the BSU and project levels scales) do not preclude a locatable mineral resources project with existing valid rights from BLM approval. Refer to **Appendix H** of this EIS for GRSG RDFs, disturbance calculations and an analysis of Project consistency with the 2015 and 2019 GRSG ARMPAs.

SSS – Migratory Birds and Raptors

Potential direct effects from the Proposed Action to special status migratory birds and raptors would be similar to those described under migratory birds and raptors above. Direct mortality through nest destruction is not anticipated because mitigation measures SSS-1 and SSS-3 would require a qualified biologist to conduct breeding bird and raptor pre-construction surveys prior to surface-disturbing activities occurring between March 1 and August 31.

Indirect effects would include a decrease in quality of foraging or breeding habitat due to changes in vegetation community composition and/or an increase in invasive species during Project development, increased habitat fragmentation, and avoidance and displacement of habitat associated with mine-related noise and human presence.

SSS – Bats

Thirteen special status bat species were detected during 2018 acoustic monitoring in and around the Project area. Spotted bats, red bats, and little brown bats are also known to occur in the Project area (refer to **Table H.1, Appendix H).** Direct effects to bats would include the loss of 5,695 acres of potential foraging habitat, and would be most significant where disturbance occurs in grasslands, riparian, wetland, and shrubland foraging habitats. Re-establishment of bat roosting or foraging habitat may prove challenging following concurrent or final reclamation due to the permanent removal of water resources, rock outcrops and riparian habitats.

Thacker pond, Thacker Creek, Crowley Creek, and seeps and springs in the Project area provide important foraging habitat for bats. Approximately 0.11 acres (4,790 square feet) of wetland and aquatic habitat would be permanently lost from mining activities. Although it is not anticipated, additional wetland and riparian habitat and seeps and springs may be impacted over the life of the mine from groundwater depletions associated with Project dewatering activities (see Section 4.3). Water is a critical resource for sensitive bat species in the Project area and any impact to water quantity or quality could be a significant impact. LNC has proposed groundwater monitoring and contingency mitigation measures (including flow augmentation and guzzlers) to minimize drawdown effects to perennial surface waters as summarized in Section 4.3.3.

Bats may avoid wetlands and Crowley Creek and Thacker Creek during operations due to noise and human activity. Bats are known to use the associated Crowley Creek wetlands as foraging area, with peak activity occurring in spring (**Figure 4.5-13, Appendix A**).

Based on data provided by NDOW, no underground resources that provide spring, summer, and winter hibernacula for bats (e.g., abandoned mine land features) are present within the Project area or a ¼-mile buffer (NDOW 2018). However, cliffs, crevices, and riparian areas located within the Project area may provide seasonal roosting, hibernation, or maternity colony habitat for bats. Day roosting habitat may also be present in the Project area. These habitats would be removed by mining activities if located within the disturbance footprint. To minimize risks to roosting bats, mitigation measure SSS-8 would require LNC to delineate potential bat roosting habitat within the Project area and limit disturbance outside of maternal roosting or wintering hibernacula periods. Additionally, proposed mitigation measure SSS-9 would mitigate impacts to roosting habitat by requiring LNC to develop alternate roosting sites outside of the disturbance footprint.

Bats could roost in natural crevices and crevices of active pit walls. Lights would be used in the pit for night operations, which could attract aerial insects and thereby attract foraging bats. Bats may temporarily roost on the walls at night between bouts of foraging. However, due to the continuous mining disturbance, any significant bat roosting (e.g., hibernation and maternity roosts) is not expected in the pits.

Design features outlined in the Mine Plan (LNC 2019a), including the use of shielding and cages on light sources and use of lighting that does not attract bats, birds, or their prey would be implemented to avoid and minimize the potential effect of artificial lighting on foraging bats within the Project area.

The creation of reclaim ponds and emergency stormwater management ponds could increase the amount of habitat available for insects, thereby attracting bats to the Project site. Under normal conditions these ponds would be kept dry. BMPs would limit standing water on the Project site during construction and operation (Cedar Creek 2020a). Proposed mitigation measure SSS-2 would require LNC implement the use of exclusionary devises to keep birds and bats from accessing ponds when water is present.

LNC would conduct visual inspections of mining facilities that pose hazards to avian and bat species, such as the processing and storage facilities and administration buildings, on a daily basis (Cedar Creek 2020a). Other facilities (e.g., borrow areas, storage facilities) would be inspected quarterly.

SSS – Lahontan Cutthroat Trout (LCT)

There are no anticipated direct effects expected from construction or operation of the proposed Project on LCT. LCT occupied stream reaches are identified in **Figure 4.5-14** of **Appendix A**. According to Piteau Associates (2019b; 2020a), simulated flow losses to LCT occupied reaches of Crowley and Pole Creek due to water use requirements from the proposed Project would not be expected. Most of the simulated flow losses were estimated to occur near the headwaters of Thacker Creek, close to the proposed Project area. Refer to Section 4.3, *Water Quantity and Quality,* for a detailed analysis of potential effects to water resources from the Proposed Action.

No effects to LCT from operations-related activities are expected. Exploration activities would avoid stream reaches, and would use existing roads that cross Pole Creek to avoid effects to aquatic species. By implementing water management plans as outlined in the Mine and Exploration Plans of Operation (LNC 2019a; LNC 2019b), changes to water quantity in streams and other water bodies surrounding the Project area would be avoided.

Connectivity into the reaches within the project boundaries in high water years is a possibility with spring flows (January through April) being the most likely time for LCT to move down into the ephemeral reaches. During high water years, care must be taken to not disturb Pole and Crowley Creek until after the water naturally recedes out of the ephemeral portion. During these spring high water year events it is still unlikely that the proposed Project would cause direct effects on LCT populations, as water would not be limiting during these times. There are no direct effects expected on Washburn or Rock Creeks.

There are no measurable indirect effects expected on Pole, Crowley, Washburn, or Rock Creeks.

SSS – Reptiles

Potential direct effects to desert horned lizard and other special status reptile species include the loss of potential habitat, and direct mortality from being crushed by heavy equipment and construction vehicles. Indirect effects include a decrease in habitat quality and insect or prey availability through a change in vegetation communities, the spread of invasive species, and increased habitat fragmentation.

SSS – Amphibians

Effects to western toad are anticipated to be unlikely, due to limited habitat and the low probability of occurrence in the Project area. Surface disturbance would remove approximately 0.11 acres of wetland habitat, and three ephemeral springs (SP-001, SP-003, and SP-058) are located within the predicted water drawdown area. SP-001 is a man-made ephemeral stock pond located within the pit footprint and therefore, would be directly affected during mining. SP-003 and SP-058 are characterized as man-made surface features (stock ponds) that are typically dry. Riparian vegetation, which is used by amphibians for cover and breeding, is extremely minimal or lacking within the Project area, due to both the seasonal or ephemeral nature of water presence, and/or heavy livestock use.

Mortalities due to vehicular collisions would be unlikely because amphibians spend most of their life cycles associated with aquatic systems. Western toads may be prevented from moving through disturbed upland habitats located between the limited amounts of aquatic/riparian habitat in the Project area.

SSS – Springsnails

No direct effects on springsnails are expected from construction or operations of the Proposed Action. Construction and operation of the proposed Project would affect one spring (SP-001), which would be mined through (**Figure 4.5-14, Appendix A**). SP-003 and SP-058 fall within the 10-foot drawdown area but are not anticipated to be affected by drawdown associated with the open pit mining. These springs were determined to be ephemeral, or seasonal, and no springsnails occur in these springs. Affects to springsnails from potential project dewatering of seeps and springs are discussed further in Section 4.5.3.

SSS – Plants

Direct effects from construction-related activities could include the loss of vegetation communities that may provide suitable habitat for special status plant species. Surface disturbance in occupied habitat would result in direct mortality of individuals and the partial or complete destruction of a species' seed bank. Potential direct effects to special status plant species are not expected from construction of the Proposed Action because field surveys did not identify any special status plant species within the proposed disturbance areas.

Indirect effects could include a decrease in quality or availability of suitable habitat through a change in vegetation composition and diversity, expansion of invasive species and potential for increased soil erosion. Soil erosion could result in less soil to support special status plant communities.

LNC has revised their south Exploration Plan boundary to avoid Crosby's buckwheat, which was identified within the southwest corner of the south Exploration area during field surveys in 2018 (SWCA 2018a) (**Figure 4.5-15, Appendix A**). Direct effects to Crosby's buckwheat are not expected. Indirect effects could still include those as listed above.

4.5.1.2 Alternative B (Partial Pit Backfill)

Effects to wildlife from surface disturbance and project facilities under Alternative B would include those described under the Proposed Action. In addition, this alternative would result in the complete backfilling of the North and West Pits and partially backfilling a portion of the South Pit. Although no permanent pit lakes would be anticipated to develop a small wetland area would likely occur in the South Pit area.

Wildlife could be attracted to the seasonal wetland, as it would provide an additional water source and foraging opportunities. Water quality in the resulting South Pit wetland could be degraded and may adversely affect wildlife exposed to surface water that may pool in the wetland. These ecological risks are analyzed in Section 4.5.3 below.

Reclamation on the upland and lowland areas of the pit would likely re-establish satisfactory wildlife habitat; however, the South Pit interior would likely generate low-quality habitat for long-term terrestrial wildlife use due to its steepness, lack of adequate protective cover and food resources, and the distance from the pit rim to the surface of the pit lake (SRK 2020).

Biological development within the south pit area, including the potential growth of wetland or riparian-like vegetation, could occur, and depends on physical characteristics, water chemistry and nutrient availability, and the environment in which it is situated. Depending on biological and environmental factors, there is the possibility that areas of the South sub-pit could potentially support riparian and wetland habitat capable of supporting small wildlife populations (SRK 2020).

GRSG

Required mitigation credits to offset direct and indirect effects to GRSG are anticipated to be the same as under Alternative A. Alternative B would yield a total number of 1,374 term debits, and one permanent debit, to fully offset the anticipated temporary effects during the life of the Project under the Nevada GRSG CCS.

4.5.1.3 Alternative C (No Pit Backfill)

Under Alternative C, construction and operation of the Project would include 482 acres of additional surface disturbance and loss of potential wildlife habitat. The additional 482 acres of disturbance would occur primarily in shrubland and habitat dominated by introduced annual-grasses. The additional habitat loss would affect foraging behavior and create additional habitat fragmentation. Decreased habitat use due to avoidance would occur immediately surrounding the expanded project footprint.

The expanded East WRSF would remove an additional spring (SP-059), a man-made livestock water feature. No springsnails or amphibians were identified at this survey location.

Under Alternative C the West, North, and East Pit areas would not be backfilled at the end of the life-of-mine and the open pit would remain as a post-mining feature. Upon the cessation of pit dewatering at mine closure, three small permanent pit lakes would develop. The pit lakes could attract wildlife to the Project site by providing additional water and foraging sources in the existing

area. Water quality in the pit lakes would be anticipated to be degraded and could adversely affect wildlife. These risks are analyzed in Section 4.5.3 below.

Reclamation on the upland and lowland areas would likely re-establish satisfactory wildlife habitat. The upland habitat includes the pit walls, upper mine benches, and the areas immediately adjacent to the pit rim and beyond. The open pit interior would likely generate low-quality long-term habitat for terrestrial wildlife. The pit walls could potentially provide habitat for nesting species such as bats, cliff swallows, and possibly some raptors (SRK 2020).

Biological development within a pit lake, including the potential for wetland or riparian like vegetation, could occur, and would depend on physical characteristics, water chemistry and nutrient availability, and the environment in which it is situated. Depending on biological and environmental factors, there is the possibility that areas of the south sub-pit could potentially support riparian and wetland habitat capable of supporting small wildlife populations (SRK 2020a).

Big Game

Surface disturbance under Alternative C would increase and would impact a total of approximately 798 acres of mapped bighorn sheep year-round habitat, 897 acres of mapped mule deer year-round habitat, and 501 acres of pronghorn summer range and 5,013.5 acres of pronghorn winter range habitat. Other effects to big game would be similar to those described under Alternative A.

Migratory Birds and Raptors

An additional 482 acres of migratory bird and raptor breeding and foraging habitat would be disturbed under Alternative C. Direct and indirect effects associated with habitat loss would be similar to those described under Alternative A.

Burrowing Owls

And additional 482 acres of Burrowing Owl breeding and foraging habitat would be removed under Alternative C. Burrowing Owls were observed in the vicinity of the expanded east WRSF during surveys, and additional Burrowing Owl nests could potentially be removed by the expansion of the East WRSF.

Springsnails

The expanded East WRSF would remove an additional spring (SP-059), a man-made livestock water feature. No springsnails or amphibians were identified at this survey location.

GRSG

Alternative C would disturb up to 482 additional acres of suitable GRSG habitat. Alternative C would yield a total number of 1,358 term debits, and 29 permanent debit, to fully offset the anticipated temporary effects during the life of the Project under the Nevada GRSG CCS.

4.5.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the Project and there would be no effects to wildlife, special status species or their habitat other than those related to the reclamation of existing disturbance under previous authorizations.

4.5.2 Issue – Noise

4.5.2.1 Alternative A (Proposed Action – Preferred Alternative)

During Project operation, heavy equipment and processing facilities would operate continuously. Construction of the mine facilities would require the use of heavy equipment on an intermittent basis. Noise levels would be greatest within the area of operations, and attenuate with distance from the Plan boundary. A detailed assessment of potential noise effects to wildlife and human receptors is provided in the *Wildlife Noise Impact Assessment, Lithium Nevada Corporation, Thacker Pass Project*, prepared by Cedar Creek (2019d).

Exploration within the Plan area would involve the use of heavy equipment and increased vehicular and human presence along roads and land clearing areas. Heavy equipment during exploration would include drill rigs, trucks, generators, an excavator and a dozer. Exploration activities would occur 24 hours a day within exploration boundaries, however, use of heavy equipment would be intermittent. The boundary of the exploration area would be more than a mile from the nearest residence, and noise levels may be intermittently perceptible above ambient levels at this location. However, noise levels are not expected to exceed the EPA threshold for human receptors. The exploration areas are about 2.75 miles from the nearest sage-grouse lek (Montana lek) in the Montana mountains at a location where there is no line-of-sight to the exploration areas. Noise levels during exploration are expected to be lower at this lek compared to ongoing mining operations, and are not expected to exceed thresholds associated with sage- grouse breeding behavior.

During construction and mining phases, blasting of basalt outcrops within the Plan area would be required on an intermittent basis. The frequency of blasting would be greatest during construction, at a rate of up to 25 blasts per year. During mining, up to 6 blasts per year may be required. Each individual blast produces an impulsive noise during a brief period of up to several seconds. Blasts would be done during mid-day or early afternoon hours (Clark pers comm 2020). Given the low frequency of blasting events, and the time of day which they would be done, blasting is not expected to cause an adverse effect to most species of wildlife or human receptors.

Ground-borne vibration is a localized effect that is perceptible in the immediate vicinity of the vibration-producing activity. Generally, ground-borne vibration is not perceptible by the most sensitive receptors at a distance of more than 600 feet from a vibration producing source (FTA 2018). As such, the effects of vibration from the project on humans or wildlife are expected to be negligible.

General Wildlife

During construction and operations, increased noise levels would occur due to the operation of heavy equipment, and increased vehicular and human presence along roads and land clearing areas. The magnitude of direct and indirect effects from increased noise varies by species and can also vary by individuals of the same species. After initial avoidance of areas with increased human presence and noise-generating activities, some wildlife species may acclimate to the disturbance and begin to reoccupy areas formerly avoided.

Avoidance or accommodation are the most common responses of wildlife to increased noise and human presence. Avoidance would result in direct effects including displacement of wildlife from a larger area than the actual disturbance area. If a species could not leave an area, noise could be damaging or disturbing. Damaging noise would result in harming the direct health, reproduction, or survivorship of the individual. A disturbing noise would result in detectable changes in behavior or physiological stress. Indirect effects to wildlife displaced from disturbed sites include greater intraspecific competition, use of less favorable habitats, or density dependent effects when congregating into smaller areas of undisturbed or suboptimal habitat (Kuck et al. 1985; Gill and Sutherland 2000; Brown et al. 2012).

More mobile wildlife species that inhabit the Project area, including bats, big game, and birds, may be able to vacate the construction areas and use adjacent habitat to avoid disturbance. However, this could lead to increased competition for resources in areas adjacent to the Project area and decreased survivability of individuals. Less mobile species would be more affected by noise. Small mammals present in the Project area that might be affected by noise include common species of mice, voles, or ground squirrels. Special status small mammal species may be affected by noise-related effects as a result of the Project, if present.

Potential effects for raptors and migratory bird species would include nest abandonment or the loss of eggs or young. Studies have documented avian avoidance of sites during migration (McClure et al. 2013), reduction of reproductive success (Knight et al. 2012) and a reduction of species abundance in nesting territories (Bayne et al. 2008), in areas experiencing increased anthropogenic noise and human activity. LNC is developing a BBCS to avoid such disturbances to avian species. By implementing ACDFs in the BBCS and recommended mitigation measure SSS-1 and SSS-3, no nest abandonment or loss of eggs or young for raptors or migratory birds would be anticipated.

GRSG

One active sage-grouse lek is located within 0.96-miles, and three active leks are located within 3.1 miles from the Project boundary (**Figure 4.5-10, Appendix A).** All lek sites are located north of the Project area in the Montana Mountains. The leks are remote and often situated in exposed areas in low sagebrush vegetation communities, such as on a hillside or plateau summit. Sage grouse have been shown to demonstrate sensitivity to anthropogenic noise (e.g., Holloran 2005; Connelly et al. 2011). Noise created may affect sage grouse by disrupting behavior, causing physiological stress, or masking biologically important sounds, especially during the breeding season (February–May) (Bickley et al. 2012). Noise may also increase predation risk of sage-

grouse by masking the sounds of approaching predators and increase stress levels by increasing the perception of predation risk (Quinn et al. 2006; Rabin et al. 2006). Sage-grouse have high site fidelity, meaning that they will return to the same lek sites year after year, which is thought to limit their adaptability to disturbance (AWWI 2017).

Modeled estimates of increased noise at sage-grouse leks near the Project area were predicted by Saxelby (2019b). Noise levels produced by mining and processing activities were predicted to result in maximum noise level increases of 8.7 dBA at the Montana-10 sage-grouse lek, 5.9 dBA at the Pole Creek-01 lek, 3.8 dBA at the Thacker Creek lek, and 1.5 dBA at the Crowley lek. These increases are less than the ARMPA guideline of a 10 dBA increase recommended for sage-grouse lek sites. NDOW currently is in the process of revising recommended noise monitoring and modeling protocols from those originally recommend to the applicant (Saxelby 2019a, Saxelby 2019b). During this interim period NDOW evaluated noise data collected for the project and provided updated calculations that indicate noise increases would range between 8.0-11.4 dBA (A-weighted decibels) (hours 0400-0900), 6.3-10.9 dBA (hours 1800-1000), and 6.8-10.1 dBA (hours 0000-2400). In each time period, up to two predicted exceedances of the ARMPA guideline of a 10 dBA increase in ambient noise occurred. These NDOW calculated values indicate there is potential risk for Project-related noise effects on the Montana-10 lek, and potentially the Pole Creek-01 lek. Impacts to GRSG from noise could also affect adjacent breeding, nesting, and brood-rearing habitats (e.g., habitat located between the lek and the project boundary).

Golden Eagles

The Noise effects analysis for Golden Eagles from Alternatives A, B, and C is presented in Section 4.5.6.

4.5.2.2 Alternative B (Partial Pit Backfill)

Potential noise effects to sensitive receptors under Alternative B are anticipated to be similar to those described under Alternative A.

4.5.2.3 Alternative C (No Pit Backfill)

Potential noise effects to sensitive receptors under Alternative C are anticipated to be similar to those described under Alternative A.

4.5.2.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the Project and USFWS would not issue an EITP, and there would be no change in effects to sensitive receptors or exiting noise levels within the Project area. Existing sources of noise under Alternative D would be limited to reclamation of existing surface disturbance under previous authorizations.

4.5.3 Issue – Water Quality and Quantity

4.5.3.1 Alternative A (Proposed Action – Preferred Alternative)

Surface disturbance under the Proposed Action was designed to avoid direct effects to aquatic habitat, including measures to avoid Pole Creek and Thacker Creek, and minimize disturbance to

Crowley Creek. Surface disturbance would directly affect Crowley Creek by construction of a single access road crossing and culvert. The directly affected stream reach along Crowley Creek is ephemeral and does not support fish. Exploration activities would avoid stream reaches by using existing roads that cross Pole Creek. Project-wide BMPs would be implemented to limit erosion and reduce sediment in precipitation runoff from Project facilities and disturbed areas during construction, operation, and initial stages of reclamation. To further reduce potential effects on aquatic habitat and species, mitigation measure SSS-12 would require LNC to conduct construction or maintenance activities at Crowley Creek during no flow, or low flow periods, and to use fish-friendly culverts.

The creation of reclaim and emergency stormwater management ponds could increase the amount of wildlife to the Project site by providing an additional source of water, resulting in increased drowning, exposure to contaminated water, and risks associated with increased interaction with mining activities. Risks to wildlife would be reduced by limiting the availability and access of created water sources during construction and operation. When possible, LNC would ensure truck wash areas are kept free of standing water during construction. Water used for dust suppression during construction would be applied at a rate that discourages puddling (Cedar Creek 2020a). All emergency and reclaim ponds would be fenced to restrict wildlife, and these ponds would be kept dry under normal conditions.

Risks to surface and groundwater resources are summarized in detail in Section 4.3. Potential risks to wildlife from dewatering associated with mining operations include changes in surface water and ground water flow to seeps, springs, creeks, and surrounding wildlife habitat in the Project area. This could create a localized loss of wildlife drinking water sources and reductions in aquatic food sources, and an increase inter- and intra-species competition for local water resources. The changes in local water sources could also lead to a redistribution of wildlife due to changes in water availability. Water is a critical resource for many species in the Project area, and any impact to water quantity or quality could be a significant impact.

Loss or degradation of wet meadows, springs, seeps, and associated habitat could result in long-term impacts to GRSG within and outside the Project Area. This is based on the potential for mining and dewatering to impact ground and surface waters north of the Project Area. Although the applicant has committed to offsetting habitat effects of the Project through purchasing habitat credits through the CCS program, these credits do not account for potential effects resulting from groundwater drawdown and loss of seeps or spring habitat.

According to Piteau (2019b; 2020b), simulated flow losses to Thacker Creek and Crowley Creek due to the Project would be small, falling within the measurement error of the stream gages, and less than seasonal variation. Most of the simulated flow losses were estimated to occur near the headwaters of Thacker Creek close to the Project. The modeled simulations predict that drawdown would have a negligible effect on baseflow (i.e., approximately 1 percent or less reduction) in both creeks. Therefore, mine related drawdown is not expected to result in a measurable effect to flows in Thacker or Crowley Creeks.

The locations of springs and seeps within the maximum extent of the drawdown areas (defined by the 10-foot contour) under the Proposed Action are shown on **Figure 4.3-7 (Appendix A)**. Three ephemeral springs (SP-001, SP-003, and SP-058) are located within the predicted 10-foot drawdown area. SP-001 is a man-made ephemeral stock pond located within the pit footprint and therefore, would be directly affected during mining. SP-003 and SP-058 are characterized as man-made surface features (stock ponds) that are typically dry. The proposed Project would directly affect SP-001 (which would be mined through). These springs are ephemeral or seasonal and no springsnails occur in these springs. Aquatic wildlife would not be expected to use the springs due to the seasonal presence of water and heavy use by livestock, and the absence of riparian vegetation in association with the springs. However, other terrestrial wildlife in the Project area may depend on these springs as seasonal water sources.

LNC has developed a water monitoring plan and has proposed groundwater monitoring and contingency mitigation measures (including flow augmentation and guzzlers). BLM has also proposed additional monitoring to minimize drawdown effects to perennial surface waters as summarized in Section 4.3.3. The monitoring plan is included in the Thacker Pass Project, Water Quantity and Quality Impacts Report – Addendum I (Piteau 2020a) that is included in **Appendix P** to this EIS.

During final closure and reclamation, open pits would be backfilled, and no open water would occur in association with the pits. There would be no expected ecological risk or effects to wildlife consumption of or exposure to contaminated pit water.

4.5.3.2 Alternative B (Partial Pit Backfill)

Under Alternative B, effects to wildlife and special status species associated with water quality and quantity changes would include those effects described under the Proposed Action. In addition, under Alternative B, a seasonal ponding creating wetland-like conditions could form in the south sub-pit. Smaller wildlife would not likely use the pit lake water, as the steep terrain and distance to the upper rim would create a barrier for access. However, larger more mobile wildlife, could potentially use the pit as a seasonal water source. Pit lakes would also be accessed by birds and bats, who may be attracted to these water sources. In particular, these lakes may be an attractant to species not currently common in the Project area such as Shorebirds, Bald Eagles, or Osprey. While fish eating birds would not stay for an extended period, a new water body may attract them.

According to SRK, NDEP Profile III reference values for molybdenum concentrations could result in post-closure pit water levels in which ecological risks to wildlife cannot be ruled out (SRK 2020). No-Observed-Adverse-Effects-Level (NOAEL) based Hazard Quotients (HQs) for molybdenum ranged from 1.6 to 24.3, and Lowest-Observed-Adverse-Effects-Level (LOAEL) based HQs ranged from less than 1.0 up to 2.6 (SRK 2020).

4.5.3.3 Alternative C (No Pit Backfill)

Under Alternative C, effects to wildlife and special status species associated with water quality and quantity changes would include those effects described under the Proposed Action. In addition, three final pit lakes would form post-closure under Alternative C. These pit lakes could potentially

attract wildlife as a source of water or forage. Smaller wildlife would not likely use the pit lakes, as the steep terrain and distance to the upper rims would create a barrier for access. However, larger more mobile wildlife, and birds and bats, could potentially use the pit lakes as a seasonal water source. According to SRK, NDEP Profile III reference values for molybdenum concentrations could result in post-closure pit water levels in which ecological risks to wildlife cannot be ruled out (SRK 2020a). NOAEL-based HQs for molybdenum ranged from less than 1.0 to as high as 12.4. However, LOAEL-based HQs for molybdenum did not exceed 1.0 for any of the identified wildlife receptors, meaning that harmful effects would not be anticipated.

Additional impacts to 12 seeps and springs would occur under Alternative C, as presented in Section 4.3, **Table 4.2**. The potential for additional loss of water in the Project area would have a significant effect on wildlife and special status species.

4.5.3.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the Project and there would be no effects to wildlife, special status species or their habitat other than those related to the reclamation of existing disturbance under previous authorizations.

4.5.4 Bald and Golden Eagles

The direct and indirect effects analysis for Bald and Golden Eagles has been consolidated in the following section. The study area for Bald and Golden Eagles is the proposed Project boundary and a 10-mile buffer (**Figure 4.5-16**, **Appendix A**). This section summarizes the effects on the environment of implementing the Proposed Action or alternatives to the action. The USFWS is granted management authority of Bald and Golden Eagles under the Eagle Act (16 U.S.C. § 668) and its regulations (50 CFR 22) and is responsible for enforcement of related requirements. The discussion of overall effects to the environment of the eagle take permit program is provided in USFWS 2016a. This section of this EIS analyzes only effects that were not analyzed in USFWS 2016a that may result from the issuance of an EITP for this Project.

4.5.5 Issue – Ground Disturbance and Project Infrastructure

4.5.5.1 Alternative A (Proposed Action – Preferred Alternative)

Golden Eagles

In determining the significance of effects of the Project on eagles, the Service screened the Proposed Action of issuing an EITP for the take of Golden Eagles against the analysis provided in the PEIS (USFWS 2016a) and the Service's 2016 report, *Bald and Golden Eagles Population Demographics and Estimation of Sustainable Take in the United States, 2016 Update* (USFWS 2016b). The Service assessed Project effects to eagles at the project, local, and regional scales.

Under the Proposed Action, the applicant is requesting authorization for disturbance to and loss of annual productivity from one Golden Eagle breeding pair (territory #5 as shown on **Figure 4.5-16, Appendix A**) during the period of up to five years from the date of the issuance of the permit. The

Proposed Action would authorize the disturbance to and loss of annual productivity from one Golden Eagle territory (territory #5) for a maximum of five breeding seasons.

There are 7 Golden Eagle nests within 1-mile of the proposed Project boundary, and 12 Golden Eagle nests within 2 miles of the Project boundary (**Figure 4.5-16, Appendix A**). There are 19 territories within the 10-mile survey area (WRC 2019b). Of the 12 nests within 2-miles of the Project boundary, only the six nests in territory #5 would potentially be affected by disturbance from blasting activity. In 2018, 12 of the territories were considered occupied (WRC 2018b) and 10 were considered occupied in 2019 (WRC 2019b). Additional ground and aerial surveys were conducted in 2020 within 2 miles of the Project area (WRC 2020). Four territories were determined to be occupied within 2 miles of the Project area (WRC 2020). However only one eagle territory is likely to be disturbed to an extent that take is likely, based on minimization measures being applied at other nest sites.

The Proposed Action would have a direct impact to Golden Eagles through the presence of drilling and mining activity in close proximity to their nests, thus causing potential negative impacts to Golden Eagle breeding and nesting activities. Impacts from Trucking of ore (Table 4.11), blasting (Section 4.5.2.1 under Golden Eagles), rock crushing (Section 4.5.1.1), road construction (Section 4.5.2.1), and heavy equipment (Section 4.5.2.1) have been considered in the total impacts to Golden Eagles.

Disturbance of the occupied Golden Eagle territory is assumed to result in loss of annual productivity (i.e., number of young reared) from that territory. The Service uses an estimate of 0.59 Golden Eagle young fledged per occupied nesting territory per year (USFWS 2016c) to estimate loss of annual productivity. One territory means 1 * 0.59 = 0.59 Golden Eagle young of lost annual productivity each for a maximum of five breeding seasons.

The applicant would provide mitigation to offset the proposed take. To determine the amount of mitigation required, the Service's Golden Eagle Resource Equivalency Analysis (REA) was used (USFWS 2018). The values described above are directly entered into the REA to calculate the required compensatory mitigation to offset disturbance of the breeding pair for five years.

Under Alternatives A and B, the USFWS would use electric utility power pole retrofitting to offset authorized take of Golden Eagles. Electrocutions from power poles is known to be a major cause of eagle mortality. Power poles can be retrofitted by verified methods (such as insulating or covering electrical components or modifying pole elements to increase the distance between electrical components) to reduce the risk of electrocution to eagles, with the maintenance and efficacy of retrofits confirmed through post-installation inspections and monitoring. The effects of retrofitting power poles has been quantified "per eagle", allowing use of the REA to calculate the number of power pole retrofits needed to offset the authorized take of Golden Eagles (USFWS 2013).

Based on the updated Eagle Act permit regulations, a compensatory mitigation ratio of 1.2 to 1 is used (USFWS 2016a). The 1.2 to 1 ratio for compensatory mitigation achieves a net benefit to Golden Eagle populations ensuring that regional eagle populations are maintained consistent with

the preservation standard of the Eagle Act despite indications of declines in Golden Eagle populations (USFWS 2016a). Using the REA, the applicant would offset the take of Golden Eagles at the Project by contributing to a USFWS-approved fund or an approved in-lieu fee program in the amount equal to retrofitting approximately 24 power poles per year (where avoided loss from retrofits is maintained and effective for up to 10 years) or 11 poles per year (where avoided loss from retrofits is maintained and effective for up to 30 years). The final power pole number depends on the type and expected longevity of each retrofit. As the implementation of compensatory mitigation would fully offset the estimated take for the Project, and would provide additional net benefit to eagle populations, there would be no significant negative impacts to eagle populations from issuing an EITP under the Proposed Action.

The Eagle Act regulations require compensatory mitigation to be conducted in the same Eagle Management Unit (EMU) in which the take occurs (USFWS 2016). The Project is located in the Pacific Flyway EMU. The location of power poles to be retrofitted has not yet been determined but would be in the Pacific Flyway.

In addition, the Proposed Action incorporates adaptive management and minimization measures as described in **Appendix D**. The proposed Applicant-committed measures would be implemented to further reduce the risk of Project-related injury or mortality hazards to eagles within the Project boundary.

Direct effects to Golden Eagles would include the loss of approximately 5,695 acres of potential foraging habitat and a reduction in prey base until concurrent or final reclamation is completed and vegetation is re-established. There are 7 Golden Eagle nests within 1-mile of the proposed Project boundary, and 12 Golden Eagle nests within 2 miles of the project boundary (**Figure 4.5-16, Appendix A**) and 19 territories within the 10-mile survey area (WRC 2019b). In 2018, 12 of the 19 territories were considered occupied (WRC 2018b) and 10 of the 19 were considered occupied in 2019 (WRC 2019b). Four territories were determined to be occupied during surveys in 2020 within 2 miles of the Project area (WRC 2020). Breeding eagles and up to four territories may be impacted by the proposed Project.

Should any previously unknown or known active Golden Eagle nests be found before construction or during construction or during operational activities, an appropriately sized buffer of two miles for blasting and one mile for all other activities shall be established around these nests during the breeding and nesting season for eagles. The buffers would remain in place until the nests are no longer active.

No Golden Eagle nests or nesting habitat occurs within the Project area. Recently occupied territories (#5, #16, and #9) overlap the Project area and eagles could forage within or pass through the Project area (**Figure 4.5-16, Appendix A**). It is likely that the occupied territories would be affected due to mining activities, and in addition, loss of habitat associated with territory #5 would occur. Potential disturbance to this territory would occur over the life of the Project. The territorial pair may adjust their territorial boundary away from the mine site, or potentially be disturbed from the loss of habitat and mining operations. Territory #16 would lose some habitat, however adaptive

management and minimization measures as described in Appendix D would be implemented to reduce effects on this territory.

LNC would reduce attraction of eagles to the Project area by limiting the availability of created water sources. Access to standing water on the Project site would be limited during construction and operation. When possible, LNC would ensure truck wash areas are kept free of standing water during construction. Water used for dust suppression during construction would be applied at a rate that discourages puddling (Cedar Creek 2020b). The creation of reclaim and emergency stormwater management ponds could increase the attraction of eagles and their food sources to the Project site, since the ponds would provide an additional source of water. All process ponds would be fenced to restrict wildlife, and these ponds would be kept dry under normal conditions. Since fencing does not exclude birds or bats or small prey species, recommended mitigation measure SSS-2 would require LNC to install additional exclusionary devices, such as bird balls or HDPE netting, to prevent eagles and their prey from accessing water management ponds and to minimize drowning. The installation of avian exclusionary devices at pond locations would be consistent with requirements of the NDOW Industrial Artificial Pond permit for the Project.

Pit dewatering activities have the potential to increase eagle prey to the mine site. Sump pumps used for pit dewatering would directly fill water trucks for on-site dust suppression. No storage tanks or wells would be needed to support dewatering operations. Golden Eagle prey may be attracted to pit dewatering areas, but the increased vehicle traffic and human activity would likely reduce eagle attraction to the site.

All ponds would remain dry under normal mine operations and the emergency and reclaim ponds would be fenced to deter wildlife. Stormwater ponds would not be fenced. The installation of avian exclusionary devices at pond locations would be consistent with requirements of the NDOW Industrial Artificial Pond permit for the Project. A Solid and Hazardous Waste Management Plan would be developed for the Project that outlines proper storage, handling, and disposal methods that include preventing exposure of wildlife to toxic substances. Any spills associated with wastes or chemicals would be managed under the Spill Contingency Plan, to minimize exposure to wildlife.

Under the Proposed Action, LNC would incorporate APLIC guidelines for construction of transmission and power lines, and communication towers to reduce risk of electrocution or collision with eagles and minimize attraction of eagles to electrical structures (APLIC 2006; 2012). LNC would conduct visual inspections of mining facilities that pose hazards to avian species, such as the processing and storage facilities and administration buildings, on a daily basis (Cedar Creek 2020a). Other facilities (e.g., borrow areas, storage facilities) would be inspected quarterly.

An emergency helicopter pad would be constructed by the operator as part of the Proposed Action. The helicopter pad would be used only by medical personnel for emergency ambulance flights to medical care facilities during human health emergency situations. The anticipated flight path of any helicopter using the emergency pad would be to approach the Project area from Winnemucca or Reno from the south. Once medical emergency passengers are onboarded at the mine site the

helicopter would then generally follow the most direct southerly route to the nearest hospital. If helicopter flights occur during the avian breeding season, potential effects to eagles could include increased noise disturbance with potential negative effects to Golden Eagle breeding and nesting activities.

Upon final closure and reclamation, open pits would be backfilled, and no open water would occur associated with the pits. No highwall would remain.

Indirect effects include decreased quality of foraging habitat, increased habitat fragmentation, and avoidance and displacement associated with increased mine-related noise and human presence.

Bald Eagles

Bald Eagle foraging and breeding habitat is absent within the proposed Project area and limited within the 10-mile study area. No Bald Eagles were observed within the study area during 2018, 2019, and 2020 surveys. Occurrences of Bald Eagles within the Project area would likely be limited to migrating or dispersing individuals passing through the area; therefore no significant adverse effects to Bald Eagles are anticipated as a result of the Project. Although take of Bald Eagles is not expected to occur at this Project and take of Bald Eagles would not be permitted, Bald Eagles in the region may benefit from avoidance and minimization measures established to reduce the risk to Golden Eagles. Bald Eagles may benefit from compensatory mitigation actions provided to offset the take of Golden Eagles under the Proposed Action.

4.5.5.2 Alternative B (Partial Pit Backfill)

Potential effects to Bald and Golden Eagles and required mitigation would be the same as under Alternative A.

4.5.5.3 Alternative C (No Pit Backfill)

Under Alternative C, the USFWS would require nest site enhancement within the Pacific Flyway EMU as compensatory mitigation; compensatory mitigation would differ from Alternative A under the eagle incidental take permit. Under this alternative, the USFWS would require 1:1 mitigation as retrofits, and 0.2:1 mitigation as nest site enhancement within the Pacific Flyway Eagle Management Unit. The LNC would contribute funds to the National Fish and Wildlife Foundation (NFWF) or directly to a utility company for the retrofits, and would contribute funds for nest site enhancement to NFWF or directly to an ongoing study that is treating Golden Eagle nests for Mexican chicken bugs or other parasites if they are identified as a concern. The USFWS considers this a viable option as recent scientific studies found that treating young eagles for the protozoan parasite (*Trichomonas gallinae*) was effective and increased nest site productivity (Kochert et al. 2018). Current and emerging threats of disease and ectoparasites have the potential to negatively affect Golden Eagle productivity (Dudek and Heath 2017).

4.5.5.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the proposed Mine and Exploration Plans. No adverse effects to Golden Eagle territories would be anticipated.

4.5.6 Issue – Noise

4.5.6.1 Alternative A (Proposed Action – Preferred Alternative)

Golden Eagles

Though loud noises are assumed to disrupt Golden Eagle behavior, there are few studies that have measured the effect of noise on Golden Eagles. Noise level changes were estimated in the Thacker Canyon pass where Golden Eagle nests have been observed (Saxelby 2019b; 2019c; 2019d; 2020). Many of the eagle nests within 1-2 miles of the proposed Project are located deep in the canyon along the east wall, facing west and they are not within direct line of sight between the nests and the proposed Project area. Saxelby prepared an assessment of operational noise from the proposed Project at the nearest Golden Eagle nest locations in Thacker Canyon. Estimated Thacker Pass Project noise levels (L_{50}) produced by mining and processing activities were estimated between 19.3 and 29 dBA (Saxelby 2019b). Not including blasting activities, maximum (L_{max}) noise levels from mining operations were predicted to range between 5-15 dBA louder than median (L_{50}) noise levels. This would be above the current ambient levels to which the eagles are accustomed.

Upon USFWS request, Saxelby revised the noise analysis to include maximum levels (L_{max}) of noise at these nest sites. Maximum blasting noise levels are proposed to range from 64.3 to 76.1 dBZ (L_{max}) at the nests in Thacker Canyon. Existing maximum noise levels were found to be 78.6 dBZ (L_{max}). Proposed blasting would only occur on an irregular basis when basalt outcrop layers are encountered during mining. The proposed blasting activity is not expected to exceed the existing typical maximum noise level in the vicinity of the Thacker Canyon Golden Eagle nests sites (Saxelby 2020).

Even so, the increase in noise levels from operations and blasting activities may affect Golden Eagles that currently maintain breeding territories near the proposed Project and could disturb nesting eagles and result in nest failure and/or breeding territory abandonment unless appropriate nest buffers are implemented. Increases in noise levels within an eagle territory may also adversely affect Golden Eagles during the courtship phase. LNC has submitted an application to the USFWS for an incidental take permit related to potential disturbance to one Golden Eagle territory resulting from construction, operation, and reclamation of the proposed Project.

Bald Eagles

As discussed previously, no Bald Eagle breeding or foraging habitat occurs within the Project area and regular Bald Eagle occurrences have not been documented during surveys. Bald Eagles are not anticipated to be affected by mine related noise.

4.5.6.2 Alternative B (Partial Pit Backfill)

Potential effects to Bald and Golden Eagles would be the same as discussed under Alternative A.

4.5.6.3 Alternative C (No Pit Backfill)

Potential effects to Bald and Golden Eagles would be the same as discussed under Alternative A with the exception of the creation of open pit highwall areas left backfilled or reclaimed at the end of mining and the additional 482 acres of surface disturbance resulting from the expanded East

WRSF. These areas of highwall habitat may attract Golden Eagles to perch and could provide adequate nesting habitat depending on the highwall rock type and stability. The additional surface disturbance would remove more foraging habitat from the Project area.

4.5.6.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the proposed Mine and Exploration Plans. No adverse effects to Golden Eagle territories would be anticipated.

Mitigation of Golden Eagle Take and Monitoring

The USFWS has reviewed the proposed Project and is currently reviewing the applicant's application for an EITP for disturbance of one Golden Eagle territory annually over the first five years of the Project. If the USFWS does approve the Project EITP, the incidental take would be fully compensated through the retrofitting of utility power poles and avoidance of future electrocution of Golden Eagles. Up to 24 power pole retrofits per year of disturbance would be required to fully compensate from anticipated Golden Eagle take from the proposed Project. In addition, some level of eagle monitoring would be required under the EITP for up to three years beyond the permit term, if issued.

4.5.7 Recommended Mitigation and Monitoring

LNC has proposed monitoring and mitigation to minimize risks to surface waters, including seeps and springs, as described in Section 4.3.2. Mitigation and monitoring measures to minimize direct and indirect effects to wildlife and special status species from the Proposed Action are proposed below**.** In addition, to help ensure the effectiveness of proposed wildlife mitigation measures for the Proposed Action, a biological resources focused Technical Assistance Group (TAG) would be created to develop appropriate monitoring of biological resources and to evaluate the success of mitigation. The TAG would consist of the applicant, the BLM, the NDOW, the USFWS, and any other agencies or academic institutions as appropriate. Annual meetings would be held with the group participants to review the success of the mitigation and monitoring.

Issue SSS-1: Potential Effects to Nesting Migratory Birds

SSS-1: In order to avoid potential effects to breeding migratory birds, a nest survey would be conducted by a qualified biologist within potential breeding habitat prior to any surface disturbance proposed during the avian breeding season (March 1 through August 31), including any surface disturbance associated with exploration activities. Qualified biologists used for migratory nest clearance surveys should have previous experience with bird and nest ID, and preferably be a Certified Wildlife Biologist under The Wildlife Society's certification program. Surveys would be conducted no more than ten days and no less than three days prior to initiation of surface disturbance. Surveys would follow established BLM standards and protocols and would be approved by the BLM biologist prior to being implemented. If active nests are located, the BLM biologist would be notified immediately, and appropriate protection measures would be established to determine avoidance or restriction activities, in adherence with BLM and NDOW recommended

nest buffer distances. If no active nests are present in the area survey, implementation of the surface disturbance would commence within ten days of survey completion.

Effectiveness: Implementation of this measure would limit the timing and location of surface disturbance activities, which would reduce the potential for disruption to migratory bird breeding and nesting activities. However, this mitigation measure would only reduce effects from construction activities and would not reduce impacts or mortality from habitat loss or degradation.

Issue SSS-2: Potential Effects to Nesting Raptors

SSS-2: Prior to initial surface disturbance, LNC would have a qualified biologist conduct raptor nest surveys within 1-mile of the disturbance area in suitable habitat. If active raptor nests are located, LNC would coordinate with the BLM to establish appropriate nest activity buffers in adherence with BLM and NDOW recommended raptor buffer distances. Any activity that could disturb the nesting raptors would be avoided in the established activity buffer until the nest is no longer in-use, or as directed by the BLM. Nest status monitoring would be performed in a way so as not to disturb breeding and brood-rearing activities.

Effectiveness: Implementation of measure SSS-2 would reduce and minimize adverse effects to nesting raptors; however, it would not mitigate impacts to loss of raptor foraging habitat.

Issue SSS-3: Potential Effects to Avian Species from Water Ponds

SSS-3: Recommended mitigation measure SSS-3 would require LNC to consult with NDOW on the potential installation of exclusionary devices consistent with NDOW Industrial Artificial Pond Permit requirements to prevent raptors and other migratory birds and bats and their prey from accessing ponds and to minimize drowning.

Effectiveness: Implementation of measure SSS-3 would effectively reduce and minimize adverse effects to birds and bats and their prey from drowning.

Issue SSS-4: Potential Effects to Avian Species Requiring Adaptive Management

SSS-4: Recommended mitigation measure SSS-4 would require LNC to develop a monitoring plan that would help identify mine facility problem areas that pose threats to raptors, and other migratory birds and bats, and may require additional mitigation or adaptive management.

Effectiveness: Implementation of measure SSS-4 would reduce and minimize adverse effects to migratory birds and bats; however, it would not mitigate impacts to loss of suitable habitat.

Issue SSS-5: Potential Effects to Pygmy Rabbits

SSS-5: Pre-construction clearance surveys for pygmy rabbits would be required prior to surface disturbance during the initial construction phase of the Project (Years 1-6) within delineated habitat. Surveys would be conducted during the winter (November through February) for areas that are anticipated to be disturbed in the following year. Surveys would be conducted according to the methods outlined in the protocol *Surveying for Pygmy Rabbits (Brachylagus idahoensis)* (Ulmshneider et al. 2008). If occupied pygmy rabbit habitat (burrows) is identified during pre-

construction clearance surveys consultation with the appropriate BLM and NDOW wildlife biologists would occur to develop appropriate avoidance strategies and mitigation measures.

Effectiveness: By implementing mitigation measure SSS-5, potential mortality to pygmy rabbits from construction activities would be reduced. However, this mitigation measure would only reduce direct mortality from construction activities, and would not reduce impacts or mortality from habitat loss or degradation.

Issue SSS-6: Potential effects to Western Burrowing Owl

SSS-6: During Western Burrowing Owl nesting season (March 1 through August 31), pre-construction clearance surveys following the Winnemucca BLM District's survey protocol would be conducted by a qualified biologist within the Project area in areas identified as potential Western Burrowing Owl habitat within the Project area. Survey results would be reported to the BLM. For active nests, an avoidance buffer, no less than 75 meters (250 feet), would be established and the buffer area avoided to prevent destruction or disturbance to nests/burrows until they are no longer active. The site characteristics used to determine the size of the buffer would be: (a) topographic screening; (b) distance from disturbance to nest/burrow; (c) the size and quality of foraging habitat surrounding the nest/burrow; and (d) and the sensitivity of the species to nest disturbances. Additional monitoring shall be conducted to ensure nesting Burrowing Owls have fledged the nest prior to disturbance. If no active nests are present within the area surveyed, implementation of the proposed disturbance would commence within ten days of survey completion.

Effectiveness: Implementation of measure SSS-6 would limit surface disturbance activities, which would reduce the potential for disruption to Western Burrowing Owl breeding and nesting activities. However, this mitigation measure would only reduce effects from construction activities, and would not reduce impacts or mortality from habitat loss or degradation.

Issue SSS-7: Potential Loss of Western Burrowing Owl Nests

SSS-7: To offset the permanent loss of detected Western Burrowing Owl nests within the Proposed Action disturbance footprint, LNC would coordinate with the BLM and NDOW to create Artificial Burrow Systems (ABS) to replace lost burrows. Techniques and methods for creating the ABS would be done in coordination with the BLM and NDOW based on existing literature. Pre-clearance surveys would be completed prior to the installation of ABS. Depending on the location of placement of the ABS, additional baseline studies conducted by LNC and a potential supplemental NEPA analysis may be needed. Monitoring for the effectiveness of the created ABS should include identification of Burrowing Owls within the Project Area during the time of year they are present (spring/summer) and capturing and tagging Burrowing Owls by installing telemetry devices to track their movements to determine if they are using the ABS for nesting. Monitoring should be coordinated with the BLM and NDOW prior to any field identification of Burrowing Owls, and should be performed for five years.

Effectiveness: Implementation of mitigation measure SSS-7 would help mitigate effects on the loss of Burrowing Owl breeding habitat from the permanent destruction of nests.

Issue SSS-8: Potential Effects to Bat Roosting Habitat

SSS-8: LNC would be required to coordinate with NDOW to verify the presence or absence of potential bat day roosting and potential maternity roosting habitat within the Project area. Disturbance activities that occur within any areas verified as potential roosting or maternity habitat shall only be completed during seasons outside of bat maternal roosting (May 1 through August 31) or wintering hibernacula (November 1 through April 1).

Effectiveness: Implementation of mitigation measure SSS-8 would help minimize mortality to roosting bats within the Project area by avoiding disturbance to maternal roosts of winter hibernacula during critical roosting periods.

Issue SSS-9: Potential Effects to Bat Roosting Habitat

SSS-9: During removal of any NDOW verified roosting or maternity habitat during initial construction and expansion activities in the Project area, LNC shall repurpose removed rock material and create stacked rock areas within the Proposed Plan boundary, but outside of the disturbance footprint to recreate opportunities for bat roosting.

Effectiveness: Implementation of mitigation measure SSS-9 would help to mitigate the loss of potential roosting habitat within the Project area by creating potential alternate roosting habitat within the Plan boundary.

Issue SSS-10 and SSS-11: Potential Effects to Rare Plants and Their Habitat

SSS-10: This measure has been deleted in response to LNC's modification of the proposed Exploration Plan of Operations boundary to avoid known Crosby's buckwheat habitat. Baseline surveys of the remaining proposed Mine and Exploration Plan areas did not identify any existing populations.

SSS-11: This measure has been deleted in response to LNC's modification of the proposed Exploration Plan of Operations boundary to avoid known Crosby's buckwheat habitat. Baseline surveys of the remaining proposed Mine and Exploration Plan areas did not identify any existing populations.

Issue SSS-12: Potential Effects to Fish Movement in Crowley Creek during High Flow Periods

SSS-12: Construction or improvement activities at Crowley Creek would be limited to times in the year when the stream is dry or during low flow periods. If construction or improvement activities do occur during streamflow, construction would be limited to low water periods. Construction would not impede fish movement and fish-friendly culverts would be used.

Mitigation Required under State Regulation

As required under NRS 232.162, LNC is working with the SETT to utilize the CCS to offset effects of the proposed Project's surface disturbance to GRSG and sagebrush habitat. Mitigation pursued by the applicant through the CCS program is used to offset impacts to GRSG (including noise) and sagebrush habitat only, and is not intended to offset effects to other resources, such as impacts to riparian and water resources. The final number of credits purchased would be

determined based on proximity of credit generation to the Project. The SETT has completed a formal quality assurance review of the results of the CCS HQT (SWCA 2019b) for the Proposed Action.

4.5.8 Residual Effects

Assuming successful reclamation of all project components, residual effects to wildlife habitat would include the permanent loss of less than five acres for the Proposed Action. These residual effects would be associated with access roads which would not be reclaimed which are required to conduct mine closure and monitoring. Depending on the success of reclamation, fragmentation and the loss of shrub-dominated communities would represent a long-term change in wildlife habitat composition (i.e., shrub-dominated communities to grass/forb-dominated communities). Additionally, surface water springs and seeps that would be removed or covered by mining activity would not be restored post-mining.

4.6 SOILS

4.6.1 Issues – Ground Disturbance and Project Infrastructure

This section discusses potential effects to soil resources including effects on structure, organic matter, erodibility, function, and possible contamination caused by mining and reclamation activities.

4.6.1.1 Alternative A (Proposed Action – Preferred Alternative)

Activities associated with construction and operation of the alternatives, including mine construction and operation, mineral processing, ancillary mine features, exploration, and closure and reclamation would have direct and indirect effects on approximately 5,695 acres of soil resources within the Area of Analysis (**Appendix I**).

This section analyzes potential direct and indirect effects on soil resources of the alternatives. Potential direct effects on soils include changes to structure, physical, and chemical alterations that could result in the potential for decreased soil function, including a decrease in quality of topsoil. Loss of soil function can lead to increased susceptibility to wind and water erosion, which in turn would lead to the indirect effect of dust and sediment generation due to wind and water erosion, causing off-site deposition of dust and sediment. In addition, potential direct effects on soils include soil contamination.

This section also analyzes the suitability of harvested and stockpiled growth media for successful reclamation.

Generally, soils in the study area are fair to poor as a source of reclamation material, slightly to moderately susceptible to water erosion, and slightly to highly susceptible to wind erosion (LNC 2019a, **Appendix G**). More precisely, most of the soil at the project site by acreage is poor as a source of reclamation material, moderately susceptible to water erosion, and moderately to

highly susceptible to wind erosion. No soils within the area of analysis were rated as a good source of reclamation material. For detailed acreages and soil ratings by Project area, see **Appendix I**.

The Proposed Action would have direct and indirect effects on soil resources in the area of analysis. Potential soil disturbance from implementation of the Proposed Action is approximately 5,695 acres within the area of analysis, which includes 300 acres of exploration disturbance that could occur in any soil throughout the area of analysis, including within the Mine Plan boundary (150 acres) and the North and South Exploration Areas (150 acres).

During construction, the top 12-18 inches of topsoil, 12 inches in depth on average, would be salvaged for use as growth media, and this suitable growth media would be stockpiled as near to the source as possible for reuse during reclamation. During reclamation, this suitable growth media would be placed on disturbed surfaces to approximately six to 12 inches in thickness and would be revegetated with seed. Concurrent reclamation is projected to occur at the earliest economically and technically feasible time on disturbed areas that are no longer required for operations. All disturbed areas, including areas disturbed during previous exploration, would be reclaimed except for pre-1981 existing unpaved or other secondary roads, which would be left in place to provide ongoing access to public lands and for reclamation monitoring needs.

Mine Construction

Mine construction would involve grading and excavating activities to develop an open mine pit, mine facilities, processing facilities, WRSFs, ROM stockpile, clay tailings filter stack, and GMSs.

Effects to soil function could occur from excavation and compaction during mine construction and may result in direct effects to soils, including physical and chemical changes. Compaction would make the ground surface less permeable to water, increasing the possibility of erosion as discussed below and slowing drainage. Changes in permeability and drainage affect how readily vegetation can become established and grow. In addition, these changes can lead to increased vulnerability to wind and water erosion. Reclamation, which would begin in Year 5, would include deep ripping of the subgrade to reduce compaction and promote vegetation growth as well as placement and grading of growth media and seeding. Reclamation would occur on a rolling basis as disturbed areas are no longer required for operations, with revegetation taking place as soon as economically and technically feasible. In addition, LNC would conform to project-wide environmental protection measures to limit both wind and water erosion. Best management practices (BMPs) include erosion control devices such as silt fences, check dams, sediment traps, and rock and gravel cover; and revegetation (**Appendix B**). In addition, the project includes diversions, sediment ponds, and culverts to manage stormwater. Fugitive dust would be controlled by application of water. All areas where growth media are salvaged would be seeded after contouring, regrading, and scarifying. These soils would continue to be susceptible to wind and water erosion until stabilizing vegetation becomes established.

Indirect effects of dust and sediment generation could result from water and wind erosion. Wind erosion could cause deposition of fugitive dust on nearby vegetation, which could affect its ability to thrive. Any loss of vegetation could result in loss of vegetative cover, leading to the potential for

more erosion. Fugitive dust emissions would be controlled by the application of water. In addition, reclamation would be concurrent with mine operation, and would begin as soon as economically and technically in disturbed areas no longer used for mine operations.

Water erosion would occur primarily during the wet season and could result in sedimentation in the onsite ephemeral drainages and intermittent surface waters. LNC would implement project-wide best management practices (BMPs) to limit erosion and reduce sediment as a result of water erosion.

Mine construction could affect soil resources through leaks or accidental spills of contaminants. Such leaks and accidental spills could contaminate the soil, causing the soil to lose productivity and the capacity to support plant growth, and disrupting the process of organic matter decomposition. Potential soil contaminants are described in Section 5.16, *Wastes, Hazardous and Solids*, and include fuels and vehicle and equipment maintenance fluids

However, these materials would be stored and managed under the Spill Contingency Plan, which is prepared pursuant to 43 CFR 3809.401(2)(vi) and establishes responsibilities and guidelines for actions to be taken by mine and plant personnel in the event of a spill of hazardous materials at the Project site.

Mining Operations

Mining operations would involve mineral recovery from open pits, crushing, storage of mine materials in a ROM stockpile, storage of gangue in a CGS, and storage of waste rock in WRSFs. It would also include salvaging growth media and storing it in three GMSs.

Removal and transport of lithium ore and placement of ROM, coarse gangue, and waste rock into stockpiles could generate dust as a result of wind erosion. Stockpiles could also generate dust through wind and water erosion.

Mine operation could affect soil resources through leaks or spills of contaminants. Contaminant sources during mine operation include potential leaks of petroleum products from mobile equipment such as end dumps, loaders, water truck, equipment hauler, and motor graders as well as plant reagents, laboratory reagents including assay chemicals, lithium and compounds, and sodium hypochlorite (15.3 percent) solution (chlorine bleach).

However, these materials would be stored and managed under the Spill Contingency Plan, which is prepared pursuant to 43 CFR 3809.401(2)(vi) and establishes responsibilities and guidelines for actions to be taken by mine and plant personnel in the event of a spill of hazardous materials at the Project site.

Mineral Processing

Mineral processing would involve separating the lithium-rich material from low-grade coarse gangue, chemical processing to separate lithium from the ore, and production of lithium-based batteries or components (**Appendix B**).

Soil resources may be affected as a result of leaks or accidental spills of contaminants. Contaminant sources during mineral processing include potential leaks from plant site equipment, including acid leaching, lithium carbonate production, causticizing and filtration, lithium hydroxide production, lithium sulfide production, lithium metal production, and battery production (**Appendix B**). Contaminants could include sulfuric acid, lithium carbonate, lithium hydroxide monohydrate, and chlorine. The chemical plant would operate in conformance with all applicable MSHA and OSHA safety regulations, as appropriate. LNC would have a trained response team at the site 24 hours per day to manage potential spills of regulated materials at the site. If spills or leaks occur, LNC would implement steps described in its Spill Contingency Plan and would employ controls and cleanup measures in accordance with NDEP guidelines. In addition, a high-density polyethylene-lined emergency pond would be constructed near the acid-leaching plant process areas that would contain any chemical slurry that is released to secondary containment and cannot be immediately returned to processing. This pond would be fenced to restrict wildlife access. Hazardous waste, including spills, would be handled, stored, and managed according to federal (43 CFR 262), state, and local regulations. LNC would obtain a Hazardous Waste Identification Number from the EPA for both the mine and plant site.

LNC would also develop and implement a Solid and Hazardous Waste Management Plan that would identify wastes generated at the Project site and their appropriate means of disposal, to minimize the likelihood of a release to the environment.

Ancillary and Support Facilities

Ancillary and support facilities include site security, signs, and fencing; power transmission and distribution; fuel and hydrocarbon storage; safety and fire protection; and solid and hazardous waste handling and disposal.

Loss of soil function could result from installation of signs, fencing, power transmission and distribution facilities, and fuel and hydrocarbon storage because of required excavation and grading.

This excavation and grading would involve compaction, which would increase risk of erosion. Erosion can in turn result in dust and sediment generation.

Soil resources may be affected as a result of leaks or accidental spills of contaminants. Contaminant sources include potential leaks from above-ground storage tanks used to store fuels (**Appendix B**) and hazardous wastes, including used oil and coolant that would be stored in separate above-ground storage tanks. These tanks would be double-walled, with primary containment consisting of a tank and secondary containment consisting of a double-walled container, concrete containment slabs and walls, or earthen-lined berms.

All hydrocarbon products and antifreeze would be stored at the mine maintenance area and transported, stored, and used in accordance with federal, state, and local regulations. Used oil and containers would be disposed or recycled according to federal, state, and local regulations. Hazardous waste, including spills, would be handled, stored, and managed according to federal (43 CFR 262), state, and local regulations.

Exploration

Exploration, as defined in Section 2.2.8, could result in loss of soil function, erosion, contamination, and dust and sediment generation.

Surface sampling, bulk sampling, trenching, and drilling could all result in compaction of the soil and removal of vegetative cover. In addition, while travel to exploration sites would be on existing roads where possible, if additional access is required, travel would be overland. This earthwork and overland travel would compact the soil and damage or destroy vegetative cover. These changes could lead to erosion and dust and sediment generation.

Exploration activities would require the use of heavy equipment that is fueled by petroleum products. Any such use is subject to potential leakage and contamination of the environment.

Closure and Reclamation

Closure and reclamation would involve placing salvaged growth media, preparing areas for revegetation, including ripping the subsoil and placing salvaged growth media, seeding, and monitoring for revegetation success.

Effects to soil function could occur from removal, stockpiling, and placement of soil for growth media and may result in direct effects to soils, which include physical and chemical changes. These changes would be caused by mixing, crushing, and compaction during salvage operations for the GMSs.

Suitable growth media would be salvaged during ground disturbance from the footprint of proposed disturbances in the Project area for subsequent use in reclamation. Growth media handling operations would be conducted using dozers, front-end loaders, haul trucks, and other equipment. Growth media would be placed in stockpiles in designated areas and would be located so that mining operations would not disturb the stockpiles.

Mixing and compaction of the soils during salvage operations would affect the productivity and fertility of newly disturbed soils. Physical effects of compaction on the soils include reduced permeability and porosity, decreased available water holding capacity, increased bulk density, and loss of soil aggregate structure. Surface soil aggregates are the most susceptible to damage, and, if damaged, can create a surface crust when wetted, essentially sealing the soil surface and increasing the risk of soil erosion and impeding seeding growth during reclamation. A reduction in soil productivity or fertility indirectly effects vegetation growth and thus the success of reclamation efforts.

Soils that are stored for extended periods, such as stockpile sites, would be more affected by compaction, lack of aeration, decreased porosity and permeability, and reduced water-holding capacities. GMSs would be reseeded after shaping to reduce erosion and maintain biological processes to increase soil productivity. Additionally, BMPs such as silt fences or staked weed-free straw bales, would be used as necessary to reduce sediment runoff during precipitation events.

Based on current predictions of available growth media, it is anticipated that a minimum of approximately six to 12 inches of growth media would be placed during reclamation. It is

estimated that planned growth media salvage would acquire enough material to place on top of any fill material (waste rock and coarse gangue are currently planned).

Based on NRCS rating for sources of reclamation material and topsoil in the Area of Analysis, which indicates fair to poor salvaged growth media, salvaged growth media may require soil amendments for successful reclamation.

4.6.1.2 Alternative B (Partial Pit Backfill)

Alternative B would be the same as Alternative A except that the south open pit would be partially backfilled, potentially allowing a small wetland area to develop. Effects on soils under Alternative B as a result of loss of soil function, erosion, contamination, dust and sediment generation, and suitability of growth media for revegetation would be the same as under Alternative A.

At the end of mining, a small portion of the south open pit would be partially backfilled to an elevation of approximately 4,709 feet. Alternative B would affect the locations, area and height of backfill material as compared to Alternative A. Adequate growth media quantity and quality media for reclamation is projected for Alternative B, as for Alternative A.

4.6.1.3 Alternative C (No Pit Backfill)

Alternative C differs from Alternative A in that the West, North, and East Pits would not be backfilled at the end of the mining period. Effects on soils under Alternative B as a result of loss of soil function, erosion, contamination, dust and sediment generation, and suitability of growth media for revegetation would be similar to those under Alternative A with an additional 482 acres of surface disturbance resulting from the expanded East WRSF footprint.

However, Alternative C would require additional growth media, resulting in a larger effect on soil function, erosion, and dust and sediment generation. Under Alternative C, the open pits would be left open and not be backfilled. Approximately 7.8 million cubic yards additional material would be placed in the West WRSF and approximately 207.2 million cubic yards of additional material would be placed in the East WRSF under Alternative C. These WRSFs would require more growth media to cover than the open pits would require.

4.6.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.6.2 Recommended Mitigation and Monitoring

No mitigation measures for soils are proposed beyond the applicant committed design features for erosion presented in the Mine Plan and sediment control and measures to prevent unnecessary or undue degradation presented in the Reclamation Plan.

4.6.3 Residual Effects

Concurrent reclamation would begin in Year 5, after construction of the mine and processing facilities is completed in Year 4. During this period, although wind erosion would be minimized

through application of water, it is possible that wind erosion could result in dust deposition on- and off-site.

4.7 NON-NATIVE AND INVASIVE PLANTS

4.7.1 Issue – Ground Disturbance

4.7.1.1 Alternative A (Proposed Action – Preferred Alternative)

Invasive plant and noxious weed establishment and spread under the Proposed Action would be an indirect effect as a result from surface disturbance associated with the Mine Plan and Exploration Plan. Invasive plants and noxious weeds are adapted to establish and spread through disturbed ecosystems. Mining and exploration activities would result in an increase of vegetation and soil disturbance and an increase in traffic to the Project area. This would result in an increased risk of existing invasive plant and noxious weed populations spreading and other species currently not present within the Project area to become established. Increased traffic from the Project area would result in an increased risk of spreading invasive plants and noxious weeds off-site of the Project area.

Establishment and spreading of invasive plants and noxious weeds would result in loss to structural diversity and can cause ecosystem instability. Additionally, their presence would result in the increase risk for fire frequency, decrease forage production for livestock and wildlife, and would reduce recreational land value (Ditomaso 2000). Invasive plant and noxious weed populations would reduce the integrity of the natural resources, reducing soil and plant community value for health, esthetics, and wildlife habitat (USDA 2007).

Compliance with the weed control measures identified in the Plan Appendix D Thacker Pass Project Noxious and Invasive Weed Management Plan (LNC 2019a) and BLM WD RMP (BLM 2015) would limit the potential for establishment and spread of invasive plants and noxious weeds. These measures would include but are not limited to:

- implementing the management measures as appropriate during construction, operations and post construction reclamations phases;
- implementing weed treatment prior to construction/operations on a site-specific basis;
- ensuring equipment brought to the Project area is weed free and that the equipment is cleaned and inspected prior to entering the Project area;
    - vehicles and equipment would be inspected and verified to be free of soil and debris capable of transporting noxious weed seeds or parts prior to being allowed access to the Project area as well as prior to leaving the Project area;
    - vehicles and equipment that require cleaning would be addressed using either compressed air or high-pressure washing devices;
- controlling weeds prior to soil stripping to prevent potential germination in soil stockpiles and controlling weeds on stockpiles prior to redistribution;
- seed with certified noxious weed-free native seed mixes;

- monitor high priority areas like traffic areas, road cuts, embankments, non-use areas around buildings, and ditches and pond embankments;
- promptly implementing revegetation on lands disturbed as soon as possible, adequate vegetation cover reduces the opportunity for invasion by weeds;
- use of straw, hay, mulch, and imported gravel or fill would be noxious weed free.

These control measures would result in a decrease of the potential establishment and spread of invasive plants and noxious weeds, but efforts to control weeds may not be effective in all circumstances and could lead to infestations in some areas.

4.7.1.2 Alternative B (Partial Pit Backfill)

Potential effects under Alternative B are anticipated to be the same as discussed under Alternative A.

4.7.1.3 Alternative C (No Pit Backfill)

Potential effects under Alternative C are anticipated to be the same as discussed under Alternative A with the exception of additional 482 acres of surface disturbance resulting from the increased footprint of the East WRSF.

4.7.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.7.2 Recommended Mitigation and Monitoring

No mitigation measures are proposed beyond the implementation of LNC's Thacker Pass Project Noxious and Invasive Weed Management program.

4.7.3 Residual Effects

Increased surface disturbance and stripping of established vegetation and topsoil would result in increased invasive plant and noxious weed establishment and spread. Bare soils are more susceptible to the establishment and spread of invasive plants and noxious weeds. As surface disturbance and traffic increases, this would result in the spreading of existing invasive plant and noxious weed populations and establishment of new populations of invasive plants and noxious weeds not currently present in the Project area or Humboldt County. Introduction of invasive plant species and noxious weeds in reclaimed areas would impair reclamation success.

Control measures outlined in the Thacker Pass Project Noxious and Invasive Weed Management Plan and BLM WD RMP would decrease the potential establishment and spread of invasive plants and noxious weeds as long as they are adhered to through the life of the mine and any subsequent reclamation and decommissioning activities.

4.8 RANGELAND MANAGEMENT

4.8.1 Issues – Ground Disturbance and Livestock Health

The analysis of direct and indirect effects to range resources and grazing management focuses on surface disturbance from developing mine facilities that would eliminate livestock grazing acreage and forage vegetation and the potential for mining activity to inadvertently present potential threats to the overall health of livestock.

4.8.1.1 Alternative A (Proposed Action – Preferred Alternative)

Alternative A would result in the removal of approximately 5,695 acres of potential livestock foraging areas as a result of mine development and surface disturbance. Exploration related surface disturbance is estimated to remove an additional 150 acres of potential foraging areas during the 41-year life-of-mine. **Table 4.78** shows the temporary loss of acreage and Animal Unit Months (AUMs) within the affected allotments as a result of mining activities within the mine and exploration Plan boundaries. An AUM is defined as the amount of forage that will support a mature cow/calf pair for one month. Upon mine closure and successful reclamation the disturbed areas would be available for livestock grazing if the BLM decides to add those acres back into the permits.

Table 4.8. Acreage and AUMs Eliminated by Allotment

Allotment	Mine Plan Boundary		
	Plan Boundary Acreage	***Surface Disturbance Acreage / Percent of Allotment Total***	***Loss of AUM / Percent of Allotment Total***
Crowley Creek	1,907	90.3 / <1	6 / 1
Kings River	1,086	857.4 / 1	123 / 1
Pole Creek	7,467	4,447.2 / 13	371 / 1

< = less than

Groundwater drawdown associated with pumping of groundwater from the Quinn Well could potentially affect existing vegetation communities used for livestock forage on private lands located within the anticipated 10-foot maximum drawdown contour for the Project (**Figure 4.3-23, Appendix A**). Stringham (2020) evaluated the potential for groundwater drawdown to affect groundwater dependent vegetation in the vicinity of the Quinn Well and Crowley Creek including portions of Sections 11, 12, 13, 14, 22, 23, 24, 33, and 34 in Township 44 North Range 36 East. Stringham concluded that adverse effects to existing basin wild rye vegetation may occur in Sections 33 and 34 (Township 44 North Range 36 East) if the current static groundwater table depth of 14-30 feet is lowered as a result of mine water pumping from the Quinn Well and surface water spreading (irrigation) ceases (Stringham 2020). In the area surrounding the Quinn Well, the static groundwater table depth is estimated at 20 to 30 feet below the surface (Piteau 2020a). This indicates that existing forage vegetation in this area is dependent upon surface irrigation and not

dependent upon groundwater levels, therefore adverse effects are not anticipated to result from groundwater drawdown during the life of the mine (Stringham 2020).

Upon successful completion of reclamation of surface disturbance, native vegetation potentially accessed for livestock forage would return to the Project area and livestock grazing would continue under management policy at that time.

Mining and exploration activities, including vehicle travel on unpaved roads, would result in fugitive dust emissions which can affect livestock. Fugitive dust emissions would result in the potential for livestock to contract Bovine Respiratory Disease (BRD) (BLM 2010). This disease typically only effects young livestock but can result in the need for medical attention or even death of infected individuals, resulting in a financial loss for livestock operators. Additionally, fugitive dust deposition on forage vegetation can affect the overall health and forage value of vegetation and cause excessive wear to the teeth of livestock. The deposition area for dust would depend on climatic conditions, such as wind direction and speed and the frequency of precipitation events.

4.8.1.2 Alternative B (Partial Pit Backfill)

Under Alternative B, effects related to rangeland management as a result of project development ground disturbance and effects to livestock health would be the same as for Alternative A. Reclamation would leave a portion of the south open pit backfilled to an elevation of 4,709 feet amsl creating an area where seasonal ponding is anticipated to occur.

4.8.1.3 Alternative C (No Pit Backfill)

Under Alternative C, effects to rangeland management as a result of project development ground disturbance and effects to livestock health would be similar to Alternative A. The expanded East WRSF would eliminate an existing man-made livestock watering facility in the Pole Creek allotment. Reclamation under Alternative C would not include backfilling the open pit. This open pit post-mining feature would not provide a source of forage vegetation for livestock as vegetation is unlikely to grow in the pit without the application of backfill material and growth media. The anticipated three pit lakes would be located in the Kings River and Pole Creek allotments respectively. The anticipated pit lake water quality has the potential to be harmful to livestock if constituents of potential ecological concern (COPEC) are present. Water quality is analyzed in the project Ecological Risk Assessment (SRK 2020) to determine the presence and volume of COPEC. If unmitigated, molybdenum is predicted to reach concentrations for which harmful effects cannot be ruled out. The use of pit water for livestock watering in the future can be controlled through covenants and agreements, and livestock access can be restricted through the use of livestock deterrents (e.g., cattle guards, fencing, natural barriers such as boulders, etc.).

4.8.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.8.2 Recommended Mitigation and Monitoring

No specific mitigation measures are proposed currently. The BLM would continue to coordinate with LNC and the existing grazing permittees that would be affected under all action alternatives to identify appropriate measures to avoid and reduce effects to the grazing permittees and resources. Unavoidable effects resulting in the loss of key grazing resources would be addressed on a case by case basis prior to construction, and over the life-of-mine. Pit lakes would exclude access by livestock through the use of livestock deterrents (e.g., cattle guards, fencing, natural barriers such as boulders, etc.). Restoration of rangeland improvements that would be removed would be negotiated prior to the final release of reclamation obligations.

4.8.3 Residual Effects

Despite the implementation of mitigation measures, acreage of available forage for livestock grazing would be incrementally reduced during the life-of-mine as a result of mining and exploration surface disturbance. These effects would remain until the successful completion of reclamation when vegetation communities have re-established to the point of providing sufficient forage to support BLM-administered grazing.

4.9 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

The Clean Air Act, National Ambient Air Quality Standards (NAAQS), and other laws, regulations, policies, and plans set thresholds and requirements for emissions and air quality. Additional information on air quality standards, relevant laws and regulations, air quality permit requirements is provided in **Appendix O**. Information regarding the affected environment for air resources, the local climate and meteorology is provided in **Appendix G**.

4.9.1 Issue – Air Emissions

The air quality analysis assesses the expected future effects of pollutant emissions from equipment, vehicles, and activities associated with the project. Construction, exploration, operation, and reclamation of the project would use equipment, vehicles, stationary machinery, industrial processes, and other sources that emit air pollutants. These emissions can include gases and particles from machinery and process sources and in engine exhaust; particles (dust) from materials handling, processing, and storage; and dust from vehicle travel on roadways and wind action on exposed earth surfaces. Emissions of hazardous air pollutants (HAPs) can result from handling of earthen materials, combustion of hydrocarbon fuels, and handling and use of various chemicals. Emissions can result in effects on air quality and Air Quality Related Values (AQRVs) (primarily visibility and acidic deposition) in the region. The air quality assessment estimates the quantities of pollutants emitted (emissions inventories) and uses the emissions data as inputs to dispersion models to estimate potential effects on pollutant concentrations, visibility impairment, and deposition rates. Assessment results are compared to applicable standards and guidelines to ensure the project would not cause or contribute to violations of applicable standards or to significant

impacts and to identify possible emissions control strategies or mitigation measures. Detailed calculations and modeling data are provided in **Appendix K**.

4.9.1.1 Alternative A (Proposed Action – Preferred Alternative)

Project Emissions

The project schedule consists of two years of facility construction and pre-production waste rock removal, followed by 41 years of commercial mining production. The commercial mining operation would be developed in two phases (Phases 1 and 2). Concurrent with the commercial mining, LNC would conduct continuing exploration activities. This section discusses the potential emissions from each of these components of the Project. **Appendix K** provides further detail on how the emissions inventory was estimated.

Construction: The site preparation and construction activities are expected to include a combination of scraping, dozing, grading, compacting, and material transfers, using standard construction equipment. The pre-production waste rock removal operations would include drilling, blasting, waste hauling, and material transfers. These activities would create fugitive dust emissions, tailpipe emissions from mobile equipment, and combustion products from blasting. **Table 4.8** presents the estimated annual emissions from construction and pre-production waste rock removal.

Table 4.8. Construction Emissions (tons/year)

Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2e
Facility Construction – Fugitive	-	-	34.5	7.5	-	-	0.10	34,109 (all sources)
Mobile Equipment – Tailpipe	137.4	269.9	8.6	8.6	0.31	29.9	0.42	
Waste Rock Removal	30.0	0.8	12.8	1.0	0.002	-	0.04	
Total	**167.4**	**270.7**	**55.9**	**17.2**	**0.31**	**29.9**	**0.57**	**34,109**

Source: LNC 2019h

Note: Sum of individual values may not equal total due to independent rounding.

Exploration: Concurrent with the commercial mining, LNC would conduct continuing exploration operations. Exploration operations would result in fugitive dust emissions from drill pad and access road construction and from exploration drilling, and tailpipe emissions from the drill rigs and support equipment. **Table 4.9** presents the estimated annual emissions from exploration activities.

Table 4.9. Exploration Emissions (tons/year)

Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2e
Exploration Operations – Fugitive	-	-	1.5	0.2	-	-	0.0047	-
Mobile Equipment – Tailpipe	15.2	9.3	0.3	0.3	0.03	2.4	0.061	3,018
Total	**15.2**	**9.3**	**1.8**	**0.5**	**0.03**	**2.4**	**0.07**	**3,018**

Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	CO_2e

Source: LNC 2019h

Note: Sum of individual values may not equal total due to independent rounding.

Commercial Production (On-site): In Phase 1 the average mining rate would be approximately 7.7 million tons per year, producing an average of approximately 3.1 million tons per year of ore and resulting in approximately 33,000 tons per year of lithium carbonate equivalent (LCE) end products. In Phase 2 the average mining rate would be approximately 11.0 million tons per year, producing an average of approximately 6.2 million tons per year of ore and resulting in approximately 66,000 tons per year of LCE end products.

Mining would result in tailpipe emissions from mining equipment (e.g., excavators), trucks and other mobile equipment, combustion emissions from blasting, and fugitive dust emissions. Mineral processing would result in particulate matter emissions from crushers, material transfers, and the attrition scrubbers. Processing of the lithium-bearing ore to produce LCE end products, operation of the sulfuric acid plant, and operation of ancillary equipment, would result in emissions of criteria pollutants, HAPs, and greenhouse gases (GHGs). **Table 4.10** presents the estimated annual emissions from on-site production activities.

Table 4.10. Facility-Wide On-site Operational Emissions (tons/year)

Source Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAP	H_2S	H_2SO_4	CO_2e
Phase 1										
Process	1.0	78.4	71.0	65.1	75.8	17.9	0.30	0.43	26.70	21,342
Fugitive	9.1	0.2	54.5[1]	7.4[1]	-	-	0.28	-	-	-
Mobile – Tailpipe	180.0	392.5	12.1	12.0	0.4	43.5	0.82	-	-	58,746
Facility Total	**190.1**	**471.1**	**137.6**	**84.5**	**76.2**	**61.4**	**1.39**	**1.43**	**26.70**	**80,088**
Phase 2										
Process	1.8	81.2	96.3	84.5	76.1	35.2	0.58	0.86	27.85	42,656
Fugitive	9.1	0.2	96.1[1]	13.2[1]	-	-	0.48	-	-	-
Mobile – Tailpipe	276.8	587.5	18.5	18.2	0.7	67.6	1.29	-	-	90,022
Facility Total	**287.7**	**668.9**	**210.9**	**115.9**	**76.8**	**102.8**	**2.34**	**0.86**	**27.85**	**132,678**

Source: LNC 2019h

[1] Fugitive PM emissions include wind erosion of exposed material surfaces.

Note: Sum of individual values may not equal total due to independent rounding.

Commercial Production (Off-site Transport): During commercial operation, reagents for the lithium processing plant would be delivered to the processing plant by trucks from Winnemucca. The various lithium end products would be shipped by truck to Winnemucca. At present, it is not known whether the lithium end products would be sold locally or shipped further for sale or processing. For purposes of estimating emissions, LNC has assumed that all products would be

transported from Winnemucca by rail to San Francisco. **Table 4.11** presents the estimated annual off-site emissions from the reagent and product trucking operations and product rail transport.

Table 4.11. Off-site Transport Emissions (tons/year)

Activity	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Phase 1							
Reagent Trucking	3.17	13.09	35.47	8.99	0.03	0.53	4,547
Product Trucking	0.21	0.87	2.36	0.60	0.002	0.04	303
Total Off-site Trucking	3.38	13.96	37.83	9.59	0.032	0.57	4,850
Product Transport by Rail	0.80	2.82	0.07	0.06	0.003	0.11	312
Total Off-site Transport	**7.56**	**30.74**	**75.73**	**19.24**	**0.0067**	**1.25**	**10,012**
Phase 2							
Reagent Trucking	6.34	26.18	70.93	17.98	0.061	1.07	9,095
Product Trucking	0.42	1.75	4.73	1.20	0.004	0.07	606
Total Off-site Trucking	6.77	27.93	75.66	19.18	0.065	1.14	9,701
Product Transport by Rail	1.60	5.64	0.13	0.13	0.006	0.21	623
Total Off-site Transport	**15.13**	**61.5**	**151.45**	**38.49**	**0.136**	**2.49**	**20,025**

Source: LNC 2019h

Closure and Reclamation: Closure and reclamation activities would use mobile equipment similar to that used in mining, but at a lower level of intensity. Emissions are expected to be less than for the mining activities included in the production phase (**Table 4.10**), and the resulting effects also would be less than modeled for commercial production. Therefore, closure and reclamation emissions were not quantified separately.

Downstream GHGs: In addition to the direct and indirect GHG emissions shown in **Table 4.8** through **Table 4.11**, the project would result in increased GHG emissions from downstream (off-site) transport of reagents and products as shown in **Table 4.11**. Section 2.4.1, *Offsite GHG Emissions*, of the Thacker Pass Air Quality Impact Report included as **Appendix K** of this EIS provides further detail on emissions of GHG from downstream transport of lithium products that would be produced at the proposed Thacker Pass Mine. BLM has reviewed this information and determined that further detailed analysis of downstream GHG emissions from the end uses of lithium-based products would be speculative.

Ambient Concentrations

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) dispersion model was used along with the estimated emission rates to estimate the resulting ambient pollutant concentrations in the Project area. Phase 2 of commercial production would have the highest potential emission rates. Therefore, in order to evaluate the maximum potential effects from the Project, the air quality effect analysis was conducted using Phase 2 emission rates. **Appendix K** provides further detail on the modeling methods and results.

Table 4.12 presents the estimated maximum ambient concentrations and compares them to the NAAQS and Nevada standards.

Table 4.12. Estimated Maximum Ambient Concentrations for Project Operation

Pollutant	Averaging Period	Modeled Effect (µg/m^3)	Background Concentration (µg/m^3)	Total Effect (µg/m^3)	NAAQS (µg/m^3)	Nevada Standard (µg/m^3)	Complies with Standards?
CO	8-hour[a]	1,280.5	801.4	2,081.9	10,000	7,000[f]	Yes
	1-hour[a]	8,602.8	1,030.4	9,633.2	40,000	40,500	Yes
H_2S	1-hour[b]	6.0	0	6.0	-	112	Yes
NO_2	Annual	20.3	1.9	22.2	100	100	Yes
	1-hour[c]	161.0	9.2	170.2	188	188	Yes
$PM_{2.5}$	Annual	3.5	2.3	5.8	12	12	Yes
	24-hour[d]	15.0	8.0	23.0	35	35	Yes
PM_{10}	24-hour[a]	64.1	10.2	74.3	150	150	Yes
SO_2	3-hour[a]	99.8	1.3	101.1	1,300	1,300	Yes
	1-hour[e]	179.2	1.1	180.3	196	196	Yes

Source: LNC 2019h

[a] Highest second-high modeled concentration
[b] Highest first-high modeled concentration
[c] Highest eighth-high daily maximum 1-hour modeled concentration
[d] Highest eighth-high modeled concentration
[e] Highest fourth-high modeled concentration
[f] The Nevada standard is 7,000 µg/m3 for sites above 5,000 feet of elevation.

Table 4.12 shows that the estimated maximum ambient concentrations for all pollutants and averaging periods are less than the applicable NAAQS and Nevada standards. Accordingly, the project would not have a substantial effect on air quality.

Ozone effects of the project were not modeled but were assessed based on emissions of the ozone precursors VOC and NO_x. The project region is rural, away from the influence of precursor emissions from urban areas. The area surrounding the project is sparsely populated and used primarily for ranching and farming. The EPA designation of Humboldt County as unclassifiable/attainment for ozone reflects the relatively low level of emissions. Humboldt County's existing emissions of VOC and NO_x are 76,852 and 7,866 tons per year, respectively. For comparison, the Project operational emissions of approximately 103 tons per year of VOC and 699 tons per year of NO_x and represent a small fraction of county-wide emissions of these ozone precursors. Given these emission levels, the project's contribution to ozone formation is not expected to be substantial and is not expected to cause or contribute to an exceedance of the ozone standards.

AQRVs

The potential effects on AQRVs at Federal Class I areas were assessed. The nearest Class I area to the project is the South Warner Wilderness at a distance of 170 kilometers (106 miles). Because

the Project is located more than 100 kilometers from the nearest Class I area, EPA guidance does not recommend further AQRV analysis.

4.9.1.2 Alternative B (Partial Pit Backfill)

Under Alternative B, the distribution of excavated materials on the site would differ from that under Alternative A (Proposed Action) because the South Pit would be partially rather than fully backfilled. The total amount of land disturbance and equipment and vehicle activity would be essentially the same as under Alternative A. Therefore, effects to air quality under Alternative B are anticipated to be the same as those described for the Proposed Action. Accordingly, Alternative B would not have a substantial effect on air quality.

4.9.1.3 Alternative C (No Pit Backfill)

Under Alternative C the West, North, and East Pits would not be backfilled at the end of the life-of-mine and the open pit would remain as a post-mining feature. Because additional hauling of waste rock and coarse gangue material would be required compared to Alternative A (Proposed Action), LNC would use four additional haul trucks. The operation of the additional trucks would increase emissions as follows, compared to the Proposed Action:

- PM (total) – 2 tons/year
- PM_{10} (particulate matter 10 micrometers or less) – 2 tons/year
- $PM_{2.5}$ (particulate matter 2.5 micrometers or less) – 2 tons/year
- CO – 23.52 tons/year
- NO_X – 77.76 tons/year
- SO_2 – 0.092 tons/year
- VOC – 5.68 tons/year
- GHGs – 10,184 tons/year

These emissions increases are small compared to the operational emissions under the Proposed Action (**Table 4.10**). Therefore, effects to air quality under Alternative C are anticipated to be similar to those described for the Proposed Action. Accordingly, Alternative C would not have a substantial effect on air quality.

4.9.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

Potential emissions and other effects to air quality under Alternative D would be related to the reclamation of existing disturbance under previous authorizations and is not anticipated to result in exceedances of the NAAQS.

4.9.2 Recommended Mitigation and Monitoring

The air quality analysis has demonstrated that all pollutant concentrations with the project would be less than the NAAQS and Nevada standards, and that effects on AQRVs in Class I areas would be negligible. Therefore, no mitigation is required.

4.9.3 Residual Effects

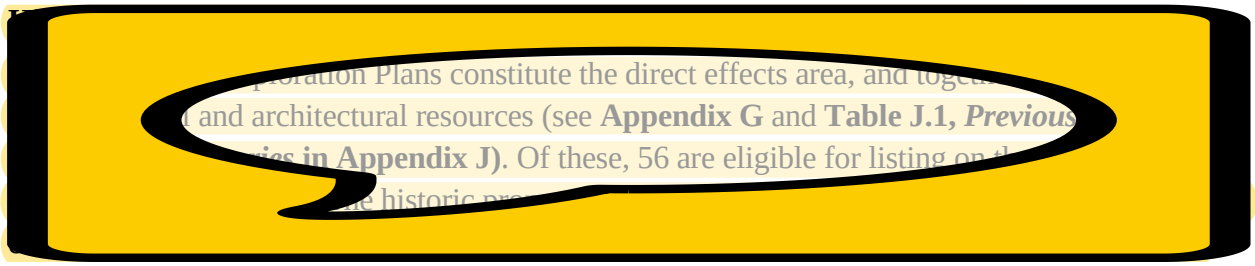
Because no mitigation is required, there would be no residual effects.

4.10 CULTURAL RESOURCES

Inventory of Cultural Resources

Historic properties were identified and documented through archival background research and by conducting intensive pedestrian inventories. A review of inventories and studies previously carried out within the Plan boundaries and indirect effects area identified 38 inventories conducted over the past 49 years (**Table J.1, *Previous Cultural Resources Inventories*, Appendix J**). In 2018, 12,963 acres were inventoried for the Project (CR2-3402; Young et al. 2019). As a result, the entirety of the Mining and Exploration Plans and portions of the indirect effects area have been covered by pedestrian inventories meeting the standards of the Nevada BLM (see BLM 2019). Together, the inventories identified over one thousand (n=1020) cultural resource sites and a component of a large cultural district: the Thacker Pass component of the Double H/Whitehorse Obsidian Procurement District (DHWOPD/CrNV-02-14275). The Thacker Pass component is a 16,030-acre area within the expansive, but dis-contiguous 166,346-acre Double H/Whitehorse Obsidian Procurement District (DHWOPD) extending north and south of the Project area around the McDermitt Caldera (Berg et al. 2008; Moore 1993; Young et al. 2008; 2019). The Thacker Pass Component became its own National Register of Historic Places (NRHP)-eligible district under Criterion D through BLM-State Historic Preservation Office (SHPO) consultation in 2009 and remains a management framework for cultural resources studies in the region.

The majority (95 percent) of the documented cultural resources throughout the Project area are prehistoric lithic scatters associated with obsidian toolstone assay and reduction within the Thacker Pass Component of the DHWOPD. Several prehistoric resources also contain grinding implements and other indicators of a broader range of activities having taken place. Historic-era resources are far less common (5 percent) and include remnants of Civilian Conservation Corps (CCC) activity in the area, built environment (architectural) linear features (roads and utility lines), and late nineteenth and early twentieth century ranching and homesteading pursuits.



Exploration Plans constitute the direct effects area, and toge
and architectural resources (see **Appendix G** and **Table J.1, *Previous***
***ies* in Appendix J)**. Of these, 56 are eligible for listing on th
historic pr

resource with eligible prehistoric and historic components. All are eligible under NRHP Criterion D for data potential, and a CCC-associated refuse scatter (CrNV-21-1220) is also eligible under Criterion A for contributions to local, regional, and national history. None of the resources in the Mining or Exploration Plan areas remain unevaluated for the NRHP (**Table J.2, *List of Historic Properties in the Project Area,* Appendix J)**.

Fifty-one of the historic properties intersecting the Mining and Exploration Plan areas contribute to the eligibility of the Thacker Pass component of the DHWOPD under Criterion D. The remainder of the resources are ineligible for listing on the NRHP and/or do not contribute to the eligibility of the district.

Historic Properties Within the Indirect Effects Area

The indirect effects area intersects 134 archaeological and architectural resources. Of these, 35 are eligible for listing on the NRHP: 18 under Criterion D, two (2) under Criterion A, and 15 that remain unevaluated. These include 28 prehistoric resources and one district eligible under Criterion D, two historic-era resources eligible under Criterion A, and three mixed resources with eligible components; one CCC Camp (CrNV-02-10141) with the historic component eligible under Criterion A and two prehistoric components eligible under Criterion D. Fourteen of the fifteen unevaluated sites are prehistoric; the other is a mixed prehistoric and historic component resource (**Table J.2, *List of Historic Properties in the Project Area,* Appendix J)**.

The indirect effects area also overlaps a portion of the NRHP-eligible Thacker Pass component of the DHWOPD. Nine of the historic properties within the indirect effects area also intersect and contribute to the eligibility of the district under Criterion D. The remainder of the resources in the indirect effects area are ineligible for listing on the NRHP and/or do no contribute to the eligibility of the district.

4.10.1 Issues – Ground Disturbance and Project Infrastructure

Ground disturbing activities and project infrastructure development could directly, indirectly, and cumulatively affect one or more of the NRHP integrity aspects of 85 historic properties and one district. Fifty-one resources rest within the Mining and Exploration Plan areas, 30 are within the indirect effects area, and five overlap the direct and indirect effects area. Effects on cultural resources are assessed based on the degree to which the Proposed Action and Alternatives could adversely affect a historic property if its NRHP qualifying characteristics were to be altered.

4.10.1.1 Alternative A (Proposed Action – Preferred Alternative)

Under Alternative A, BLM and Nevada SHPO have concurred that the Proposed Action has the potential to directly affect 56 historic properties (see **Table J.2, *List of Historic Properties in the Project Area,* Appendix J)**. Surface effects in the Mining Plan area and Exploration Plan area would adversely affect all 56 historic properties eligible under Criterion D due to the loss of integrity and data from ground disturbances altering artifact and feature assemblages, temporally sensitive remains, and the depositional environment of the local landform (location), and in the case of obsidian quarrying locales, connection to large-scale prehistoric land-use patterns within

the Thacker Pass component of the DHWOPD (setting). Historic properties also eligible under Criterion A, specifically the CCC remnants at CrNV-21-1220, would suffer the same integrity and data loss due to ground disturbances, as well as changes in feeling and setting with the addition of new mining infrastructure to the landscape.

Indirect effects from the Proposed Action under Alternative A could affect 35 historic properties in the area outside the Mining and Exploration Plan areas (see **Table J.2, *List of Historic Properties in the Project Area,* Appendix J**). However, at each of these resources, typical indirect effects on cultural resources such as visual, auditory, vibration, and airborne (i.e., fugitive dust) would not have the potential to physically damage or destroy historic property components or significantly affect any aspects of NRHP integrity. Visual effects from the additions of new mining infrastructure would not affect aspects of integrity at 18 historic properties eligible under Criterion D, including the Thacker Pass component of the DHWOPD, as there would be no adverse effects to data potential. Visual effects would be negligible at one historic-era component eligible under Criterion A as changes to the landscape in the vicinity of the CCC Wash House (CrNV-21-5414) may only slightly alter the distant viewshed. Despite existing built environment elements (SR 293, utility lines, fences, gravel pits, livestock features, etc.) project infrastructure would have an adverse effect on the NRHP integrity aspects of setting and feeling at the CCC Camp (CrNV-02-10141). Each of the historic-era resources lack standing structures and, although eligible, many aspects of original integrity have been weakened through years of deconstruction, decay, and vandalism.

The Mining and Exploration Plan areas overlap 14,363 acres of the Thacker Pass component of the DHWOPD and the indirect effects area overlaps 1324 acres. As such, approximately 97 percent of the Thacker Pass component of the approximately 68,000-acre DHWOPD rests within an area that would be directly or indirectly affected by the Proposed Action. Within the direct and indirect effects areas, the Thacker Pass component contains 889 resources, 58 of which are historic properties and contributing elements of the DHWOPD. Direct and indirect effects to these historic properties due to the Proposed Action would also affect the DHWOPD as those resources contribute to the eligibility of the district under Criterion D for data potential.

Cumulatively, the Thacker Pass component is one of several obsidian procurement components within the larger DHWOPD encompassing the McDermitt Caldera; the cumulative effects study area (CESA) surrounds the caldera. The Thacker Pass component is significant because it contains artifacts, features, and geochemical information relevant to understanding prehistoric regional obsidian procurement in northern Nevada and the Great Basin. While spatial patterning of obsidian toolstone in the Thacker Component is well-understood, archaeologists lack understanding of the timing of prehistoric use of the resource. The Proposed Action would adversely affect the data potential of contributing properties, and the district itself, by fragmenting the record and disturbing the integrity of discrete procurement activities preserved within contributing properties. This would result in a loss of temporal and geochemical information within and between the components of the DHWOPD.

4.10.1.2 Alternative B (Partial Pit Backfill)

Under Alternative B, the effects to cultural resources within the Plans of Operations area would remain the same as described for Alternative A (Proposed Action).

4.10.1.3 Alternative C (No Pit Backfill)

Under Alternative C, the effects to cultural resources within the Plans of Operations area would remain the same as described for Alternative A (Proposed Action).

4.10.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.10.2 Recommended Mitigation and Monitoring

Adverse direct and indirect effects to historic properties (NRHP-eligible or unevaluated cultural resources) would be resolved through the implementation of approved mitigation. The mitigation for effects from the Proposed Action is the implementation of an approved Historic Properties Treatment Plan (HPTP), currently in development. Mitigation strategies within the HPTP may vary from property to property but would involve a combination of avoidance, cultural resources monitoring, data recovery, and public outreach/interpretation for each historic property and the DHWOPD. Data recovery excavations and artifact collection typically occur at resources that cannot be avoided through other forms of treatment or mitigation. The HPTP would be approved by BLM through consultation with Nevada SHPO and local Native American tribes. BLM and USFWS Tribal consultations for the Project are ongoing and continue through the HPTP process. Section 4.18, *Native American Religious Concerns*, presents information regarding the government-to-government Tribal consultation process. To date, government-to-government consultation between the BLM and representatives from the Fort McDermitt Paiute and Shoshone Tribe, Summit Lake Paiute Tribe, and Winnemucca Indian Colony have not raised any concerns about specific traditional areas, sacred sites, or ceremonial areas or activities in the Project area.

4.10.3 Residual Effects

Residual effects to historic properties resulting from the Proposed Action include the direct and indirect effects from Project area activities as described in Section 4.10.1.1 above, and resulting activities that would potentially disturb or alter historic properties. The development of a HPTP as described in Section 4.10.2. would mitigate adverse effects to historic properties, but there may still be permanent loss of cultural resources and a limited fragmentation of the Thacker Pass component of the DHWOPD. The use of routes and utility corridors surrounding the Project area would also increase and change access to areas leading to potential effects through new surface disturbances, unauthorized artifact collection, and vandalism at cultural resources.

4.11 SOCIAL AND ECONOMIC CONDITIONS

4.11.1 Issues – Project Infrastructure, Public Safety, Access, and Transportation

4.11.1.1 Alternative A (Proposed Action – Preferred Alternative)

Construction Effects

In order to build the new facilities construction is expected to occur over four years and would construct an open pit mine, lithium processing plant, and sulfuric acid manufacturing plant that would have the capacity to produce up to 33,000 tons of lithium carbonate. Phase 2 would increase production capacity of lithium products to approximately 66,000 tons (University of Nevada, Reno Center for Economic Development 2018-19).

Annually, the investment during construction would be over $128.3 million and is expected to employ approximately 1,000 personnel at its peak, roughly six to eight months at an average wage rate of $51,200 per job. In addition, construction impacts are expected to result in $265.4 million in economic activity in Humboldt County. The construction would also support $8.2 million in state and local taxes (LNC 2019a; LNC 2020e; University of Nevada, Reno Center for Economic Development 2018-19). **Table 4.13** details the total economic effect of the construction phase on Humboldt County.

Table 4.13. Estimated Mine and Plant Annual Construction Effects on Humboldt County

	Direct	Indirect	Induced	Total	Multiplier
Economic Activity	$218,394,336	$115,119,708	$31,917,271	$265,431,316	1.22
Personal Income	$56,553,554	$4,291,382	$7,763,556	$68,608,492	1.21
Employment	1,000	97	243	1,340	1.34
Average Wage per Job	$56,553	$44,241	$31,948	$51,200	-
State & Local Taxes	$4,016,272	$1,126,478	$3,071,061	$8,213,811	-
Federal Taxes	$17,437,041	$1,088,259	$2,457,810	$20,983,110	-

Source: University of Nevada, Reno Center for Economic Development 2018-19

Annual Operation Effects

Beginning year three, LNC would begin Lithium Carbonate production at a maximum capacity rate of 33,000 tons per year. The same capacity rate would continue through year six when Phase 2 construction is scheduled to be completed. Beginning year seven, Lithium Carbonate would have the increased production capacity of 66,000 tons per year. Impacts of this phase would be longer-term, continuing over the life of the mine.

Over Phase 1 of operations, LNC would spend $153 million and employ as many as 183 jobs to produce 33,000 tons of Lithium Carbonate. This direct spending would support over $18 million in total personal income and support 298 total jobs at an overall average wage of $62,675. This activity is expected to support approximately $5 million in state and local taxes (University of

Nevada, Reno Center for Economic Development 2018-19; LNC 2019a). **Table 4.15** shows the total economic effect of annual operations on Humboldt County.

Table 4.14. Estimated Mine and Plant Annual Operation Effects on Humboldt County, Phase 1

	Direct	Indirect	Induced	Total	Multiplier
Economic Activity	$153,347,849	$22,753,090	$7,840,870	$183,941,809	1.20
Personal Income	$13,457,088	$3,729,600	$1,500,400	$18,687,088	1.39
Employment	183	75	40	298	1.63
Average Wage per Job	$73,536	$49,728	$37,510	$62,675	-
State & Local Taxes	$2,919,628	$1,426,602	$725,592	$5,071,822	-
Federal Taxes	$5,355,002	$1,562,471	$569,192	$7,486,665	-

Sources: University of Nevada, Reno Center for Economic Development 2018-19; LNC 2019a, Table 3-2. Expected Project Workforce

Note: Numbers may not sum due to rounding.

Over Phase 2 of operations, LNC would spend $262 million and employ as many as 313 jobs to produce 66,000 tons of Lithium Carbonate. This direct spending would support over $32 million in total personal income and support 511 total jobs at an overall average wage of $62,675. This activity is expected to support approximately $8.7 million in state and local taxes (University of Nevada, Reno Center for Economic Development 2018-19; LNC 2019a). **Table 4.15** shows the total economic effect of annual operations on Humboldt County.

Table 4.15. Estimated Mine and Plant Annual Operation Effects on Humboldt County, Phase 2

	Direct	Indirect	Induced	Total	Multiplier
Economic Activity	$262,283,479	$38,916,488	$13,410,887	$314,610,854	1.20
Personal Income	$23,016,768	$6,414,912	$2,588,190	$32,019,870	1.39
Employment	313	129	69	511	1.63
Average Wage per Job	$73,536	$49,728	$37,510	$62,675	-
State & Local Taxes	$4,993,680	$2,440,035	$1,241,039	$8,674,754	-
Federal Taxes	$9,159,102	$2,672,422	$973,536	$12,805,060	-

Source: University of Nevada, Reno Center for Economic Development 2018-19

Additionally, lithium operations would generate excess volume of sulfuric acid and electricity that would be sold on the open market. These sales are expected to annually produce additional revenues of $2.1 million for power and $1.8 million of sulfuric acid. If this excess capacity is sold in Humboldt County, the amount of revenue leaving the county would be reduced.

Income and Employment

The four-year construction period is estimated to have total expenditures of over $873.5 million, or $218.4 million annually. These expenditures are estimated to directly support a peak of 1,000 jobs, each with an average wage of $51,200. These effects are not sustainable past the four-year period but would provide the types of short-term employment opportunities that accompany construction projects. The top industries that would be affected by the construction of the open pit mine, lithium processing plant, and sulfuric acid manufacturing plant include construction, food/beverage industries, truck transportation, and real estate (LNC 2020e; University of Nevada, Reno Center for Economic Development 2018-19).

Once the construction phase is complete, annual operation of the mine would create more sustainable enterprises that would annually contribute to employment, income, and tax revenues in Humboldt County. Economic effects are expected to continue through the life of the mine, projected to be 41 years. Phase 2's average annual effect of the mine would support 511 total jobs annually at an average overall wage of $62,675. Since the annual operations would be of an open pit mine, lithium processing plant, and sulfuric acid plant, it follows that lithium mining, processing, and sulfuric acid manufacturing are the top sectors expected to be affected by mine operations (University of Nevada, Reno Center for Economic Development 2018-19).

Population, Housing, and Public Services

Potential changes in population due to the Proposed Action were estimated by multiplying the total job effects by the average household size in Humboldt County. Four different scenarios were considered, depending on the percentage of labor sourced from Humboldt County. The construction phase of the project could cause the population of Humboldt County to increase by 675 to 2,700 additional residents under various scenarios. The long run operation of the plant may cause the Humboldt County population to increase by 224 to 894 additional residents under various scenarios, a 1 to 5 percent increase in the 2016 population, depending on the percent of labor sourced from outside the county (University of Nevada, Reno Center for Economic Development 2018-19).

Changes to housing demand were estimated using total housing units, total population, and estimated population. The equation used is as follows:

$$\frac{Total\ Housing\ Units}{Total\ Population} = Current\ Housing\ Units\ Per\ Capital\ (HUPC)$$

$$HUPC * New\ Population = Housing\ Demand$$

The short-term facility construction is expected to increase housing demand by between 106 and 442 housing units, while annual operations are expected to increase housing demand by between 35 to 140 units (University of Nevada, Reno Center for Economic Development 2018-19). **Table 4.16** details the potential effect of the Proposed Action.

Table 4.16. Proposed Action Effect on People and Housing

Import Labor (percent)	Construction		Operations	
	People	***Housing***	***People***	***Housing***
100%	2,700	442	894	140
75%	2,025	317	670	105
50%	1,350	211	448	70
25%	675	106	224	35

Source: University of Nevada, Reno Center for Economic Development 2018-19

LNC is not proposing to develop a man camp or develop worker housing. LNC plans to hire from the local population (including Native Americans), who currently reside in existing housing in local communities such as Orovada, Quinn River Valley, Kings River Valley, McDermitt (including the Fort McDermitt Indian Reservation), Paradise Valley, and Winnemucca (LNC 2020d).

Under each scenario it is expected that Humboldt County would be able to absorb the new population and housing demands. For instance, in 2016 it is estimated that there were 1,049 vacant housing units, more than enough to cover potential increased demand. During construction, contractors are anticipated to depend heavily on temporary housing at Winnemucca hotels, the existing man-camp, and RV parks. Additionally, it is anticipated that most of the operations workforce would live in Winnemucca and travel to and from Thacker Pass by company-provided buses. This assumption is based on living and commuting habits of other mining operations around the state (LNC 2020e). Other factors may also be affected due to increased population including increased school sizes and limited capacity (University of Nevada, Reno Center for Economic Development 2018-19). Effects to public access, traffic patterns, and adjacent property values can be seen in Section 4.13.1.1.

Fiscal Effects

Directly, the construction of the open pit mine, lithium processing plant, and sulfuric acid plant would annually generate $4 million in state and local tax revenue, and over $17.4 million in federal tax revenue. When indirect and induced effects are taken into account, construction could support as much as $8.2 million and $20.9 million in state, local and federal taxes, respectively, annually over the four years of construction. Phase 2 annual operations would directly support nearly $5.0 million in state and local taxes and $9.1 million in federal tax revenue. In total, including indirect and induced effects, operation of the mine could support as much as $8.6 million in state and local taxes and $12.8 million in federal taxes annually (University of Nevada, Reno Center for Economic Development 2018-19).

Table 4.17. Fiscal Effects of the Proposed Action in Humboldt County

Effect Type	Construction Phase		Operations – Phase 1		Operations – Phase 2	
	State & Local Taxes	***Federal Taxes***	***State & Local Taxes***	***Federal Taxes***	**State & Local Taxes**	**Federal Taxes**
Direct	$4,016,272	$17,437,041	$2,919,628	$5,355,002	$4,993,680	$9,159,102
Indirect	$1,126,478	$1,088,259	$1,426,602	$1,562,471	$2,440,035	$2,672,422
Induced	$3,071,061	$2,457,810	$725,592	$569,192	$1,241,039	$973,536
Total	**$8,213,811**	**$20,983,110**	**$5,071,822**	**$7,486,665**	**$8,674,754**	**$12,805,060**

Source: University of Nevada, Reno Center for Economic Development 2018-19

Note: Sum of individual values may not equal total due to independent rounding

Grazing Effects

As discussed in **Table 4.7**, Alternative A would result in the loss of 500 AUMs. Using the average value of production per AUM, calculated in **Table G.23** (**Appendix G**), of $65.69, the lost AUMs would result in a loss of $32,845 of direct economic value annually.

4.11.1.2 Alternative B (Partial Pit Backfill)

Potential effects to social and economic conditions under Alternative B are anticipated to be the same as described under Alternative A.

4.11.1.3 Alternative C (No Pit Backfill)

Potential effects to social and economic conditions under Alternative C are anticipated to be the same as described under Alternative A.

4.11.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations. Potential effects under Alternative D to social and economic conditions would be limited to the remaining investment and employment required of LNC related to the reclamation of existing disturbance under previous authorizations.

4.11.2 Issues – Quality of Life and Non-Market Values

As described in Section G.1.10.6, *Local Economy and Employment*, in **Appendix G**, mining is the largest source of employment in Humboldt County. The proposed action would extend mining activity into the study area, contributing to the continuation of mining as the main form of livelihood for the local population. Other sectors of importance for employment and earnings may be to some extent driven by mining activities, such as the accommodation and food services sector and the retail trade sector. For this reason, the proposed action would tend to reinforce existing social values rather than alter them.

Much of the land in the study area is public land. For example, 71.8 percent of land area is administered by the BLM (Headwaters Economics 2020). Activities consistent with this land

ownership are, therefore, also of importance to the study area. The dominant use of the land in the proposed Project area is livestock grazing and dispersed recreation, most of which would still be allowed in areas that are not proposed for surface disturbance.

Public lands can be important economic assets for local communities. In addition to drawing tourists, public lands can attract businesses, retirees, and workers who seek recreational opportunities, scenery, and quality of life amenities that public lands generate. From the early 1970s to the 2010s, western rural counties with the highest share of federal lands on average had faster population, employment, and personal income growth than counties with the lowest share of federal lands. For example, on average, western non-metro counties have a per capita income that is $436 higher for every 10,000 acres of protected public lands within their boundaries (Headwaters Economics 2012). This is true in Humboldt County, where, in 2013, an estimated $5,453 (13 percent) of the per capita income could be explained by the presence of protected public land, the highest percentage of any non-metro county in Nevada (Headwaters Economics 2013).

Some forms of recreation would be impacted by mining and exploration activities beyond that of the area of surface disturbance. Activities, noise, and the additional human presence could deter wildlife from the area effecting photography, viewing, and hunting activities. It could also affect recreational activities that benefit from aesthetic qualities and a feeling of isolation.

4.11.3 Recommended Mitigation and Monitoring

No mitigation measures have been identified.

4.11.4 Residual Effects

Residual effects would include direct and indirect effects of the Proposed Action after the implementation of mitigation measures.

4.12 ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," (Federal Register 1994) established a requirement for Federal agencies to incorporate environmental justice considerations into planning and decision processes to help ensure that no person or group bears a disproportionate burden of adverse effects.

The Council on Environmental Quality (CEQ) issues guidance for considering environmental justice within the National Environmental Policy Act process (CEQ 1997) that is used in this analysis. The CEQ suggests the following approach for identifying potential low-income and minority populations (CEQ 1997):

> *Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.*

> *Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.*

CEQ guidance does not specify how to identify a "low-income population," but in practice the same approach used for minority populations can be followed—where persons in poverty status are greater than 50 percent of the area's total population, or where the percentage in poverty is meaningfully greater than the percentage in the general population or an appropriate comparison area. CEQ guidance does not provide a specific threshold for determining when an area's population is "meaningfully greater." In practice, "meaningfully greater" is often interpreted to identify an environmental justice population if the percentage of population in minority and/or poverty status in an area is at least ten percentage points higher than in the comparison area (e.g., greater than or equal to 19 percent population in poverty in a study area geography compared with 9 percent population in poverty in the comparison area). This threshold has been used in many BLM resource management plans and EISs, and is based on experience evaluating environmental justice indicators, the potential for adverse impacts on environmental justice populations from BLM decisions, and the sense that this threshold represents a meaningful difference between the affected and comparison populations.

This section assesses potential environmental justice effects of the Proposed Action, with a focus on any disproportionately adverse effects from environmental risk exposure on low-income and minority communities.

4.12.1 Issues – Air Emissions, Project Infrastructure, Noise, Public Access, Public Safety, Transportation, Wastes (Hazardous and Solid), Water Quality and Quantity

4.12.1.1 Alternative A (Proposed Action – Preferred Alternative)

The existence of disproportionately high and adverse human health or environmental effects associated with the Proposed Action depends on the existence of minority and low-income populations in the study area, and on the existence of adverse effects that may disproportionately affect those populations.

The analysis indicates that the potential effects of surface exploration activities and mine development under the Proposed Action would not be expected to disproportionally affect any particular population.

The area in the immediate vicinity of the proposed project includes a single residence located approximately 0.5 miles to the northeast of the proposed Mine Plan area on Pole Creek Road. A number of residences are located in the Kings River Valley to the west of the proposed Mine Plan

area. The nearest residence in the Kings River Valley is located approximately 3 miles to the west of the proposed Mine Plan area. The nearest residential area with multiple residences to the proposed project is the unincorporated community of Orovada, approximately 19 miles southeast, which has been identified as a potential low-income community and minority community. The closest incorporated community to the Project area is the city of Winnemucca, which is approximately 63 miles to the south. In the larger surrounding communities, racial and ethnic minorities account for a lower share of the overall population, and the overall incidence of poverty has been and remains below the statewide average.

McDermitt census-designated place (CDP) and Orovada CDP may have social issues that make them more vulnerable to the impacts of pollution. For instance, increased truck traffic in the vicinity of the communities due to the Proposed Action may disproportionately impact those vulnerable communities. For example, negative impacts of increased traffic include air pollution, noise pollution, and increased risk of vehicle collisions. Due to Orovada's proximity to the proposed project, it is more likely to experience the negative effects of increased truck traffic. Increased housing needs to mining workers is not expected to negatively impact McDermitt CDP and Orovada CDP. The Proposed Action would require 442 housing units during construction and 140 during operation, and Humboldt County had 1,222 vacant housing units in 2018, largely in excess of the potential needs of the proposed project.

4.12.1.2 Alternative B (Partial Pit Backfill)

Potential environmental justice effects under Alternative B are anticipated to be the same as described under Alternative A.

4.12.1.3 Alternative C (No Pit Backfill)

Potential environmental justice effects under Alternative C are anticipated to be the same as described under Alternative A.

4.12.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations.

4.12.2 Recommended Mitigation and Monitoring

LNC plans to hire from the local population (including Native Americans), who currently reside in existing housing in local communities such as Orovada, Quinn River Valley, Kings River Valley, McDermitt (including the Fort McDermitt Indian Reservation), Paradise Valley, and Winnemucca. LNC is sponsoring upcoming training programs, in Winnemucca, McDermitt, and Lovelock, called "The Build Nevada Program." The Build Nevada Program is an educational training to give basic skills needed for a career in construction. LNC is scheduling meetings with the McDermitt Tribe so members can learn more about the Thacker Pass Project as well as meeting with people one-on-one, to discuss their qualifications and to help them identify paths to obtain tuition assistance to attend the Build Nevada Program. LNC's hiring practices and training programs have the opportunity to enhance benefits, such as employment and other indirect economic benefits, to

minority and low-income populations who may be disproportionally affected by the proposed project (LNC 2020d).

4.12.3 Residual Effects

There would be no disproportionate adverse environmental justice effects on minority or low-income populations; therefore, no residual environmental justice effects are expected.

4.13 LANDS AND REALTY

4.13.1 Issue – Public Access

Potential direct and indirect effects to lands and realty would result from the preclusion of other uses of the land occupied by the Mine and Exploration Plan. The dominant use of the land in the Proposed Project area is livestock grazing and dispersed recreation, most of which may still be allowed in areas that are not proposed for surface disturbance. See sections 4.8 and 4.17 for an analysis of potential impacts to Rangeland Management and Recreation, respectively.

4.13.1.1 Alternative A (Proposed Action – Preferred Alternative)

Alternative A would result in a Mine Plan area of 10,468 acres with 5,695 acres of surface disturbance. The Exploration Plan area would be an additional 7,465 acres; 1,589 acres represents the North Exploration area and 5,877 acres represents the South Exploration area. Exploration related surface disturbance is estimated to total 150 acres.

U.S. Highway 95 and SR 293 would be the major transportation routes used to access the Project area and mine related traffic would occur on a 24-hour basis to support mining operations. The average annual daily traffic count on these routes in 2016 were 320 and 150 vehicles, respectively. Under Alternative A, approximately 120 to 200 mine related truck/vehicle trips between the Project area and Winnemucca are anticipated to occur. Truck trips would include transport of raw materials to the mine site and mine products and waste transported to railroad and other facilities in Winnemucca. Some truck trips could originate out of the Reno/Sparks, NV area, while a limited number of truck trips would occur between the Project area and Boise, ID.

The Harney transmission line and associated ROW is located within the Project area. Project development would not affect the transmission line or the ability for Harney Electric to maintain the line.

Public Access

Existing public use of the proposed Project area is limited and throughout the year. SR 293, Pole Creek Road, Crowley Creek Road and Rock Creek Road are the main transportation routes in the Project area. Under Alternative A, LNC would not close, block, or limit in any manner access along these routes; however, the estimated 60 to 200 daily truck trips may slow traffic and increase trip times during peak traffic flow. Additionally, this increase in traffic volume may result in increased degradation to road conditions, particularly unpaved roads.

Pole Creek Road provides access to the Montana Mountains. Mine related traffic on Pole Creek Road would be limited to exploration vehicles and equipment and would only be present while traveling between the mine site and active exploration drill pads.

Effects to Traffic Patterns

Existing public use of SR 293 is limited mainly to the residents of the Kings Valley community and recreationists traveling to outdoor recreation areas within Humboldt County. Material deliveries would typically occur during normal business hours; however, mining activities would occur 24 hours a day, 365 days a year. During Phase 1, an estimated 60 to 100 one-way truck trips per day would occur predominantly between the transloading facilities near Winnemucca and the plant. During Phase 2, between 120 to 200 one-way truck trips per day be required to support the Project through reagent and product shipments.

To reduce the number of daily vehicle trips, the majority of mine employees would be bussed in from the Winnemucca, Orovada, and McDermitt areas using dedicated bus service. This increase in daily truck traffic is not anticipated to require the development of a formal traffic study according to Nevada Department of Transportation (NDOT) Access Management System and Standards (NDOT 2017).

The anticipated project-related increase in traffic during construction would remain within the capacity of existing roadways; however, the mix of heavy vehicles in the traffic stream would increase relative to other areas of Humboldt County.

Effects to Adjacent Property Values

Research regarding the effects of mining activity upon property values adjacent to mining operations is limited. Hite (2006) found that property values can be adversely affected by as much as 30 percent when a new mining operation is approved adjacent to existing private properties. Currently, only a single residence is located within one mile of the proposed Project area. The valuation of the property would be adversely affected by the construction and operation of the proposed Project as a result of the range of physical effects from operations (increased noise, light, traffic, changes in viewshed). Other effects of the construction and operation of the proposed Project may also result in positive affects to the valuations of adjacent properties due to the anticipated increase in job seeking members of the public looking to secure housing near or in the vicinity of the proposed Project area.

4.13.1.2 Alternative B (Partial Pit Backfill)

Potential effects to public access, traffic patterns, and adjacent property values under Alternative B are anticipated to be the same as described under Alternative A.

4.13.1.3 Alternative C (No Pit Backfill)

Potential effects to public access, traffic patterns, and adjacent property values under Alternative C are anticipated to be the same as described under Alternative A.

4.13.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations. Potential effects to public access, traffic patterns, and adjacent property values would include those related to reclamation commitments under previous authorizations.

4.13.2 Recommended Mitigation and Monitoring

If deemed necessary by NDOT, a turn lane could be constructed on U.S. Highway 95 at Orovada.

4.13.3 Residual Effects

Residual effects would be the same as those discussed in Section 4.13.1 above.

4.14 NOISE

4.14.1 Issue – Increased Noise Levels from Project Activity

Potential effects to wildlife and special status species are presented in Section 4.5, *Wildlife and Special Status Species, including Migratory Birds.*

Human Receptors

Regarding effects of noise on humans, EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." This report identifies sound levels less than or equal to 55 L_{dn} (day-night average sound level) as being appropriate outdoors for residential areas and other places in which quiet is a basis for uses to avoid annoyance and interference with outdoor activity (EPA 1974). The nearest areas of human use are residences located 0.5 miles northeast and 3.25 miles west of the Mine Plan area.

4.14.1.1 Alternative A (Proposed Action – Preferred Alternative)

During Project operation, heavy equipment and processing facilities would operate continuously. Construction of the mine facilities would require the use of heavy equipment on an intermittent basis. Noise levels would be greatest within the area of operations, and attenuate with distance from the Plan boundary. The applicant has identified noise related control measures in the proposed Plan including noise reduction systems (baffling, facility insulation) to be implemented at the plant processing area and at mining facilities.

Exploration within the Plan area would involve the use of heavy equipment and increased vehicular and human presence along roads and land clearing areas. Heavy equipment during exploration would include drill rigs, trucks, generators, an excavator and a dozer. Exploration activities would occur mainly during daylight hours but could extend to 24 hours a day, however, use of heavy equipment would be intermittent. The boundary of the exploration area would be more than a mile from the nearest residence, and noise levels may be intermittently perceptible above ambient levels at this location. However, noise levels are not expected to exceed the EPA threshold for human receptors.

During construction and mining phases, blasting of basalt outcrops within the Mine Plan area would be required on an intermittent basis. The frequency of blasting would be greatest during construction, at a rate of up to 25 blasts per year. During mining, up to 6 blasts per year may be required. Each individual blast produces an impulsive noise during a brief period of up to several seconds. Blasts would be done during mid-day or early afternoon hours (Clark pers comm 2020). Given the low frequency of blasting events, and the time of day which they would be done, blasting is not expected to cause an adverse effect to wildlife or human receptors.

Ground-borne vibration is a localized effect that is perceptible in the immediate vicinity of the vibration-producing activity. Generally, ground-borne vibration is not perceptible by the most sensitive receptors at a distance of more than 600 feet from a vibration producing source (FTA 2018).

Construction and operation of the project would require the use of haul trucks and commuter buses, resulting in an increase in traffic noise in surrounding areas. During Phase 2, 120 to 200 one-way truck trips per day would be required to support the Project through reagent and product shipments. Employees are anticipated to be bused to and from the Project site in company buses from Winnemucca, Orovada, and/or McDermitt areas. These vehicles would access the site via SR 293. During peak hours, noise from trucks and buses may be intermittently noticeable above existing traffic, but is not expected to result in an exceedance of the EPA noise threshold.

Noise generated during construction, operation, and closure of the mine could affect members of the public recreating in the Thacker Pass area by reducing the ability for individuals to experience quiet and solitude of public lands. The severity of effect would vary based upon the source of noise, the proximity of recreationists to the site of noise generation, and local climatic conditions.

Reclamation would require the temporary use of trucks, graders, and earthmoving equipment, which would result in noise levels similar to the construction phase. Reclamation activities are not expected to result in noise levels exceeding thresholds associated with sage grouse leks or human receptors.

4.14.1.2 Alternative B (Partial Pit Backfill)

Under Alternative B, activities would be conducted within a similar footprint compared to the Proposed Action. As such effects under Alternative B are expected to be the same as Alternative A.

4.14.1.3 Alternative C (No Pit Backfill)

Under Alternative C, activities would be conducted within a slightly larger footprint compared to the Proposed Action. Alternative C would add four haul trucks to the equipment fleet, however the additional activity is not expected to result in a condition that would significantly differ from worst-case effects discussed under Alternative A. As such effects under Alternative C are expected to be the same as Alternative A.

4.14.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Existing sources of noise under Alternative D would be limited to reclamation of existing surface disturbance under previous authorizations.

4.14.2 Recommended Mitigation and Monitoring

Best noise control practices are recommended where feasible to minimize construction noise levels. Applicable measures to minimize construction noise include the following.

- Requiring that all construction equipment powered by gasoline or diesel engines have sound-control devices such as exhaust mufflers that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.
- Using equipment powered by electric motors instead of gasoline or diesel-powered engines.
- Preventing excessive noise by shutting down idle vehicles or equipment.
- Development of a noise monitoring plan in coordination with the BLM and NDOW to collect further data regarding noise emissions and identify appropriate noise emission thresholds with regards to human and wildlife receptors and prescribe effect noise reduction measures should thresholds be surpassed during project construction or operation. Consideration of identifying and restricting activities that produce high noise levels to times that are not considered critical to wildlife and specials status species, as feasible.

Effectiveness

Recommended mitigation would reduce the potential for noise levels from project activity to be noticeable above ambient levels.

4.14.3 Residual Effects

Residual effects would include remaining noise propagation sources after the application of BMPs and mitigation measures.

4.15 VISUAL RESOURCES

The BLM created *Manual 8400 – Visual Resource Management* as guidance to develop a comprehensive inventory and related management objectives for public lands. The objective of Visual Resource Management (VRM) is to manage public lands in a manner which would protect the quality of the scenic (visual) values of these lands. A VRM analysis systematically identifies and evaluates visual resources to determine the appropriate level of impacts and management. Visual values are identified through the VRM Inventory, Manual Section 8410, and are considered with other resource values in the Resource Management Planning (RMP) process.

The BLM's Winnemucca District Office concluded that the Thacker Pass Project boundary falls primarily within VRM Class II per the 2015 Record of Decision and Resource Management Plan

for the Winnemucca District Planning Area, with an exception to the east end of the Project area which fall within VRM Class III (BLM 2015a). The contrast rating system provides a means to evaluate proposed surface disturbing projects to determine whether the projects conform with the approved VRM objectives. The objective of VRM Class II is to retain the existing character of the landscape, while keeping the level of change to the characteristic landscape low. Management activities may be seen but should not attract attention of the casual observer. The objective is that changes in the landscape repeat the basic elements of form, line, color, and texture found in the predominant natural features. The objective of a VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate, and management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The criteria for determining the degree of contrast followed BLM Manual 8431, Visual Resource Contrast Rating, as follows (BLM 1986a):

- No effects anticipated: The element contrast is not visible or perceived.
- Weak: The element contrast can be seen but does not attract attention.
- Moderate: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- Strong: The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

The process for analyzing impacts to visual resources involves a systematic comparison of the landscape's visual characteristics before and after a project is implemented, as observed from key observation points (KOPs), using the basic design elements of form, line, color, and texture. KOPs are “the most critical viewpoints,” where there is public sensitivity to visual change due to the type of user, level of use, orientation to proposed project, etc., such as points or a series of points on a travel route, or at a use area or a potential use area.

Seven KOPs have been identified based on critical viewpoints in the visual resources study area for the Thacker Pass Project (**Appendix M, Figure M.2**). The selected KOPs were chosen to include critical locations where the proposed mine site and process facilities would be visible to the public (**Figure 4.15-1, Appendix A**). These points include traveling corridors along SR 293 and Pole Creek Road, recreation areas including the Montana Mountain Range, and the nearest residence to the Project area. These KOPs were used for conducting the contrast rating system to evaluate the existing landscape character, degree of contrast, and VRM objectives conformance. KOP locations are shown in **Appendix M**, and described below:

- KOP-1 – Located less than one-quarter mile east of the Thacker Pass Project process plant entrance. This KOP looks west-northwest from SR 293 toward the process plant entrance and plant site buildings. This KOP analyzes the foreground-middle ground zone into the background zone from SR 293.
- KOP-2 – Located less than one-quarter mile west of the Thacker Pass Project’s West WRSF and near the mine site entrance. This KOP looks east-northeast from SR 293 toward

the project area. This KOP analyzes the foreground-middle ground zone into the background zone from SR 293.

- KOP-3 – Located less than one-quarter mile from the north side of the Thacker Pass Project area. This KOP looks southwest at the Thacker Pass Project area from Pole Creek Road. This KOP analyzes the foreground-middle ground zone into the background zone from Pole Creek Road.
- KOP-4 – Located approximately one mile from the north side of the Thacker Pass Project area. This KOP looks south-southeast from Pole Creek Road on top of the Montana Mountains. This location was chosen to provide a viewshed analysis for the public that utilizes the Montana Mountains for recreation.
- KOP-5 – Located approximately seven miles from the mine facilities and three miles from the process facilities. This KOP is on an access road just north of SR 293 and looks west-northwest toward the Quinn Production Well and a 25-kV distribution line that would be installed to power the mine and process facilities.
- KOP-6 – Located just east of Pole Creek Road close to the nearest residence, this KOP is approximately one-half mile from the Thacker Pass Project area and looks west toward the Project area. The KOP analyzes the foreground-middle ground zone into the background zone.
- KOP-7 – Located on SR 293 adjacent to the Thacker Pass mining area, this KOP looks northeast toward the Project area. The KOP analyzes the foreground-middle ground zone of the mine entrance.

4.15.1 Issue – Project Infrastructure

This section discusses project related effects to visual resources resulting from the Proposed Action, Alternatives B and C, and the No Action Alternative. Primary issues related to visual resources include direct and indirect effects associated with the change of the landscape character and degradation of views from the selected KOPS resulting from the construction of proposed infrastructure included in all three action alternatives, impacts to night skies, and the consistency of the Proposed Project and other Alternatives with the BLM Visual Resource Management Class II objectives. All visual simulations used for the analysis for effects to visual resources are provided in **Appendix M**.

4.15.1.1 Alternative A (Proposed Action – Preferred Alternative)

Visual resource effects can be attributed to the introduction of project infrastructure and proposed ground disturbance, and have been assessed in three phases – construction, operations, and reclamation – to accurately account contrast changes to the land over the 41-year life of the mine. Additionally, visual resource effects have been assessed from the vantage point of the selected KOPs described above. Overall, changes in the landscape character from the Thacker Pass Project would result in short-term strong contrast during construction, long-term strong contrast during mining operations, and long-term weak contrast in final reclamation. Concurrent reclamation

would take place during mining operations to minimize the overall visual contrast of the existing landscape. Overall, the construction and operation of the Proposed Alternative would not meet the current VRM Class II objectives, and would not conform with the existing ROD/RMP (see Section 1.5.3). The existing character of the landscape would not be retained, and the level of change to the characteristic landscape would be noticeable and likely attract the attention of the casual observer. Overall, the construction and operation of Alternative A would not meet the current VRM Class II objectives, and would not conform with the existing ROD/RMP (see Section 1.5.3).

Mine Exploration

Under the Proposed Action, exploration activities would occur as needed throughout the operational phase of the mine in the north and south Exploration Plan areas as described in Section 2.2.8, *Exploration*. Exploratory drilling or activity could occur at any location within the exploration areas at any time during the day or night. Exploration within the Plan area would involve the use of heavy equipment and increased vehicular and human presence along roads and land clearing areas. Exploration activities would occur mainly during daylight hours but could extend to 24 hours a day. Temporary impacts on visual resources would include the presence of heavy equipment, clearing of vegetation, additional lighting, and waste rock storage facilities. Long-term impacts could include new access roads. All disturbed land that is not required for operations would be reclaimed after exploration. Vegetation communities would be restored, which would reduce long-term impacts to the line, color, and texture of the natural landscape. Exploration roads would also likely be used for mine construction and operation, and would be reclaimed once they are no longer needed (either post-construction or post-operation).

Mine Construction

Construction of the Thacker Pass Project is expected to begin in 2021 and last for approximately two years. Construction would remove vegetation, add roads, waste rock storage facilities, clay tailings, pits, and associated buildings and infrastructure. The largest visual impacts would result from the mass-grading and reshaping of soils and landforms that would alter topography. Visual changes to the landscape would include removal of vegetation and exposure of soil, causing a contrast in color, line, form, and texture to the existing landscape. All disturbed land that is not required for operations would be reclaimed after construction. Areas that would be reclaimed include the powerline and pipeline construction corridor – an area ranging approximately eight miles. Vegetation communities would be restored, which would reduce long-term impacts to the line, color, and texture of the natural landscape. Smaller construction roads, and construction laydown areas would also be reclaimed after construction. **Appendix M** provides visual simulations for the existing landscape, ten years into mine operation, and post-reclamation, illustrating likely impacts to visual resources from selected KOPs.

Mining Operations

Mining operations are expected to last 41 years, through 2063. Contrasts to the existing landscape during operations would be long-term due to the life of the mine. Mitigation measures would be implemented throughout mine operations to minimize visual changes to the landscape. Mitigation

measures include blending infrastructure to conform with the surroundings by choosing appropriate paint colors to match the adjacent scenery, concurrently backfilling the mine pit, and, when feasible, concurrently sloping and reclaiming stockpiles.

Both mine facilities and process facilities would be visible in the foreground from areas along SR 293 (see effects for KOP 1 and KOP 7 below). Long-term contrast changes include form, line, color, and texture to the existing landscape. Buildings would change the form of the existing landscape to include geometric features, sharp lines, and smooth textures. Buildings would result in strong contrasts to the line, form, color, and texture of the existing landscape to include geometric features, sharp lines, and solid textures. The buildings would be painted in BLM-approved colors that blend with the existing landscape (shades of tan and brown), to retain the existing character and not draw attention to the casual observer.

The west WRSF, CTFS, and CGS would be in the foreground, middle ground, and background from areas along SR 293 and Pole Creek Road (see effects for KOP 1, KOP 2, KOP 3, and KOP 6 below), resulting in long-term contrasts in the form, color, and texture the existing landscape. When feasible, concurrent reclamation of stockpiles and storage facilities would be accomplished throughout operations to minimize the overall contrast of the existing landscape and to not attract attention to the casual observer.

The WRSFs color and texture would be that of a typical mine site – consisting of a dark brown color with a smooth to rocky texture. The WRSF would be sloped to blend with current topography and, when feasible, would be concurrently reclaimed with reclamation seed mix to minimize overall visual contrast to the existing landscape. Concurrent reclamation would match the color and texture of the WRSF to the existing landscape, minimizing overall long-term effects to the landscape. Additionally, material from the WRSF would be used to backfill the pit, thus minimizing the overall size of the WRSF.

The CTFS would consist of a mixture of clay tailings, neutralization solids, and salts. The overall color of the mixture would be a tan to tannish gray. The CTFS would be constructed in a phased approach, and, when feasible, concurrently reclaimed. Reclamation efforts would include sloping the CTFS to blend with current form of the landscape and seeding with reclamation seed mix to blend with the texture and color of the landscape.

Closure and Reclamation

If the proposed mining operations are approved, a Reclamation Plan for the Thacker Pass Project would be completed in accordance with the BLM and NDEP regulations to prevent unnecessary or undue degradation of public lands by operations authorized by mining laws. This plan would include requirements to return the site to a condition supporting similar land uses to those in existence prior to mining activities and reducing visual effects. Site-wide post-production reclamation contours and topography would be designed to blend with form, line, color, and texture of the existing landscape. Post-production reclamation would include recontouring, cover placement, placement of growth media, and seeding activities. Seeding activities would be scheduled to take advantage of optimal weather conditions and would coordinate with other

reclamation activities. To ensure stable vegetation growth and ground cover of all reclaimed areas, annual revegetation monitoring (including noxious weed monitoring and abatement), maintenance, and reporting, would continue for at least three years following mine closure, and revegetation activities, or until revegetation success has been achieved. Success of revegetation would be based on seasonal growth patterns, precipitation, and weather conditions. After post-reclamation is complete, the CTFS would permanently change the form and line of the current viewshed, but reclamation efforts would minimize visual effects and not attract attention.

Visual Resource Effects from Selected KOPs

Visual contrasts would range from strong to weak from KOP 1 (**Appendix M, pages 1-3**). The CTFS, CGS, the mine pit, and processing facilities would be in the foreground from this vantage point. During construction and operation, these elements would likely attract attention and dominate the landscape for travelers on SR 293. When feasible, the CTFS would be concurrently reclaimed to minimize long term visual contrasts to the landscape. All buildings, roads, and ancillary facilities would be demolished after the plant's 41-year lifespan, and the land would be reclaimed. The final reclamation slopes for the CGS would be 4H:1V. The CGS would be recontoured, covered with growth media, and seeded to blend with the established landscape upon reclamation. Approximately 353.6 million cubic yards of clay tailings would be permanently stored in the CTFS. The final reclamation slopes for the CTFS would be 5H:1V. The CTFS would be seeded with growth media to blend with the established landscape upon reclamation. Overall, visual contrasts from KOP 1 would be strong to weak for the duration of construction and operation of the lithium mine, and weak post-reclamation.

Visual effects would be greatest from KOP 2 (**Appendix M, pages 4-6**) because the proposed sediment pond and west WRSF would be in the immediate foreground from this vantage point. During construction and operation, these two developments would likely attract attention and dominate the landscape for travelers on SR 293. Similarly, the proposed attrition scrubbing area and ore stockpile area would be located approximately 1.5 miles west of KOP 2, and would likely be visible from this vantage point as well. Due to the topography of the area, the mine pit and other mining facilities would be unlikely to be visible from KOP 2. When feasible, the west WRSF would be concurrently reclaimed to minimize long term visual contrasts to the landscape. All buildings, roads, and ancillary facilities would be demolished after the mine's 41-year lifespan and the land would be reclaimed, resulting in unnoticeable long-term effects to visual resources. The mine pit would be concurrently backfilled over the mine life using approximately 144.3 million cubic yards of waste rock and 75.2 million cubic yards of coarse gangue material. The pit area and west WRSF would be covered with growth media to blend with the established landscape upon reclamation. Post-reclamation, the former sediment pond and west WRSF would not be noticeably visible from KOP 2, and would not attract attention. Overall, based on the contrast rating for KOP 2, visual contrasts would be strong to weak for the duration of construction and operation of the lithium mine, and weak post-reclamation.

The intensity and duration of effects to visual resources from KOP 3 (**Appendix M, pages 7-9**) would be similar to those described for KOP 2 above. The CTFS, GMS, and CGS would be in the

immediate foreground from KOP 3, which would likely attract attention and dominate the landscape for travelers on SR 293. Portions of the mine pit, and the East WRSF may also be visible from KOP 3. When feasible, all stockpiles would be concurrently reclaimed in phases to minimize long term visual contrasts to the landscape. Under the Proposed Alternative, the entire pit would be backfilled. At final reclamation, all stockpiles, storage facilities, and facility stacks would be reclaimed to blend with the existing landscape, as described in the KOP 2 description above. Post-reclamation, the former CTFS, GMS, and CGS would not be noticeably visible from KOP 2, and would not attract attention. Overall, based on the contrast rating for KOP 3, visual contrasts would be strong to weak for the duration of construction and operation of the lithium mine, and weak post-reclamation. Livestock grazing takes place at this KOP and grazing of the land is expected to continue throughout the life of the project.

Visual contrasts from KOP 4 (**Appendix M, pages 10-12**) and KOP 5 (**Appendix M, pages 13-15**) would be unnoticeable as a result of Alternative A. It has been determined that the view of the Project area from KOP 4 is hidden from view. The viewshed from KOP 5 would include the proposed 25-kV distribution line, which would run east to power the Quinn Production Well and correlated booster pumps. A 115-kV transmission line operated by Harney Electric Company currently runs through the project site. The proposed 25-kV distribution line that would be constructed for the Thacker Pass Project would run parallel to the larger, existing transmission line. The 25-kV distribution line and the production well were determined to be in the background zone, resulting in weak changes to the viewshed because the distribution line would repeat elements present in the existing landscape due to the existing 115-kV transmission line.

Visual effects from KOP 6 (**Appendix M, pages 16-18**) would be moderate to weak as a result of Alternative A. From KOP 6, the CTFS would be slightly visible, but would not attract attention. The elevation of KOP 6 and the adjacent residential area was determined to be significantly lower than the Project area, shielding much of the view of the project from KOP 6 and the residences. The CTFS would be recontoured, covered with growth media, and seeded to blend with the established landscape upon reclamation, minimizing contrast of the current view at the nearest residence. When feasible, CTFS would be reclaimed to minimize long term visual contrasts.

Visual contrasts from KOP 7 (**Appendix M, pages 19-21**) would be strong to weak due to the placement and visibility in the immediate foreground of the attrition scrubbing area, the mine pit, the ore stockpile, and the west WRSF. During construction and operation, these facilities would be visible and dominate the landscape for travelers on SR 293. However, all buildings and structures would be painted a BLM-approved paint color (shades of tan and brown) to blend with the environment and minimize attention. When feasible, the west WRSF would be concurrently reclaimed to minimize long term visual contrasts to the landscape, and the mine pit would be concurrently backfilled over the life of the mine. Post-reclamation, the former attrition scrubbing area, the mine pit, the ore stockpile, and the west WRSF would not be noticeably visible from KOP 7, and would not attract attention. All buildings, roads, and ancillary facilities would be demolished after the mine's 41-year lifespan, and the land would be reclaimed, resulting in unnoticeable long-term effects to visual resources.

Night Sky Effects

The Thacker Pass Project area does not have an International Dark Sky Place designation. However, due to the rural location of the project, protecting the area from light pollution is important. In conjunction with final engineering design, LNC has developed a Lighting Management Plan (ITAC and LNC 2020) for the Project to protect night skies in the area. Through this Lighting Management Plan, mitigation measures would be taken to ensure the quality of night skies and dark environments that is protected for scientific, natural, educational, cultural heritage, and/or public enjoyment.

The Lighting Management Plan includes best practices to reduce light pollution, as well as an inventory of the existing lighting at the Mine. The objectives of the Lighting Management Plan are as follows:

- To ensure that sufficient lighting is provided on-site to facilitate safety and security to mining operations;
- To ensure that lighting is of an appropriate standard and appropriately directed;
- To minimize the impact of on-site lighting sources on nearby communities, recreationalists, and road users;
- To outline a process through the Best Management Practices (BMPs) to address spillage light issues; and
- To conform to the standards of the National Electrical Code (NEC), Illuminating Engineering Society of North America (IES), and the International Dark Sky Association (IDA) (ITAC and LNC 2020).

The Lighting Management Plan includes voluntary design of downward facing, shielded light emitting diode (LED) area and localized lighting. When designing the new facilities, LNC would utilize appropriate lighting through the following BMPs where applicable:

- Outdoor lighting fixtures will be installed in conformance with the provisions of the Federal Energy Regulatory Commission and the NEC;
- Lighting will follow the standards for maximum lumens per acre output as recommended by the IDA when it does not compromise safety or as other regulations apply, such as Mine Safety and Health Administration (MSHA) minimum lighting requirements;
- To the extent possible, lighting fixtures would use light emitting diode (LED) bulbs;
- Up-lighting will not be utilized, except in cases where the fixture is shielded from the sky by a roof overhang or similar structure and where the fixture does not cause light to extend beyond the structural shield;
- Lighting, where appropriate, will be on timers or sensor-activated during nighttime operating hours;

- Temporary lighting, such as that used during operation, is exempt from these practices, provided that all temporary lighting will be aimed to minimize glare and light trespass and turned off after completion of the work;
- A regular maintenance schedule will be implemented to keep fixtures clean from dust, dirt, and debris. Such conditions can potentially reduce light output up to 50 percent; and
- Installation and use of swivel-mounted floodlights will be discouraged upon due to the potential for adjustment, either inadvertently or intentionally. If floodlights are utilized, they will be fully shielded, properly aimed and subject to regular maintenance and inspection (ITAC and LNC 2020).

Inclusion and implementation of these lighting practices would result in moderate to weak visual changes on dark night skies because while new light would be introduced into the project area, implementation of the mitigation measures would prevent extensive light pollution in the area.

4.15.1.2 Alternative B (Partial Pit Backfill)

The effects to visual resources under Alternative B would be similar to those under the Proposed Action. The only visible difference between the Proposed Action and Alternative B would be the placement of backfill in the pit. Under Alternative B, the east end of the South Pit would not be backfilled to the same elevations as the West and North pit areas, resulting in slightly higher elevations of the backfilled areas in the West and North pits. This would result in stronger visual changes to the landscape due to the contrasts in form and line of the backfilled areas. Overall, the construction and operation of Alternative B would not meet the current VRM Class II objectives, and would not conform with the existing ROD/RMP (see Section 1.5.3). The existing character of the landscape would not be retained, and the level of change to the characteristic landscape would be noticeable and likely attract the attention of the casual observer.

The same reclamation operations and night sky effects that would occur under the Proposed Action would also occur under Alternative B.

4.15.1.3 Alternative C (No Pit Backfill)

The effects to visual resources under Alternative C would be more noticeable than those under the Proposed Action and Alternative B. The visual changes would be stronger due to the larger size of the East WRSF. The East WRSF would only be visible from KOP 3, but would likely attract attention and dominate the landscape from this vantage point during construction and operation of the mine. The intensity of effects to visual resources from KOP 3 would be similar to those described for KOP 3 under the Proposed Action. However, the duration of effects under Alternative C would last longer because the pit would not be backfilled, even post-closure. The presence of an open pit under Alternative C would result in additional effects when compared to the Proposed Action and Alternative B. Overall, the construction and operation of Alternative C would not meet the current VRM Class II objectives, and would not conform with the existing ROD/RMP (see Section 1.5.3). The existing character of the landscape would not be retained, and the level of change to the characteristic landscape would be noticeable and likely attract the attention of the casual observer.

Other than not backfilling the pit, the same reclamation operations and night sky effects that would occur under the Proposed Action would also occur under Alternative C.

4.15.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Potential effects to visual resources would be related to reclamation of existing disturbance to be completed according to previous authorizations.

4.15.2 Recommended Mitigation and Monitoring

As described above, concurrent reclamation of mine areas for which mining has been completed would be implemented to mitigate effects to visual resources. During mining operations, this would allow for vegetation to establish where mining has been completed, while mining activities are in progress elsewhere within the Project area. Concurrent reclamation would result in reduced effects to visual resources and visual contrast. Other mitigation measures, such as painting buildings and structures to blend with the existing landscape, and when feasible, concurrently sloping and reclaiming stockpiles would minimize permanent contrasts within the Project area.

Similarly, the mitigation measures to address the protection of dark night skies would be achieved through the implementation of a lighting plan, described above.

4.15.3 Residual Effects

Residual effects to visual resources would be limited to those effects that are not avoided through the application of mitigation measures and best management practices. These short-term effects include the changes in landforms related to the construction of the WRSFs, material stockpiles, the CTFS, and processing facilities and administration buildings. Visual contrasts during mining operations would result in strong to weak impacts on the visual character of the landscape due to changes in form, line, color, and texture, depending on the vantage point of the observer. Post-reclamation, changes in form, line, color, and texture from the visible remnants from the WRSF, and reclaimed pit and clay tailings would result in long-term weak visual contracts when compared to the existing condition.

4.16 WASTES, HAZARDOUS OR SOLID

4.16.1 Issues – Public Access and Transportation

4.16.1.1 Alternative A (Proposed Action – Preferred Alternative)

Hazardous Materials

Dry chlorine gas (approximately 3,000 tons per year) would be produced in the process plant molten salt process. Chlorine gas would not be transported on or off site, but would be contained within the process. Caustic soda would be supplied to the site by truck and stored in tanks. The dry chlorine gas would be reacted with caustic soda and water in the process plant to produce sodium hypochlorite solution. Approximately 21,000 tons per year of 15.3 percent sodium hypochlorite solution would be produced in Phase 1. The sodium hypochlorite solution would be transferred

from storage tanks to trucks for transport to market. Sodium hypochlorite solution may also be transported by truck to a tank car transloading facility in Winnemucca where it would be sold to the market via tank car.

Hazardous materials including bulk solids and liquids would be transported to the facility by truck and unloaded at the bulk solids and liquids unloading and storage area and sulfur / sulfuric acid storage/loading/unloading area in the process plant area shown in Figure 13 of the Mine Plan. The following hazardous materials would be used/produced in the proposed mine and plant operations:

- Fuels – gasoline, off-road diesel fuel, propane.
- Vehicle and equipment maintenance fluids – including oils, greases, coolants (antifreeze), cleaning and degreasing solvents.
- Plant reagents – including caustic soda (sodium hydroxide), soda ash (sodium carbonate), sulfuric acid, flocculants, and anti-scalants used in the processing plant.
- Laboratory reagents including assay chemicals.
- Lithium and compounds – including lithium carbonate, lithium sulfide, lithium hydroxide monohydrate, lithium metal, batteries, battery components.
- Sodium hypochlorite (15.3 percent) solution (chlorine bleach).

Table 4.18 provides a summary of the estimated storage and use of chemicals and reagents for the proposed mine and plant operations; **Table 4.19** provides a summary of the estimate storage and use of fuels and equipment maintenance fluids for the proposed mine and plant operations.

Table 4.18. Chemicals and Reagents (Hazardous Materials) on Site

Reagents	Estimated Use (tons per year)	Maximum Amount Stored (tons) [1]
Limestone	169,036	7,165
Quicklime	126,204	1,127
Soda Ash	86,343	1,070
Molten Sulfur	340,247 (Phase 1 production capacity)	13,454
	680,494 (Phase 1-2 production capacity)	13,454
SNF Hyperfloc AF-307	144	22
SNF Hyperfloc CP-624	72	22
Sulfuric Acid	2,900 tons per day (Phase 1 production capacity)	14,550
	5,800 tons per day (Phase 1-2 Production Capacity	14,550
Caustic Soda	145,668	1,409
Potassium Chloride	4,712	562
Aluminum Powder	0.9	0.9
Lithium Chloride	4,712	562
Sodium Hypochlorite	21,000	254

[1] Hazardous materials identified in Table 4.17 would be included in a hazardous materials storage permit issued by the Nevada Department of Motor Vehicles and Public Safety, Fire Marshall Division; Fire Protection Licensing Bureau, HAZMAT Office.

Sulfur would be transported to the site in molten form in closed tank cars, not as a powder (solid). Sulfuric acid solution produced in the sulfuric acid plant would be shipped from the site in liquid form in road tankers during periods of excess acid production. Sodium hypochlorite solution (chlorine bleach) would also be shipped from the site in liquid road tankers.

Lithium processing would produce tailings comprised of acid leach filter cake (clay material), neutralization filter cake, magnesium sulfate salt and sodium/potassium sulfate salts, collectively referred to as clay tailings. Limestone would be added on an as-needed basis for structural stability. limestone and/or quicklime would also be used for neutralization for the acid leaching process. Neutralization solids and magnesium sulfate salt and sodium/potassium sulfate salts, components of the clay tailings, would be disposed of on site. Approximately 353.6 million CY of clay tailings would be placed on the facility over the proposed 41-year mine life under Alternative A.

Explosive agents may be required on occasion during mining operations for removing basalt waste rock material from the pit. Explosives would not be required for operations on a regular basis. Where areas of basalt are encountered, LNC would rely on a licensed contractor to conduct any needed blasting operations. The contractor would ensure explosives are handled in accordance with the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and Department of Homeland Security (DHS) provisions, and MSHA regulations. The proposed explosives storage areas would

be fenced to restrict access. Explosives would be transported to the site on SR 293 from the U.S. Highway 95 junction and on access roads to the site, the same transport route as for other hazardous materials.

Table 4.19. Storage and Use of Fuels and Equipment Maintenance Fluids on Site

Fuel Type	Maximum Storage (gallons)	Anticipated Delivery Trucks/Month	Approximate Consumption (gallons per day)
Off Road Diesel (mine)	50,000	38	11,300
Off Road Diesel (plant)	42,500	14[1]	14,794[1]
Highway Diesel	8,000	1	68
Gasoline (mine)	3,000	1	182
Gasoline (plant)	1,000	0.2	68
Bulk Tank DEF	330	3	452
Bulk Tank Oil	19,000	2	193
Bulk Tank Coolant	3,000	1	40
Bulk Tank Used Oil	3,000	0.5	-
Bulk Tank Used Coolant	3,000	0.5	-
Bulk Tank Grease	Nine 250-gallon tote	2.5	283
Bulk Solvent	Two 320-gallon totes	0.25	3.3
Propane	Two 350-gallon tanks	0.2	3

[1] Off-road diesel would be used in the package boiler for the sulfuric acid plant and would operate approximately four times per year for 72 hours each cycle. Consumption during runtime would be an estimated 300 gallons per hour.

Products and Wastes Produced

Table 4.20 summarizes the anticipated production of lithium, lithium products (lithium carbonate, lithium hydroxide monohydrate, and lithium sulfide), and other products (sodium hypochlorite) during Phase I and Phase II operations. The amounts of each lithium product produced would depend on market conditions.

Table 4.20. Amounts of Products Anticipated to be Produced Phase I and Phase II (TPY)

Product	Production (Range) TPY	Notes
Lithium metal	Phase I: 800 Phase II: 1,600	
Lithium Carbonate	Phase I: Up to 33,000 Phase II: Up to 66,000	Quantity of specific lithium end products will ultimately depend on market conditions.
Lithium Hydroxide Monohydrate	Phase I: Up to 33,000 Phase II: Up to 66,000	Quantity of specific lithium end products will ultimately depend on market conditions.
Lithium Sulfide	Phase I: Up to 33,000 Phase II: Up to 66,000	Quantity of specific lithium end products will ultimately depend on market conditions.
Sodium Hypochlorite	Phase I: 21,000 Phase II: 42,000	

Table 4.21 summarizes the types and quantities of mine and process wastes that would be disposed of in the CTFS during Phase I and Phase II operations. These include acid leach filter cake (clay material), neutralization filter cake, magnesium sulfate salts, and potassium and sodium sulfate salts.

Table 4.21. Amounts and Constituents of Mine and Process Wastes to CTFS Phase I and Phase II (TPY)

Material	Disposal Quantities (TPY) / Constituents	Notes
Acid leach filter cake (clay material)	***Phase I:*** 2,419,950 – 2,808,546 ***Phase II:*** 4,839,900 – 5,616,912	
Plagioclase	Sodium aluminosilicate ($NaAlSi_3O_8$) and Calcium aluminosilicate ($CaAl_2Si_2O_8$)	
K-Feldspar	Potassium Feldspar ($KAlSi_3O_8$)	
Epsomite	$MgSO_4.7H_2O$	
Hexahydrite	$MgSO_4.6H_2O$	
Gypsum	Calcium sulfate dihydrate ($CaSO_4 \cdot 2H_2O$)	
Quartz	Silicon dioxide (SiO_2)	
Neutralization filter cake	***Phase I:*** 632,910 – 756,426 ***Phase II:*** 1,265,820 – 1,512,852	
Calcite	Calcium carbonate ($CaCO_3$)	
Gypsum	Calcium sulfate dihydrate ($CaSO_4 \cdot 2H_2O$)	
Epsomite	$MgSO_4 \bullet 7H_2O$	
Hexahydrite	$MgSO_4 \bullet 6H_2O$	
Quartz	Silicon dioxide (SiO_2)	Quartz is from the lime used in Neutralization
Magnesium sulfate salts	***Phase I:*** 558,450 – 678,024 ***Phase II:*** 1,116,900 – 1,356,048	Magnesium sulfate salts with different amounts of hydration
Epsomite	$MgSO_4 \bullet 7H_2O$	
Hexahydrite	$MgSO_4 \bullet 6H_2O$	
Starkeyite	$MgSO_4 \bullet 4H_2O$	
Kieserite	$MgSO4 \bullet H_2O$	
Sodium/potassium sulfate salts	***Phase I:*** 111,690 – 136,656 ***Phase II:*** 223,380 – 273,312	
Glauber's Salt	Sodium sulfate decahydrate $Na_2SO_4 \bullet 10H_2O$	
Glaserite	Potassium sulfate/Sodium sulfate $K_6Na_2O_{16}S_4$	
Limestone	Negligible. Limestone is not expected to be needed for structural stability of the CTFS. If limestone is added to the tailings mixture, negligible quantities will be added.	

Source: SRK 2019

Spill Prevention, Control, and Countermeasures

The Spill Contingency Plan for the Thacker Pass Project is included as Appendix E of the Mine Plan submitted to the BLM. The Spill Contingency Plan is prepared pursuant to 43 CFR 3809.401(2)(vi) (Mine Plan, Spill Contingency Plan) and establishes responsibilities and guidelines for actions to be taken by mine and plant personnel in the event of a spill of hazardous

materials at the Project site. The plan identifies potential sources of spills at the Project site, including locations and equipment where hazardous materials are loaded, unloaded, transported, stored, or produced, establishes methods of spill prevention, including equipment inspection and maintenance procedures, and defines spill control, response, remediation, and reporting procedures that would be implemented in the event of a hazardous material spill (including spills of petroleum products).

The Mine Plan includes a separate Emergency Response Plan (ERP) (Appendix F) prepared in accordance with OSHA Emergency Action Plan regulation 29 CFR 1910.38(a). The ERP addresses hazardous materials management and emergency response procedures pursuant to NAC 445A.398(A) and release response procedures pursuant to NAC 445A.345 and NAC 445A.348. The ERP describes measures LNC would have in place to manage hazardous materials on site and avoid spills of chemicals or hazardous substances. Elements of the ERP include a Fluid Management and Monitoring Plan which would describe systems and procedures for containment and monitoring of process solutions in the process plant, emergency pond, and CTFS facility, and a Hazardous Material Spill Prevention and Countermeasures Plan that would establish systems and procedures for prevention of hazardous materials spills including application of secondary containment systems for hazardous materials storage areas.

The Mine Plan also includes a SWPPP (**Appendix C**) prepared in accordance with requirements of the National Pollutant Discharge Elimination System (NPDES) permit program. The SWPPP identifies potential sources of stormwater pollution from the construction and operation of the Project, including potential stormwater runoff from the process plant areas, hazardous materials storage areas, mine areas, and waste management areas. The SWPPP also establishes BMPs to manage the flow of stormwater, prevent uncontrolled flooding, and minimize erosion, sediment, and other pollutant transport from Project facilities.

LNC would also establish a separate Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with 40 CFR part 112 of the Clean Water Act. A facility is required to have an SPCC plan if the facility has an aggregate aboveground oil storage capacity greater than 1,320 U.S. gallons. The SPCC Plan would establish procedures for spill prevention, control, and response to potential spills of fuels and other petroleum products stored and used on site.

Hazardous and Solid Waste Management

Hazardous wastes generated on site would be managed and stored according to state, federal (43 CFR 262) and local regulations. Hazardous wastes would be stored on concrete pads and provided with secondary containment until removal and disposal at an authorized facility. Used oil and waste coolant generated from vehicle maintenance would be stored at the truck shops in areas provided with secondary containment. The materials would be either recycled off site or disposed of off-site in accordance with state, federal, and local regulations. Used coolant and oil would not be mixed, and used oil would not be burned on site or otherwise reused on site. Used oil and waste coolant containers would be disposed or recycled according to federal, state, and local regulations. The proposed locations of the fuel farm and shop buildings are shown in Figure 11 and Figure 13 of the Mine Plan.

Prior to commencement of proposed mine operation, LNC would institute a Solid and Hazardous Waste Management Plan that would identify the wastes generated at the site and their appropriate means of on-site management, transport, and disposal. Employees who manage these wastes on site would be trained in their proper handling, storage, packaging, and emergency procedures relevant to their responsibilities in accordance with the LNC Solid and Hazardous Waste Management Plan, Emergency Response Plan and Spill Control Plan, SPCC Plan, and other applicable LNC plans. Employee training would include proper identification of waste types that are and are not permitted to be disposed of in a Class I landfill, and waste types that are required to be managed as Resource Conservation and Recovery Act (RCRA) hazardous wastes. Training would include management of used oil filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Used solvents, liquids drained from aerosol cans, fluorescent light bulbs, and used antifreeze are required to be transported to licensed facilities for recycling/disposal. The firm(s) selected to transport and dispose of these materials would be certified by the NDOT and NDEP, as required by Nevada regulations. Hazardous wastes would be placed in containers on concrete pads near their points of generation or in the designated hazardous waste storage building located within the process plant area; hazardous wastes would be stored on site for no more than 90 days from their date of generation prior to transport off site for disposal.

LNC anticipates that the facility would be classified as a small-quantity generator (SQG) of hazardous waste or a very small quantity generator (VSQG) as defined in 40 CFR 260.10, based on proposed mine and plant operations. Facilities classified as SQGs generate between 220 pound (lb) (100 kilogram [kg]) and 2,200 lb (1,000 kg) of hazardous waste per month; facilities classified as VSQGs generate less than 220 lb (100 kg) hazardous waste per month. If necessary, based on the estimated types of wastes generated and the quantities, LNC would obtain a Hazardous Waste Identification Number from the EPA for both the mine and plant site.

Types of incidents that could affect the proposed mine and process plant operations include spill, fire, and explosion incidents affecting hazardous materials storage and processing equipment. The processing equipment includes molten sulfur storage equipment and sulfuric acid storage equipment and other equipment containing hazardous materials.

Hazardous and Solid Waste Disposal

Both domestic and industrial solid waste would be generated during construction and operations of the Project. Non-hazardous solid waste from construction, operation, closure, and decommissioning of the site transported off site for disposal would be disposed of in the Humboldt Regional Class I municipal waste landfill or to other permitted Class I municipal waste landfills in Nevada.

The Humboldt County Regional Landfill is located on the north slope of Winnemucca Mountain, adjacent to U.S. Highway 95, approximately 3.5 miles north-northwest of the Winnemucca (Humboldt County 2019). The facility is a Class I Municipal Waste area-fill disposal site that currently serves the residents of Winnemucca and surrounding unincorporated areas, and also accepts waste generated from commercial facilities. The Humboldt County Regional Landfill is not permitted to accept liquid wastes or wastes (other than household waste) that are classified as hazardous wastes under Federal and Nevada hazardous waste regulations. According to the 2017

State of Nevada Solid Waste Management Plan (NDEP 2017) the disposal capacity of Nevada's solid waste landfills is projected to be able to adequately accommodate Nevada's solid waste needs well into the future. The Humboldt County landfill was originally permitted for operation in 1996 and is scheduled to close in 2030. The Humboldt County landfill (2019) has a disposal capacity of 1,100,821 cubic yards (NDEP 2017). Humboldt County has recently submitted a Recreation and Public Purpose (R&PP) application to the BLM for two adjacent parcels of land totally 77.3 acres for future landfill expansion. The BLM is conducting a review of this application. Efforts are ongoing to approve the application.

Wastes classified as hazardous waste under Federal and Nevada hazardous waste regulations and other wastes (e.g., liquid wastes) not permitted to be disposed of in Class I landfills would be transported off site to Clean Harbors for management and disposal. Clean Harbors is the current LNC vendor for off-site transport and disposal of hazardous wastes; LNC anticipates that Clean Harbors would continue to be the service provider for off-site transport and disposal of hazardous wastes. Clean Harbors operates a hazardous waste management facility in Sparks, Nevada, that would accept hazardous wastes and other wastes generated by site construction, operation, closure, and decommissioning for management and disposal. Clean Harbors operates RCRA-licensed landfills in Kern County, California and Tooele County, Utah for disposal of RCRA hazardous waste (Clean Harbors 2019a; 2019b; 2019c).

Used oil, waste coolant, and other wastes generated from existing LNC operations that are not permitted to be disposed of in Class I Landfills are transported off site to state-licensed vendors for recycling and disposal. proposed operations; LNC anticipates using these licensed vendors or other licensed vendors in Nevada for off-site recycling and disposal of these wastes.

Construction wastes and wastes generated during closure (e.g., concrete building foundations) would be disposed of in a permitted on-site Class III landfill constructed within the West WRSF in accordance with NAC 444.731 through 444.737 (Sanitation, Class III Landfills). The construction waste landfill would cover an area approximately 250 feet by 350 feet. Final cover over all on-site disposal sites would consist of a minimum of 24 inches of compacted soil meeting the requirements of NAC 444.6891. No wastes other than wastes generated from construction and decommissioning activities would be disposed of in the on-site Class III landfill. The proposed location of the on-site Class III landfill is shown in Figure 8 of the Mine Plan.

Toxic Release Inventory Reporting

The proposed operation would be subject to Toxic Release Inventory (TRI) reporting provisions under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986. This requires facilities to report toxic chemical releases and pollution prevention activities. Industry sectors including mining are required to report annually how much of each Section 313-listed chemical is released to the environment and/or managed through recycling, energy recovery, or treatment ("release" is defined as emission of a listed chemical to the air or water, or placement in some type of land disposal). Sulfuric acid is a Section 313-listed chemical; releases of sulfuric acid to air, water, or land would be required to be reported by the facility.

Technologically Enhanced Naturally Occurring Radioactive Material

Radiological hazards associated with operation of the project include potential exposure to Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) due to processing of ore containing naturally occurring radionuclides, including naturally-occurring uranium. Baseline geochemical characterization indicates that radionuclides are elevated in some samples of materials including tailings and waste rock and ore, and there is the potential for leaching of radionuclides from tailings at concentrations exceeding threshold values. The tailings impoundment would therefore be constructed as a zero-discharge facility to avoid potential impacts to groundwater. The Thacker Pass Waste Rock and Gangue Management Plan also includes provisions for quarterly groundwater sampling and reporting, including analysis of radionuclide concentrations.

The Nevada Hazardous Material Regulations definition of radioactive material (NAC 459.076) incudes TENORM, although TENORM is not explicitly defined in the regulation (ASTSWMO, 2014). The Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation (NDEP-BMRR) has established guidelines for waste rock, overburden, and ore characterization and evaluation and for ecological risk assessment for proposed mining projects (NDEP-BMRR 2019). In accordance with guidelines, waste rock, overburden, and ore are evaluated for the potential to release pollutants to the environment using NDEP-specified procedures, including analysis for the NDEP Division Profile I list of parameters. NDEP may also specify analysis of other parameters/constituents required on a site-specific basis (e.g., radio-chemical analysis). Division Profile I-R reference values include uranium (0.03 mg/l), thorium (15 pCi/l), radium 226 / radium 228 (5 pCi/l) and gross alpha radiation. LNC considered guidelines set forth in the NDEP-BMRR waste rock, overburden and ore evaluation guidelines and ecological risk assessment guidelines in conducting waste characterization, modeling, and analysis for the proposed project (LNC 2020a; LNC 2020b).

The Thacker Pass Baseline Geochemical Characterization Study (LNC 2020a) includes analysis of three by-products from the lithium process: clay tailings, neutralization solids and sulfate salts. These by-product materials would be co-mingled in the lined tailings impoundment. Multi-element analysis found that uranium was enriched above average crustal concentrations in the neutralization solids. Multi-element analysis also found that uranium was elevated in approximately fifty percent of the oxidized ore feed and gangue samples. Similar trends in element enrichment were observed in the unoxidized ore feed and unoxidized gangue samples. Analysis of leachate samples indicated that uranium and gross alpha were elevated in two of three unoxidized gangue samples and that radium226/radium228 was elevated on one of three unoxidized gangue samples.

Kinetic humidity cell tests (HCTs) were also conducted to define sulfide oxidation rates and metal leaching potential under laboratory-controlled oxygen and water exposure conditions that simulate weathering of materials in the field. Kinetic testing of waste rock found that low levels of uranium were initially flushed from the HCTs at concentrations above NDEP Profile I-R reference values

(i.e., 0.03 mg/L); uranium concentrations rapidly decreased to levels below Profile I-R within the first few weeks of testing.

A simple PHREEQC model was applied to address the potential for uranium sulfate formation within the Thacker Pass tailings impoundment.[1] Source terms were generated for each tailings component (i.e., clay tailings, neutralization solids, and sulfate salts) by averaging the available Meteoric Water Mobility Procedure (MWMP) data for those materials. This included three samples of clay tailings, two samples of neutralization solids and one sample of sulfate salts. The average MWMP leachate chemistry for each of these materials was input into the PHREEQC model, and the modeled solution concentrations for each material were mixed in the approximate proportions of the planned tailings impoundment materials (i.e., 64% clay tailings, 17% neutralization solids, 18% sulfate salts). Based on the results of this PHREEQC model, uranium speciation is dominated in solution by a combination of uranyl fluoride and uranyl phosphate species. Only a very small proportion of the total uranium in solution is predicted to form uranium sulfate. Approximately 0.00007% of the total uranium is predicted to form uranium sulfate across all uranium sulfate species. Based on PHREEQC calculations using mass balanced MWMP leachate chemistry for all the tailings components, uranyl (IV) and (VI) sulfate species comprise a minimal portion of total uranium in solution. As such, these sulfate species in the tailings impoundment leachate do not present an environmental risk (SRK 2020c).

The NDEP-BMRR Screening-Level Ecological Risk Assessment (SLERA) process applicable to proposed mining projects includes pit lake water quality criteria, referred to as Division Profile III. Profile III includes a reference value for uranium. LNC conducted pit lake water quality modeling for the purposes of ecological risk assessment and compared modeled pit lake water concentrations to established reference values Modeled uranium concentrations for uranium were below ecological receptor-specific Toxicity Reference Value (TRV) threshold concentrations. For modeled concentrations below TRVs, no effect on ecological receptor species is expected to occur (LNC 2020c).

Due to the potential to leach metals and radioactive elements from the tailings at concentrations that exceed Profile I-R reference values, the tailings impoundment would be constructed as a zero discharge facility and covered with waste rock/growth media at closure; therefore, no degradation to groundwater is expected from the impoundment (LNC 2020a). The LNC Waste Rock and Gangue Management Plan (LNC 2020b) also includes provisions for quarterly groundwater sampling and reporting. Sampling and analysis would be performed according to the groundwater monitoring plan for the site and would include laboratory analysis of leachate for Nevada Profile I and Profile I-R constituents including uranium, thorium, radium226/radium228, and gross alpha radiation.

[1] PHREEQC Version 3 is a computer program written in the C++ programming language that is designed to perform a wide variety of aqueous geochemical calculations. https://www.usgs.gov/software/phreeqc-version-3

4.16.1.2 Alternative B (Partial Pit Backfill)

Hazardous materials management and hazardous and solid waste management for Alternative B would be as described above for Alternative A. Management of solid waste from the mining and production processes under the Partial Pit Backfill Alternative would not affect the types and amounts of process reagents and fuels used or the types and amounts of hazardous and solid wastes generated by the mining and production processes. Under the Partial Pit Backfill Alternative, mining would continue for 41 years and the north and west portions of the open pit would be concurrently backfilled during mining. At the end of mining, a small portion of the south open pit would be partially backfilled to an elevation of approximately 4,709 feet. The Partial Pit Backfill Alternative would affect the locations, area and height of backfill material as compared to Alternative A.

4.16.1.3 Alternative C (No Pit Backfill)

Hazardous materials management and hazardous and solid waste management for Alternative C would be as described above for Alternative A. Management of solid waste from the mining and production processes under the No Pit Backfill Alternative would not affect the types and amounts of process reagents used or the types and amounts of hazardous and solid wastes generated by the mining and production processes. Under the No Pit Backfill Alternative, mining would continue for 41 years and entire open pit would be left open and not be backfilled. Approximately 7.8 million cubic yards additional material would be placed in the West WRSF and approximately 207.2 million cubic yards of additional material would be placed in the East WRSF under Alternative C. Additional haulage (including four additional haul trucks) would be required under alternative C, which would result in additional diesel fuel consumption for haul truck operation the need for additional shipments of diesel fuel to the site. Additional fuel usage for Alternative C would be handled by increasing the number of deliveries of diesel fuel per day. No additional fuel storage tank volume would be required for Alternative C in addition to that identified for Alternative A.

4.16.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations. Potential effects to hazardous materials management and hazardous and solid waste management would be limited to those associated with reclamation activity.

4.16.2 Recommended Mitigation and Monitoring

No mitigation measures are proposed based on the potential effects of the proposed Project.

4.16.3 Residual Effects

Residual effects would be the same as those discussed in Section 4.16.1 above.

4.17 RECREATION

Primary issues related to recreation include direct and indirect effects associated with Project infrastructure and public access.

4.17.1 Issues – Project Infrastructure and Noise

Direct and indirect effects to recreation would result from the presence of Project infrastructure located within the Mine Plan and Exploration Plan boundaries (see **Figure 2.2, Appendix A**). Although some recreation activities would be allowed to continue, the aesthetic quality within the boundaries would lose the feeling of naturalness. This would include dispersed recreation, such as off-highway vehicle (OHV) use, hiking and horseback riding, hunting, mountain biking, wildlife viewing, and photography.

4.17.1.1 Alternative A (Proposed Action – Preferred Alternative)

Recreationists use the Pole Creek Road area for camping and staging areas. Camping along Pole Creek Road may be affected by Project infrastructure and noise generated from mining activities. Under Alternative A, LNC would not close, block, or limit in any manner of access to Pole Creek Road or the Montana Mountains.

Some forms of recreation would be affected by mining and exploration activities beyond that of the area of surface disturbance. Activities, noise, and the additional human presence could deter wildlife from the area effecting photography, viewing, and hunting activities. Outfitter & guide special recreation permit holders conduct guided hunts the NDOW Units. Noise and project infrastructure could result in changes in wildlife present and possibly impact the ability to offer clients a high-quality hunting experience. Project infrastructure and noise could also affect other recreational activities that benefit from aesthetic qualities and a feeling of isolation.

4.17.1.2 Alternative B (Partial Pit Backfill)

Effects to recreation as a result of the development of Project infrastructure resulting from Alternative B would be the same as for Alternative A.

4.17.1.3 Alternative C (No Pit Backfill)

Effects to recreation as a result of the development of Project infrastructure resulting from Alternative C would be the same as for Alternative A.

4.17.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the proposed Project and there would be no effects to recreational resources as a result of the development of Project infrastructure.

4.17.2 Issue – Increased Volume of Recreationists

Direct and indirect effects to recreation could result from the incremental increase in population due to permanent mine employees.

4.17.2.1 Alternative A (Proposed Action – Preferred Alternative)

Under Alternative A, LNC would employ 183 permanent employees during Phase 1 of the Project and 313 permanent employees during Phase 2. The most recent census data shows the combined population of Orovada, Winnemucca, and McDermitt at 8,431 individuals; therefore, the permanent employees for Phase 1 and Phase 2 of the Project would represent a 2.2 percent and 3.7 percent increase in the population, respectively. This incremental increase could equate to increased demands on recreational resources.

4.17.2.2 Alternative B (Partial Pit Backfill)

Effects to recreation as a result of the increased volume of recreationists resulting from Alternative B would be the same as for Alternative A.

4.17.2.3 Alternative C (No Pit Backfill)

Effects to recreation as a result of the increased volume of recreationists resulting from Alternative C would be the same as for Alternative A.

4.17.2.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the proposed Project and there would be no effects to recreational resources as a result of increased volume of recreationists.

4.17.3 Issue – Water Quality and Quantity

4.17.3.1 Alternative A (Proposed Action – Preferred Alternative)

Groundwater model simulations were used to evaluate potential effects to baseflow in the two perennial stream reaches that occur in the project study area (i.e., Thacker Creek and Crowley Creek) located outside the 10-foot drawdown contour (Figure 4.8, Piteau 2019b). For the purposes of evaluation effects to stream flow, a simulated incremental change in flow of less than 5 percent was inferred to indicate that measurable effects were unlikely to occur. A less than 5 percent reduction would be difficult to accurately measure or distinguish from natural fluctuations and is presumed to be within the model uncertainty. The model simulations predict that drawdown would have a negligible effect on baseflow (i.e., approximately 1 percent or less reduction) in both creeks. Therefore, mine related drawdown is not expected to result in a measurable effect to flows in Thacker or Crowley Creeks.

Thacker Creek Pond is a privately owned and managed fishery located outside of the proposed Project area to the west of Thacker Pass. As discussed above, reductions in Thacker Creek surface flows are anticipated to be negligible and would be difficult to identify amongst annual variations in precipitation that contribute to stream conditions.

4.17.3.2 Alternative B (Partial Pit Backfill)

Potential effects to fisheries under Alternative B are anticipated to be the same as discussed under Alternative A. Project hydrology model simulations predict that drawdown would have a negligible effect on baseflow (i.e., approximately 4 percent reduction in Thacker Creek, and 1 percent reduction in Crowley Creek) in both creeks. Therefore, mine related drawdown is not

expected to result in a measurable effect to flows in Thacker or Crowley Creeks and the resulting conditions at the Thacker Creek Pond.

4.17.3.3 Alternative C (No Pit Backfill)

Project hydrology model simulations predict that drawdown would result in a small reduction (i.e., approximately 7 percent) in baseflow in Thacker Creek; and a negligible reduction (approximately 1 percent) in Crowley Creek. The predicted reduction in baseflow for Thacker Creek (compared to the Proposed Action) is attributable to the increased sustained residual drawdown in the post mining period resulting from the increased evaporation of groundwater from the pit lakes that would develop under the No Backfill alternative. In summary, post-closure drawdown is expected to result in a small reduction (approximately 7 percent) in baseflows in Thacker Creek and therefore Thacker Creek Pond. These baseflow reductions are not predicted to recover to pre-mining conditions during the post-mining period.

4.17.3.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations. Potential effects to recreation resources under Alternative D would be related to the reclamation of existing disturbance under previous authorizations.

4.17.4 Mitigation Measures

No mitigation measures are proposed based on the potential effects of the proposed Project.

4.17.5 Residual Effects

Residual effects would be the same as those discussed in sections 4.17.1, 4.17.2, and 4.17.3 above.

4.18 NATIVE AMERICAN RELIGIOUS CONCERNS

4.18.1 Issues – Ground Disturbance and Project Infrastructure

Consultations regarding historic properties and locations of Native American Religious Concern were conducted by the BLM via mail and personal correspondence in 2018 and 2019 pursuant to the National Historic Preservation Act (NHPA) and implementing regulations at 36 CFR 800 in compliance and accordance with the BLM-SHPO 2014 State Protocol Agreement. The BLM coordinates NEPA and NHPA Section 106 compliance by using the NEPA scoping process to partially fulfill NHPA public notification requirements to seek input from the public and other consulting parties on the Project and its effects on historic properties.

To date, government-to-government consultation between the BLM and representatives from the Fort McDermitt Paiute and Shoshone Tribe, Summit Lake Paiute Tribe, and Winnemucca Indian Colony have not raised any concerns about specific traditional areas, sacred sites, or ceremonial areas or activities in the Project area.

USFWS Consultation and Coordination with Tribal Governments

Tribal participation is an integral part of the NEPA process, as well as a key component of determining whether to issue an EITP. In accordance with Executive Order 13175 and USFWS Native American Policy, the USFWS will consult with Native American tribal governments whenever our actions taken under authority of the Eagle Act may affect tribal lands, resources, or the ability to self-govern or affect their cultural practices. This consultation process is also intended to ensure compliance with the National Historic Preservation Act and American Indian Religious Freedom Act. The effects of issuing a permit for disturbance take of one breeding Golden Eagle pair at the Thacker Lithium Mine project site would be minor and local in scale.

4.18.1.1 Alternative A (Proposed Action – Preferred Alternative)

Under Alternative A, the Proposed Action does not have the potential to directly or indirectly affect any resources of Native American religious importance. The BLM's government-to-government consultation with potentially affected tribal organizations, outlined in Section 4.18.1, did not reveal any significant religious, spiritual, or scared locations in the area.

4.18.1.2 Alternative B (Partial Pit Backfill)

Under Alternative B, the effects to Native American Religious Concerns would remain the same as described for Alternative A (Proposed Action).

4.18.1.3 Alternative C (No Pit Backfill)

Under Alternative C, the effects to Native American Religious Concerns would remain the same as described for Alternative A (Proposed Action).

4.18.1.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed. Reclamation of existing disturbance would be completed according to previous authorizations. Potential effects to Native American Religious Concerns under Alternative D would be related to the reclamation of existing disturbance under previous authorizations.

4.18.2 Mitigation Measures

No mitigation measures are proposed based on the potential effects of the proposed Project as presented in 4.20.1.1.1 above.

4.18.3 Residual Effects

As discussed in Section 4.18.1.1 above, the proposed Project would not affect any locations of religious importance; therefore, no residual effects to Native American Religious Concerns are expected.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Section 102(2)(C) of NEPA and Section 1502.16 of the CEQ regulations for implementing NEPA require that the discussion of environmental consequences include a description of ". . . any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented."

Approximately 5,695 acres would be disturbed with irreversible effects on soils through mixing, compaction, and movement to different locations. The 5,695 acres of surface disturbance could have irretrievable and possibly irreversible effects on vegetation, wildlife habitat, and livestock grazing, and visual resources if reclamation proved to be unsuccessful.

The Proposed Action would include concurrent reclamation of open pit disturbance starting in mine year six and complete reclamation of mine facilities and disturbance at the end of mining. Selected access roads intended for post-mining monitoring and access to closure stormwater diversion structures would remain as post-mining facilities.

Geologic mineral resource features under the WRSFs, CTFS, and reclaimed open pit would be lost for the duration of mining and could be lost permanently after mining and reclamation are complete.

Effects to groundwater levels resulting from pumping and evaporation are anticipated to persist into the foreseeable future under the Proposed Action and other action alternatives. Groundwater modeling used to predict potential effects to water quality and quantity indicate that groundwater effects may persist for up to 300 years.

4.20 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Section 102(C) of NEPA requires a discussion of the relationship between local, short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources. "Short-term" begins and ends within the first 5 years after the action is implemented; "long-term" lasts beyond 5 years to the end of or beyond a 50-year project horizon.

The Proposed Action would directly affect 5,695 acres through construction and operation of the mine and exploration activity. These effects would reduce the long-term productivity of soils and change the vegetation communities after reclamation is complete. The altered vegetation communities would affect wildlife movement and foraging habits, including migratory bird and special status species and livestock grazing patterns.

CHAPTER 5. CUMULATIVE EFFECTS

5.1 INTRODUCTION

This section summarizes cumulative effects from past, present, and reasonably foreseeable future actions (RFFAs) for the Proposed Action and forms the basis for the discussion of cumulative effects. Cumulative effects under NEPA are defined by the CEQ as:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time"
>
> (40 Code of Federal Regulations 1508.7).

Table 5.1 presents information regarding resource CESAs.

Table 5.1. Cumulative Effects Study Areas by Resource

Resource	CESA Description	CESA Name	Size of CESA (acres)
Geology and Minerals	Project area	Geology CESA	17,933
Water Resources	Effect Model Domain	Groundwater CESA	288,501
	Quinn River and Kings River Valley hydrographic basins	Surface Water CESA	596,480
Vegetation and Wetlands	Quinn River and Kings River Valley hydrographic basins	Vegetation CESA	596,480
General Wildlife	NDOW Hunt Unit 031	Recreation CESA	86,104
Special Status Species – GRSG	Lone Willow PMU	GRSG CESA	480,106
Special Status Species – Eagles	Project area and a 10-mile buffer	Eagle CESA	218,391
Special Status Species – LCT	Quinn River and Kings River Valley hydrographic basins	LCT CESA	596,480
Soils	Project area	Soils CESA	17,933
Non-native and Invasive Plants	Humboldt County	Noxious Weed CESA	6,181,120
Rangeland Management	Grazing allotments overlapping the Project area	Range CESA	164,159
Air Quality and Greenhouse Gas Emissions	The airshed or a 100-kilometer radius of the Proposed Action	Air CESA	2,436,602
Cultural Resources	Double H/Whitehorse Obsidian Procurement District	Cultural CESA	68,000
Social and Economic Conditions	Humboldt County	Socioeconomics CESA	6,181,120
Environmental Justice	Humboldt County	EJ CESA	6,181,120
Lands and Realty	Project area and major transportation routes	Realty CESA	17,933
Noise	Project area plus a 10-mile buffer	Noise CESA	19,305
Visual Resources	Project area plus a 30-mile buffer	Visual CESA	1,808,640

Resource	CESA Description	CESA Name	Size of CESA (acres)
Wastes, Hazardous and Solid	Project area and major transportation routes	Wastes CESA	17,933
Recreation	NDOW Hunt Unit 031	Recreation CESA	86,104
Native American Religious Concerns	Humboldt County	Tribal CESA	6,181,120

CESA = Cumulative Effects Study Area; NDOW = Nevada Department of Wildlife

Relevant projects and actions are defined for the EIS as those past, present, and RFFAs that could interact with the Proposed Action or alternatives in a manner that would result in cumulative effects, resulting primarily from mining, commercial activities, and public uses.

Past and Present Actions

Past and present development projects and other actions within Humboldt County include historic and ongoing activities including mining, grazing, agriculture, recreation, and other commercial activities. Past and present actions that are unplanned but have occurred include occurrence of natural and human-caused wildfires. Past and present projects and actions are identified for those specific actions for which effects upon the natural environment would contribute incrementally to effects from the Proposed Action or action alternatives and are considered in the cumulative effects analysis are described in **Table 5.2**.

Table 5.2. Surface Disturbance Associated with Past and Present Actions and RFFAs within the Resource CESAs

Action	Past and Present Disturbance (acres)	Projected RFFA Disturbance (acres)	Total Disturbance (acres)
Mines and Quarries			
National Mine Exploration Project[1]	-	200	200
Moonlight Uranium Mine	14.6	-	14.6
Kings Valley Clay Mine	50.5	-	50.5
Sand and Gravel Operations	24	-	24
Utilities and Infrastructure			
Roads	12,485	-	12,485
Railroads	1,479	-	1,479
Communication Sites	249	-	249
Transmission Lines	4,209	-	4,209
Other			
Wildfires	22,459	-	22,459
Total	**40,970**	**200**	**41,170**

Sources: BLM 2019; Tiger 2017

[1] The National Exploration Project is a mineral development project occurring on private, USFS, and BLM lands in northern Humboldt County.

Reasonably Foreseeable Future Actions

RFFAs for the Thacker Pass Lithium Mine EIS cumulative effects analysis include other projects or actions that potentially affect those resources that would be affected by the Proposed Action during the same period of time (including final reclamation). RFFAs for which disturbance acreages can be quantified are presented in **Table 5.2** and RFFAs for which disturbance acreages are unknown are described below. RFFAs identified in this section must also have been determined by the BLM as having a reasonable likelihood of moving forward towards development and to be located within the boundaries of the various CESAs for the Proposed Action.

Other development predicted in the Winnemucca District Resource Management Plan that could contribute to cumulative effects includes renewable energy facilities, utility and road rights of way, vegetation treatments and hazardous fuels reduction, spread and invasion of noxious weeds, continued changes and possible intensification to Nevada's climate in association with global climate change, and increasing wildfire occurrence and intensity.

5.2 GEOLOGY AND MINERALS

5.2.1 Alternative A (Proposed Action – Preferred Alternative)

The CESA for geology and minerals includes the southern portion of the McDermitt Caldera and adjacent areas of Kings Valley and Quinn River Valley as shown in **Figure 4.2-1 (Appendix A)** (approximately 135,051 acres). Within this CESA, past and present disturbance, has resulted from localized mineral development and exploration activities and roads and utilities. Mining activities and sand and gravel operations typically have the largest impacts on geology and mineral resources because they contribute to mineral resource depletion, removal of mineral resources from availability for development. Surface mining activity can also affect geology and mineral resources by excavating, modifying, or covering natural topographic and geomorphic features, Disturbance associated with roads and utilities typically conform to the local topography and have negligible impacts to geology and mineral resources.

For the purpose of this evaluation, "geologic disturbance" is defined to include mine components such as open pits (that are not backfilled), waste rock areas, stockpiles, and tailings facilities that would permanently alter the natural topographic and geomorphic features in the area, even if reclaimed, and unreclaimed historic mine disturbance area (including abandoned mine lands). Surface disturbance associated with other mine components such as process plants, storm water ponds, access roads, pipelines, water wells associated with active mines would be reclaimed at closure and would not likely result in the permanent alteration of the topography of the area. In addition, surface disturbance associated with utilities and road construction and maintenance, community development, and wildfires is not considered to result in geologic disturbance.

Geologic disturbance of past, present and currently authorized mining activities within the CESA has occurred at the Moonlight Uranium Mine (approximately 15 acres); sand and gravel pits (approximately 24 acres); and the Kings Valley Clay Mine (approximately 76 acres). The Moonlight Uranium Mine is located approximately 5-miles northwest of the Thacker Pass Lithium

Mine Project (**Figure 4.2-1, Appendix A**) was discovered and had minor production in the 1950s. Primary disturbance associated with the mine consists of waste rock dumps and ore stockpiles. Unconsolidated basin fill type materials located in Kings Valley and the Quinn River Valley have been mined at authorized quarries as a source of sand and gravel for road construction (**Figure 4.2-1, Appendix A**). The Kings Valley Clay Mine is located within the Mine Plan boundary for the Project included authorization for 2 small open pits, 2 waste rock disposal area, and an ore stockpile (approximately 76 acres). The estimated cumulative geologic disturbance for the existing and currently permitted and authorized mining activities in the cumulative impact analysis area is approximately 115 acres. The 115 acres represents approximately 0.1 percent of the total area within the CESA.

Under the Proposed Action, the estimated cumulative geologic disturbance for the cumulative impact analysis area would increase to approximately 1,821 acres that includes: (1) the Proposed Action (1,782 acres); (2) other historical and permitted mine disturbance in the CESA (39 acres). The facility footprint for the Proposed Action would occupy (i.e., cover) the existing and previously authorized open pit, waste rock and ore stockpile facilities associated with the Kings Valley Clay Mine. The 1,821 acres of cumulative geologic disturbance represents approximately 1.4 percent of the total area within the CESA.

5.2.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to geology and mineral resources associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.2.3 Alternative C (No Pit Backfill)

Cumulative impacts to geology and mineral resources from the No Backfill alternative would increase compared to the Proposed Action. Under the No Backfill alternative, the estimated cumulative geologic disturbance for the cumulative impact analysis area would increase to approximately 3,403 acres that includes: (1) the No Backfill Alternative (3,364 acres), which includes the open pit and expansion of the East WRSF; (2) other historical and permitted mine disturbance in the CESA (39 acres). The total of 3,403 acres of cumulative geologic disturbance represents approximately 2.5 percent of the total area within the CESA.

5.2.4 Alternative D (No Action Alternative)

Implementation of the No Action Alternative would not result in any change in cumulative impacts to geology and mineral resources.

5.3 WATER RESOURCES

The CESA for water quantity and water quality includes the Project area and large portions of the Kings River Valley and Quinn River Valley Hydrographic Basins (HAs) that were included in the numerical groundwater flow model developed for the project (Figure 3.1, Piteau 2019b included in **Appendix P** in this EIS). Of the 596,480 acres covered by the CESA, 22,489 acres of disturbance

are associated with past, present, and RFFAs, which is a disturbance of approximately 3.7 percent of the CESA.

5.3.1 Alternative A (Proposed Action – Preferred Alternative)

Kings River Valley and Quinn River Valley are both designated basins that have fully allocated water rights, with estimated perennial yields of 17,000 afy and 60,000 afy respectively. The water demands for the project would be provided from the Quinn Production Well located in the Quinn River Valley HA. The projected water demand for the project is 2,600 acre-feet/year for the first 4 years; and 5,200 acre-feet/year for the remainder of the project. The average water supply required by the mine after year 4 (i.e., 5,200 acre-feet/year) represents approximately 9 percent of the total estimated perennial yield for the Quinn River Valley HA. The water right for pumping the Quinn Production Well would be provided by transferring existing water rights (i.e., changing manner of use from agricultural to mining and milling); and, therefore, would not increase the amount of groundwater withdrawal from the Quinn River Valley HA over existing conditions.

Impacts to surface water resources would involve removal of one ephemeral surface water feature (i.e., stock pond). The projected drawdown is not expected to impact any perennial springs or water rights. The Proposed Action in combination with the past, present, and RFFAs is anticipated to have minor to negligible, long-term cumulative effect to watersheds in the CESA.

5.3.2 Alternative B (Partial Pit Backfill)

Cumulative impacts to water resources from the Partial Pit Backfill alternative in combination with the past, present and RFFAs would be essentially the same as those identified for the Proposed Action. Model simulations estimate that the long-term evaporative losses from the seasonal wetland pond would be approximately 60.2 gpm (97.1 acre-feet/year). The long-term groundwater inflow to the wetland that would be lost by evaporation represents 0.13 percent of the estimated perennial yield of groundwater available from the King River Valley and Quinn River Valley HAs. LNC would be required by NDWR to secure a senior water right to offset evaporative losses from the seasonal wetland pond. Hence, regional long-term impact to the available groundwater in the basin(s) associated with the seasonal wetland pond would be negligible.

5.3.3 Alternative C (No Pit Backfill)

Cumulative impacts to water resources from the No Pit Backfill alternative in combination with the past, present and RFFAs would be essentially the same as those identified for the Proposed Action with the following exceptions.

The maximum areal extent of the 10-foot drawdown contour under the No Pit Backfill scenario is predicted to encompasses a larger area that predicted under both the Proposed Action (Alternative A) and Partial Pit Backfill (Alternative B) scenarios (**Figure 4.3-21, Appendix A**). The larger post-closure drawdown area is predicted to result in a small reduction (approximately 8 percent) in baseflow to Thacker Creek; and could impact baseflow in one perennial spring (SP-033) and one developed spring (SP-008) located within the maximum extent of the 10-foot drawdown contour.

There are also 14 perennial springs located outside of, but within one mile of, the maximum extent of the projected 10-foot groundwater drawdown contour (**Table 4.2**). Springs with baseflow impacted by the expansion of the drawdown area during the post-closure period would not likely recover for the foreseeable future. Reductions in baseflows would adversely affect various wildlife and special status species including migratory birds and bats. Livestock may also be adversely affected by groundwater drawdown that reduces surface flow at springs and seeps.

The No Pit Backfill alternative would result in the development of three pit lakes at closure that would persist for the foreseeable future. The North and West Pit Lakes are predicted to be flow through systems with all discharge from the North Pit Lake, and most of the discharge from the West Pit Lake being captured by the South Pit Lake. The South Pit Lake is predicted to behave as a hydraulic sink. The pit water quality from the No Pit Backfill Alternative would not impact groundwater quality within the CESA, therefore the No Pit Backfill Alternative combined with past, present, and RFFAs is not anticipated to add to cumulative impacts to groundwater quality within the CESA.

After the pit lakes are fully developed, the pit lake volume and surface area would be sustained by groundwater inflow into the pit. Model simulations estimate that the long-term evaporative losses from the pit lakes would be approximately 134 gpm (216 acre-feet/year). The long-term groundwater inflow to the pits that would be lost by evaporation represents 0.28 percent of the estimated perennial yield of groundwater available from the King River Valley and Quinn River Valley HAs. This groundwater withdrawal required for post-closure under the No Pit Backfill alternative compared with the perennial yield indicates that the regional, long-term impact to the available groundwater in the basin associated with the pit lakes would be negligible. LNC would be required by NDWR to secure a senior water right to offset pit lake evaporative losses.

5.3.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the proposed Project would not be developed, and impacts to water resources associated with the Proposed Action would not occur.

5.4 VEGETATION AND WETLANDS

5.4.1 Alternative A (Proposed Action – Preferred Alternative)

Vegetation

The CESA for vegetation and wetland resources includes the Project area and large portions of the Kings River Valley and Quinn River Valley Hydrographic Basins. Predominant native vegetation communities that occur in the CESA include big sagebrush shrubland and steppe, grassland, greasewood shrubland, salt desert scrub, low sagebrush shrubland and steppe, and pinyon-juniper woodland. Past, present, and RFFAs in the vegetation CESA have resulted, or would result, in approximately 289.1 acres of mine-and mineral exploration-related disturbance for locatable and salable minerals and includes 24 acres attributed to sand and gravel mining operations. Past, present, and RFFAs from utility and energy development and have resulted, or would result, in up

to 1,209 acres of additional disturbance. The Proposed Action including exploration within the Project area would incrementally increase disturbance by an additional 5,694.8 acres for a total cumulative disturbance of 7,192.9 acres. This disturbance represents approximately 1.2 percent of the total past, present, and RFFAs disturbance. Reclamation of mine related disturbances at past and existing operations within the CESA is ongoing and would continue until deemed satisfactory by the regulating agency which may include the United States Forest Service, BLM, and NDEP-BMRR. The incremental additional impacts to vegetation as a result of the proposed project would be temporary in nature for the majority of the project disturbance area.

Other surface disturbing activities in the CESA that contribute to cumulative effects of vegetation resources include the establishment and spread of noxious weeds and non-native invasive plant species, livestock grazing, and wildfires. Cumulative losses for vegetation resources potentially would include the reduction of native ecosystem functions such as soil stability, erosion control, livestock and wildlife forage, and wildlife habitat. The removal of woody species from these areas would result in a long-term change in vegetation structure since it may take up to 15 to 25 years for shrub species of similar stature to become re-established in these areas. Indirect impacts to vegetation resources associated with surface disturbance activities would include fugitive dust accumulation, and introduction and spread of noxious weeds or non-native invasive plant species. Fugitive dust from development activities can adversely impact native vegetation communities and alter vegetative composition. The cumulative effects of noxious weeds and non-native invasive plant species are discussed in Section 6.7, *Non-native and Invasive Plants*.

Plant communities in reclaimed areas may not exactly replicate pre-disturbance plant communities, and successful reclamation would be difficult in areas with high reclamation restraints, such as low reclamation potential soils. However, conduction of reclamation activities according to the Thacker Pass Project – Plan of Operations and Reclamation Plan would increase the potential for disturbed areas to meet reclamation success standards and contribute less to the cumulative effects on vegetation resources.

Wetland and Riparian Areas

Surface disturbing activities in the CESA that have resulted, or would result, in cumulative effects to riparian zones and wetland areas include wildfires, mining operations, utility and energy development, livestock grazing and agricultural activities. These activities may result in the temporary or permanent loss of riparian and wetland vegetation. Wildfires have had varying impacts on riparian and wetland habitats, depending on the condition and moisture levels of the riparian zone prior to the wildfire. Grazing has affected and would continue to affect riparian zones and wetland areas to varying degrees. Depending on the level of management, livestock grazing may have minimal to extensive impacts on riparian vegetation. Grazing in the annual hot season, combined with the establishment of noxious weeds and non-native invasive plant species has an increased potential for impacts to riparian and wetland resources through loss of habitat and decrease and/or loss of vegetation.

Over the last several decades, riparian zones have generally improved throughout portions of the study area in response to changes in livestock management. As the need and opportunity for

further grazing management changes are identified and implemented, riparian zones are expected to continue to improve.

Direct loss of wetland and riparian areas in the Project area from surface-disturbing activities would be very limited due to adherence to the Thacker Pass Project – Plan of Operations and Reclamation Plan along with resource protection measures and other laws, ordinances, regulations, and standards that protect wetlands. If effects on wetland and riparian areas are determined to be unavoidable based on site-specific analysis, effects would be quantified through the Section 404 permit process and mitigated through enhancement, restoration, or replacement.

5.4.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to vegetation and wetland resources associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.4.3 Alternative C (No Pit Backfill)

Potential cumulative effects to vegetation and wetland resources associated with the No Pit Backfill alternative would increase by 482 acres in comparison the Proposed Action as a result of the increased East WRDF footprint.

5.4.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the Project and there would be no effects to vegetation, wetlands, or riparian areas from the proposed project to cumulatively add to other past and present projects or RFFAs within the vegetation CESA.

5.5 WILDLIFE AND SPECIAL STATUS SPECIES

5.5.1 Alternative A (Proposed Action – Preferred Alternative)

Past, present, and RFFAs in the wildlife and special status species CESA have resulted, or would result, in approximately 289.1 acres of mine-and mineral exploration-related disturbance for locatable and salable minerals and includes 24 acres attributed to sand and gravel mining operations. Past, present, and RFFAs from utility and energy development and have resulted, or would result, in up to 1,209 acres of additional disturbance. The Proposed Action including exploration within the Project area would incrementally increase disturbance by an additional 5,694.8 acres for a total cumulative disturbance of 7,192.9 acres. It is assumed that portions of past mine-related disturbances in the CESA have been reclaimed, and ongoing reclamation at existing operations would continue. The incremental additional impacts to habitat as a result of the proposed project would be temporary in nature for the majority of the project disturbance area. These effects to wildlife, special status species and their habitat would remain until successful completion of final reclamation and closure of the mine.

Golden Eagles

The geographic extent of the analysis of cumulative impacts to Golden Eagles is within a 175-kilometer (109-mile) radius surrounding the project, which represents the average natal dispersal distance of Golden Eagles, or Local Area Population (LAP; USFWS 2016a). In order to issue an EITP, cumulative authorized take must not exceed five percent of a LAP unless the USFWS can demonstrate why allowing take to exceed that limit is still compatible with the preservation of eagles. The Eagle Act permit regulations require the USFWS to conduct an individual LAP analysis for each permit application as part of the application review. The LAP of the proposed project is 787 Golden Eagles; the five percent threshold is 39.4.

There is incomplete information available regarding the level of unpermitted Golden Eagle take in the region; thus, Golden Eagle take in the past, present, and foreseeable future is not fully known. Over the past 20 years the USFWS knows of 257 Golden Eagles killed by a variety of causes (**Appendix Q**). This is approximately 12.85 Golden Eagles killed per year in the LAP.

In addition to the estimated unauthorized take, **Appendix Q** describes the amount of previously-authorized take that overlaps with the LAP (0.36 Golden Eagles/year. The loss of productivity authorized by permit (if issued) would be an additional 0.59 eagles per year for a maximum of five years. This would be fully offset by the compensatory mitigation that would be provided by the permit holder. Cumulatively, this totals 13.8 Golden Eagles/year, which is well below the five percent threshold.

5.5.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to wildlife and special status species resources including Golden Eagles, associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.5.3 Alternative C (No Pit Backfill)

Potential cumulative effects to wildlife and special status species resources including Golden Eagles, associated with the No Pit Backfill alternative would increase by 482 acres in comparison the Proposed Action as a result of the increased East WRDF footprint.

Under alternative C if the permit is issued, loss of eagle productivity would be fully offset with required compensatory mitigation annually at a ratio of 1:1 by retrofits of power-poles at high-risk for electrocution of eagles within the Eagle Management Unit. In addition, compensatory mitigation would be required of the permit holder (if the permit is issued) for an experimental mitigation effort, at a ratio of 0.2:1, such as experimental treatment of nestling parasites while the young eagles are in a nest and are not capable of flight.

5.5.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the Project and there would be no incremental addition of cumulative effects to wildlife, special status species or their habitat other than those related to the reclamation of existing disturbance under previous authorizations.

5.6 SOILS

5.6.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions have resulted, or would result, in approximately 40,881 acres of disturbance within the soil resources CESA. The total quantifiable surface disturbances are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the soil resources CESA include, but are not limited to, mineral exploration, fuels reduction and vegetation treatments (acreage unknown), and livestock grazing leases (acreage unknown). Alternative A would contribute to the cumulative effect on soil through disturbance of approximately 5,695 acres in the proposed mine area, as well as harvesting of a corresponding area of growth media for reclamation activities.

5.6.2 Alternative B (Partial Pit Backfill)

As under Alternative A, Alternative B would contribute to the cumulative effect on soil through disturbance of approximately 5,695 acres in the proposed mine area, as well as harvesting of a corresponding area of growth media for reclamation activities.

5.6.3 Alternative C (No Pit Backfill)

As under Alternative A, Alternative B would contribute to the cumulative effect on soil through disturbance of approximately 6,177 acres in the proposed mine area. However, Alternative C would make a greater contribution to the cumulative effect on soils because this alternative would require additional growth media.

5.6.4 Alternative D (No Action Alternative)

Under the No Action Alternative, no mining activities would be conducted. Current land uses of grazing, recreation, and mineral exploration would continue. These activities would disturb soils minimally.

5.7 NON-NATIVE AND INVASIVE PLANTS

5.7.1 Alternative A (Proposed Action – Preferred Alternative)

Past, present, and RFFAs in the CESA have resulted, or would result, in approximately 289.1 acres of mine and exploration related surface disturbance, including 24 acres of sand and gravel mining operations. Past, present, and RFFAs from utility and energy development have resulted, or would result, in up to 1,209 acres of additional disturbance. The Proposed Action including exploration within the Project area would incrementally increase disturbance by an additional 5,694.8 acres for a total cumulative disturbance of 7,192.9 acres. This disturbance represents approximately 0.01 percent of the total past, present, and RFFAs disturbance. Noxious weeds and non-native invasive plant species currently exist in the CESA. Surface disturbance activities from implementation of the proposed project as well as other future projects could further spread noxious weeds and non-native invasive plant species into previously undisturbed areas, and may

increase the acreage and population numbers of already established noxious weeds and non-native invasive plant species populations. Other surface disturbing activities in the CESA that contribute to the cumulative spread of noxious weeds and non-native invasive plant species include livestock grazing, wildfire, all-terrain vehicles, wildlife and recreation use.

It is predicted that the cumulative impacts to noxious weeds and non-native invasive plant species in the CESA from past, present, and RFFAs would result in the probable introduction of new noxious weed and non-native invasive plant species in addition to the increased spread of these species into disturbed areas created from surface disturbances associated with grazing, wildfires, recreational use and the development of mining projects and utility corridors. Linear surface disturbances such as utility corridors, roads, and trails provide corridors for further introduction and spread of noxious weeds and non-native invasive plant species (Gelbard and Belnap 2003; Watkins et al. 2003). These networks of corridors can then serve as a source of propagules (D'Antonio et al. 2001) for noxious weeds and non-native invasive plant species to spread into adjacent undisturbed areas.

5.7.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to the spread of non-native and invasive plants associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.7.3 Alternative C (No Pit Backfill)

Potential cumulative effects to the spread of non-native and invasive plants associated with the No Pit Backfill alternative would increase by 482 acres in comparison the Proposed Action as a result of the increased East WRDF footprint.

5.7.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the proposed Project and there would be no change in the potential for noxious weeds and non-native invasive plants to colonize and establish new populations beyond the current rate of infestation resulting from past and present projects and other RFFA within Humboldt County would remain unchanged.

5.8 RANGELAND MANAGEMENT

5.8.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions have resulted, or would result, in approximately 40,881 acres of disturbance within the range resources CESA. The total quantifiable surface disturbances are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the range resources CESA include, but are not limited to, mineral exploration, fuels reduction and vegetation treatments (acreage unknown), and livestock grazing leases (acreage unknown).

5.8.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to rangeland resources associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.8.3 Alternative C (No Pit Backfill)

Potential cumulative effects to vegetation and wetland resources associated with the No Pit Backfill alternative would be approximately the same as the Proposed Action. Although surface disturbance under Alternative C would increase by 482 acres in comparison to the Proposed Action, the total number of AUMS lost would be the same due to exclusion fencing around the Project area.

5.8.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve the proposed Project and there would be no change in livestock grazing allotments within the Project area. The potential for noxious weeds and non-native invasive plants to colonize and establish new populations beyond the current rate of infestation resulting from past and present projects and other RFFA within Humboldt County would remain unchanged.

5.9 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

5.9.1 Alternative A (Proposed Action – Preferred Alternative)

As discussed in Section 5.1, past and present development projects and other actions within Humboldt County include historic and ongoing activities such as mining, grazing, agriculture, recreation, other commercial activities, industrial processes, electric power generation, and wildfire occurrence.

Table 5.3 shows the estimated emissions from all sources in Humboldt County for 2017 which is the most recent year for which complete data are available. The table provides an indication of the levels of total emissions from present actions (including continuing impacts from past actions) that potentially could contribute to cumulative air quality impacts.

Table 5.3 Estimated Emissions in Humboldt County for 2017

Sector	Emissions (tons per year)					
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Fuel Combustion – Electric Utilities	575	1,224	46	25	1,588	28
Fuel Combustion – Industrial	49	226	12	9	8	3
Fuel Combustion – Other	88	22	11	11	0.4	14
Highway Vehicles	2,863	754	33	21	2	265
Metals Processing	141	1	81	66	102	0.02
Miscellaneous	5,145	128	5,533	1,337	56	1,343
Off-Highway Mobile	1,090	913	51	49	1	119
Other Industrial Processes	7	0.2	6,564	842	0.001	88
Petroleum & Related Industries	1	1	0.5	0.1	0.1	0.3
Solvent Utilization	0.3	0.3	0.3	0.3	0.3	306
Petroleum/Fuels Storage & Transport	306	306	4	2	2	114
Waste Disposal & Recycling	44	2	12	11	0.5	3
Total	**10,309**	**3,576**	**12,348**	**2,375**	**1,761**	**2,284**

Source: EPA 2020x

These emissions disperse in the atmosphere throughout the CESA and beyond. The resulting pollutant concentrations are reflected in the measured ambient data which support the background concentrations used in the analysis (Section 4.9.1.1 and Appendix K.). Accordingly, the air quality effects of these past and present activities are considered to be captured in the background concentrations.

The potential air quality effects of RFFA projects and actions cannot be known in detail. However, current trends in development, including the roles of agriculture, mining, and tourism as the mainstay of the region's economy, are expected to continue. Economic and population growth in the region would tend to increase future emissions while the effectiveness of emission controls, which under current and likely future regulatory requirements is expected to improve over time, would tend to decrease future emissions. The projected RFFA do not include very large facilities or projects that would result in substantial changes in county-wide emissions. Rather, the projected RFFA indicate that future conditions would be similar to current conditions, which suggests that the projected RFFA are not expected to change the background concentrations substantially. The analysis of direct and indirect impacts has demonstrated that the impacts of the project, when added to the background concentrations, would be less than the NAAQS (**Table 4.12**). Therefore, no exceedances of the NAAQS or Nevada standards are expected after accounting for past and present actions and RFFAs, and accordingly no substantial cumulative air quality effects are expected due to human activity.

Wildfires, if sufficiently intense and widespread, can generate emissions that can affect local air quality, despite firefighting efforts. Wildfires of this magnitude that could affect the Project area are rare but not unknown, and could lead to elevated cumulative pollutant concentrations, primarily

of particulate matter. Emissions from wildland fires (prescribed burns and wildfires) can vary widely from year to year. Smoke generated during prescribed burns can have temporary impacts on local air quality, but prescribed burns are conducted to prevent much larger impacts from wildfires that otherwise could occur. As an indication of the magnitude of wildland fire emissions, **Table 5.4** presents the estimated wildland fire emissions in Humboldt County for 2017. As with emissions from other sources, the emissions from wildland fires disperse in the atmosphere throughout the CESA and beyond, and contribute to the background concentrations.

Table 5.4 Estimated Emissions from Wildland Fires in Humboldt County for 2017

Wildland Fire Type	Emissions (tons per year)					
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Prescribed	781	10	79	67	6	184
Wildfire	4,687	121	528	447	53	1,122
Total	**5,468**	**131**	**607**	**514**	**59**	**1,306**

Source: EPA 2020y. Wildland fires do not include agricultural fires.

The Project's GHG emissions would largely be compensated for by producing carbon-free electricity through the cogeneration facility onsite. The offset occurs because the GHG emissions that otherwise would be produced by off-site generation of the electricity would be avoided. The current design of the cogeneration facility is estimated to offset GHG emissions by approximately 100,000 tons per year of CO_2 equivalent (CO_2e) in Phase 1 and 200,000 tons per year CO_2e in Phase 2.

5.9.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to air quality associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.9.3 Alternative C (No Pit Backfill)

Potential cumulative effects to air quality associated with the No Pit Backfill alternative would increase slightly in comparison to the Proposed Action due to the required increase of four additional haul trucks. The cumulative increase of emissions under this alternative is anticipated to be negligible.

5.9.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve LNC's proposed Plans of Operation for mining and exploration. Potential emissions and other effects to air quality under Alternative D would be related to the reclamation of existing disturbance under previous authorizations and represent a fraction of cumulative air emissions from other past and present projects, and other RFFA within the air quality CESA.

5.10 CULTURAL RESOURCES

Past, present, and reasonably foreseeable future actions have affected and may continue to affect cultural resources, including those listed in **Table 5.2**.

5.10.1 Alternative A (Proposed Action – Preferred Alternative)

Historic wildfires within Humboldt County and the vicinity of the proposed project have adversely affected historic properties and other cultural resources. Other past and present actions such as historic and modern mineral resource exploration and extraction, recreation, and BLM-authorized activities, may affect historic properties and other cultural resources. There would be a loss or disturbance of integrity at sites that are not protected, changes in setting and access, and vandalism. These actions would negatively affect the NRHP aspects of integrity and potentially the significance of the historic property components.

Effects from reasonably foreseeable future actions could occur in the cultural resources CESA including ongoing mineral resource exploration and extraction, surface erosion resulting from fires and vegetation/fuels reduction, recreation, unauthorized artifact collecting, vandalism, and natural processes.

5.10.2 Alternative B (Partial Pit Backfill)

Under Alternative B, the effects to cultural resources within the Mine Plan area would remain the same as described for Alternative A (Proposed Action).

5.10.3 Alternative C (No Pit Backfill)

Under Alternative C, the effects to cultural resources within the Mine Plan would remain the same as described for Alternative A (Proposed Action).

5.10.4 Alternative D (No Action Alternative)

Under Alternative D, the BLM would not approve LNC's proposed Plans of Operation for mining and exploration. Potential effects to cultural sites under Alternative C would be related to the reclamation of existing disturbance under previous authorizations and would incrementally add to effects from other past and present projects, and other RFFA within the cultural resources CESA.

5.11 SOCIAL AND ECONOMIC CONDITIONS

5.11.1 Alternative A (Proposed Action – Preferred Alternative)

The socioeconomic effect of past and present actions within Humboldt County are reflected in the affected environment described in **Appendix G**. Therefore, any cumulative effects with the assessed action alternatives are reflected in the discussion of environmental consequences in Section 4.11, *Social and Economic Conditions*. The discussion below focuses on RFFAs.

As previously discussed, there are two main drivers of socioeconomic impacts associated with the Proposed Action and alternatives: a) increased employment, local expenditures and production; and b) reduced availability of public lands for other uses. RFFAs that would have a cumulative effect on local employment, expenditures and production include mining operations, exploration activities, livestock grazing and agriculture, geothermal leasing and utility and infrastructure development.

Mining employment is expected to decline in northern Nevada through 2025 based on the projections for existing major hardrock mines (BLM 2012). Development of the Proposed Action would be expected to help offset some projected reduction in mining employment from other mines. Development or expansion of other nearby smaller exploration properties or mines also may add to local mining employment and help offset the projected decline in mining employment depending on market conditions.

The Proposed Action would involve the construction and operation of a new lithium mine, lithium processing plant, and sulfuric acid manufacturing plant in Humboldt County, each of which would provide critical economic opportunities in the region. These direct effects have a multiplier effect across the economy, affecting indirect and induced industries such as government, retail, and construction support. It is important to note that economic benefits are subject to change over time due to factors such as commodity prices and restrictions.

The activity of the mine, both in the past, present, and potentially the future, has important social and economic effects within the county. Humboldt County has built its economy around agriculture, mining, and tourism. These industries provide direct wages for residents in the region. They also support a portion of the county's tax base in terms of direct, property, and sales taxes. Each of these activities stimulates activity in supply chain industries as well as industries affected by induced effects, such as accommodation and food service industries. In particular, recreation and tourism are important sources of disposable income, intensifying the multiplier effect of economic benefits in the area.

The construction and operation of the lithium mine, lithium processing plant, and sulfuric acid manufacturing plant are associated with spending across the economy. The construction of these facilities creates short-term spending and jobs, while operations activity creates longer lasting impacts. Other activities, such as rangeland management, recreation/tourism, and expansion of other mines in Humboldt County would also be expected to continue to contribute to the local economy. Alternatively, the loss of AUMs resulting from mine development and operation would adversely affect income recognized by affected grazing permittees.

The Proposed Action would result in beneficial cumulative effects to the regional economy. Based on the current Proposed Action plan, the socioeconomic effects are not expected to result in shortages in housing, labor, or a significant increase in demand on public services as well as public revenue.

5.11.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to social and economic conditions associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.11.3 Alternative C (No Pit Backfill)

Potential cumulative effects to social and economic conditions associated with the No Pit Backfill alternative would be approximately the same as the Proposed Action with the exception of the additional capital investment of approximately 343.7 million dollars for additional haulage equipment purchase, operation and maintenance to address haulage of waste rock material.

5.11.4 Alternative D (No Action Alternative)

Under the No Action Alternative, existing effects to population, employment, housing, public services, and fiscal conditions would continue at the current rate within Humboldt County.

5.12 ENVIRONMENTAL JUSTICE

5.12.1 Alternative A (Proposed Action – Preferred Alternative)

The environmental justice analysis did not identify any disproportionate effects from the Proposed Action. Consequently, no cumulative environmental justice effects are anticipated as result of the Proposed Action or alternatives.

5.12.2 Alternative D (No Action Alternative)

Under the No Action Alternative, any existing disproportionate effects resulting from other past and present actions and RFFAs would continue at the current rate within Humboldt County.

5.13 LANDS AND REALTY

5.13.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions have resulted, or would result, in approximately 40,881 acres of past and present disturbance within the Lands and Realty CESA. The total quantifiable surface disturbances are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the Lands and Realty CESA include, but are not limited to, mineral exploration, fuels reduction and vegetation treatments (acreage unknown), and livestock grazing leases (acreage unknown).

5.13.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to lands and realty authorizations associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.13.3 Alternative C (No Pit Backfill)

Potential cumulative effects to lands and realty authorizations associated with the No Pit Backfill alternative would be approximately the same as the Proposed Action.

5.13.4 Alternative D (No Action Alternative)

Under the No Action Alternative, the BLM would not approve the proposed Project and there would be no effects to existing land use or realty authorizations that would cumulatively add to effects from past and present actions or other RFFAs.

5.14 NOISE

5.14.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions or activities within the noise CESA contributing to cumulative effects to sensitive receptors include SR 293 vehicle traffic and noise generated by livestock grazing operations. Noise generated by livestock grazing would be limited to vehicle and equipment operations and is considered to have negligible effect within the Project area. Other noise generating actions and RFFAs related to mineral development are located beyond the noise CESA and are not anticipated to contribute to cumulative noise effects within the proposed Project area.

5.14.2 Alternative B (Partial Pit Backfill)

Cumulative effects under Alternative B would be the same as Alternative A.

5.14.3 Alternative C (No Pit Backfill)

Cumulative effects under Alternative C would be the same as Alternative A.

5.14.4 Alternative D (No Action Alternative)

Under Alternative D, the proposed Project would not be developed, and noise effects would be limited to those related to reclamation of existing exploration disturbance under previous authorizations.

5.15 VISUAL RESOURCES

5.15.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions have resulted, or would result, in approximately 40,881 acres of past and present disturbance within the visual resources CESA. The total quantifiable surface disturbances are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the visual resources CESA include, but are not limited to, mineral exploration, fuels reduction and vegetation treatments (acreage unknown), and livestock grazing leases (acreage unknown). When the incremental effects of Alternative A are added to these other past, present, and reasonably foreseeable future actions, cumulative effects from Alternative A

would contribute to visual changes of the existing landscape character with stronger contrasts than presently occurring.

5.15.2 Alternative B (Partial Pit Backfill)

Cumulative effects on visual resources under Alternative B would be the same as under the Proposed Action.

5.15.3 Alternative C (No Pit Backfill)

Cumulative effects on visual resources under Alternative C would be the same as under the Proposed Action.

5.15.4 Alternative D (No Action Alternative)

Under Alternative D, the proposed Project would not be developed, and any visual effects would be limited to those related to reclamation of existing exploration disturbance under previous authorizations.

5.16 WASTES, HAZARDOUS AND SOLID

5.16.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs within the CESA are limited to potential mineral development, utility and transportation corridor development, livestock grazing operations, and vegetation treatment actions. Of these actions, mineral development and transportation corridors are the most likely to contribute cumulatively to effects to waste management within Humboldt County.

5.16.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to waste management associated with the Partial Pit Backfill alternative would be approximately the same as the Proposed Action.

5.16.3 Alternative C (No Pit Backfill)

Potential cumulative effects to waste management associated with the No Pit Backfill alternative would be approximately the same as the Proposed Action.

5.16.4 Alternative D (No Action Alternative)

Under the No Action Alternative, no mining activities would be conducted, and no solid or hazardous wastes would be generated. No solid waste landfill or hazardous waste landfill capacity would be consumed under the No Action Alternative. Effects associated with other current and foreseeable projects would not be affected under the No Action Alternative.

5.17 RECREATION

5.17.1 Alternative A (Proposed Action – Preferred Alternative)

Past and present actions are related to mining, vegetation treatments, and transportation and utility corridor development. RFFAs within the CESA are limited to potential mineral development, utility and transportation corridor development, and vegetation treatment actions. The proposed Project would draw recreationists towards other areas, placing pressure on other areas of the hunt unit or displacing recreationists who cannot access the hunt unit due to other access routes being suitable only for OHVs.

5.17.2 Alternative B (Partial Pit Backfill)

Potential cumulative effects to recreation associated with the Partial Pit Backfill alternative would be the same as the Proposed Action.

5.17.3 Alternative C (No Pit Backfill)

Potential cumulative effects to recreation associated with the Partial Pit Backfill alternative would be the same as the Proposed Action.

5.17.4 Alternative D (No Action Alternative)

Under the No Action Alternative, no mining activities would be conducted, and there would be no cumulative effects to recreation. Effects associated with other current and foreseeable projects would not be affected under the No Action Alternative.

CHAPTER 6. CONSULTATION AND COORDINATION

This chapter summarizes agency and public consultation and coordination conducted by the BLM, prior to and during the preparation of this EIS.

6.1 PUBLIC PARTICIPATION AND SCOPING

This EIS was prepared in consultation and coordination with various federal, state, and local agencies, organizations, and individuals. Agency consultation and public participation have been accomplished through a variety of formal and informal methods, including scoping meetings, responses to e-mails, meetings with individual public agencies and interest groups. This section summarizes these activities.

In order to identify agency requirements and public concerns related to the proposed project the BLM has conducted a public involvement process that is intended to: (1) broaden the base of available information to support decision making; (2) inform the public about proposed actions and the potential effects resulting from those actions; and (3) ensure that public concerns and needs are understood and addressed by agency decision makers.

The CEQ, through NEPA, requires the BLM to provide opportunities for the public to participate at four specific points in the EIS process: the initial project scoping period, the review and comment period of the Draft EIS, the review of the Final EIS, and the receipt of the Record of Decision (ROD). These opportunities are defined as follows:

- Scoping: The public is provided a 30-day scoping period to disclose potential concerns and issues associated with the Proposed Action. Information obtained by the BLM and other agencies during the public scoping period is combined with issues identified by lead and cooperating agencies. The summarization of these issues forms the scope of the alternatives and analysis in the EIS.
- Draft EIS Comment Period: A minimum 45-day Draft EIS comment period is initiated by the publication of a Notice of Availability (NOA) for the Draft EIS in the Federal Register (FR). Members of the public are encouraged to provide comments on the Draft EIS via email or hardcopy to the address listed in the NOA. These public comments are combined with comments from the lead and cooperating agencies to form the basis for revising the Draft EIS into the Final EIS.
- Final EIS Review: A 30-day Final EIS availability period is initiated by the publication of the NOA for the Final EIS in the FR.
- ROD: Subsequent to the 30-day availability period for the Final EIS, the ROD would be prepared.

6.1.1 Scoping

A Notice of Intent (NOI) to prepare an EIS was published by the BLM in the Federal Register (FR)on January 21, 2020 (FR Volume 85, Number 13). The NOI invited scoping comments to be submitted to the BLM from January 21, 2020, through February 27, 2020.

The BLM hosted public scoping meetings for the Project on February 5, 2020, in Winnemucca, Nevada, and on February 6, 2020, in Orovada, Nevada. Attendees of the public scoping meetings were given an opportunity to learn about the Project and submit comments on the proposed Project.

6.1.2 Public Review of the Draft EIS

The Draft EIS was available for a 45-day public review and comment period from the date the NOA was published in the FR (July 31, 2020 to September 14, 2020). Due the conditions related to the national COVID-19 outbreak, public meetings that would normally be held in Winnemucca and Orovada, Nevada, during the 45-day comment period were held in a virtual online format.

6.2 CONSULTATION AND COORDINATION WITH FEDERAL, STATE, AND LOCAL AGENCIES, AND TRIBES

Issues related to agency consultation and review included mining regulation and reclamation, biological resources, cultural resources and Native American Religious Concerns, socioeconomics, environmental justice, wastes (hazardous and solid), visual resources, air quality, soil resources, noise, and land and water management. The BLM coordinates with the U.S. EPA regarding environmental justice issues. Since the Draft EIS, the BLM has revised the environmental justice information within Appendix G to provide correct information regarding environmental justice populations and refers the reader to that revised information.

Consultations regarding historic properties were conducted by the BLM pursuant to the National Historic Preservation Act and implementing regulations at 36 CFR 800 and in compliance and accordance with the BLM-SHPO 2014 State Protocol Agreement. The BLM coordinates NEPA and NHPA Section 106 compliance by using the NEPA scoping process to partially fulfill NHPA public notification requirements to seek input from the public and other consulting parties on the Project and its effects on historic properties. The BLM continues to comply with Section 106 of the NHPA and NEPA public notification requirements under the Advisory Council on Historic Preservation (ACHP) and CEQ guidance.

The USFWS provided an official list of Threatened and Endangered Species that could potentially occur within the Project area and is a cooperating agency in the development of this EIS. As the state agency with jurisdiction and expertise related to wildlife, NDOW participated as a cooperating agency in discussions regarding wildlife and special status species habitat, reclamation strategy, and other wildlife issues.

Humboldt County participated as a cooperating agency during discussions regarding economic, social, and environmental conditions within the county.

Executive Order 13175 directs the BLM to establish regular and meaningful consultation and collaboration with Native American Tribal governments on the development of regulatory policies and permit approvals for proposed projects that could substantially or uniquely affect tribal communities. The BLM sent letters to the tribal representatives listed in Section 6.3.5, *Tribal Organizations*.

6.3 LIST OF CONTACTS

6.3.1 Federal Agencies

- Bureau of Land Management – Nevada State Office, Reno
- Bureau of Land Management – Washington D.C.
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Forest Service

6.3.2 State Agencies

- Nevada Division of Environmental Protection
- Nevada Division of State Lands
- Nevada Department of Conservation and Natural Resources
- Nevada Department of Transportation
- Nevada Department of Wildlife
- Nevada Division of Water Resources
- Nevada Division of Minerals

6.3.3 Elected Officials

- U.S. Senator Catherine Cortez-Masto
- U.S. Senator Jacky Rosen
- U.S. Representative Mark Amodei
- Nevada Assemblywoman Alexis Hansen

6.3.4 Local Agencies

- Humboldt County Commissioners
- Humboldt County Road Department

6.3.5 Tribal Organizations

- Fort McDermitt Paiute and Shoshone Tribe
- Summit Lake Paiute Tribe
- Winnemucca Indian Colony