5.0 MITIGATION

5.1 INTRODUCTION

The Environmental Impact Statement (EIS) serves in part to inform the public and review agencies of mitigation measures, project elements, or other environmental protections that are included to reduce or avoid impacts. This chapter provides an overview of mitigation; describes avoidance and minimization measures incorporated as a component of a proposed project, or as a measure being considered in the course of the National Environmental Policy Act (NEPA) review conducted to support agency decision-making processes; and summarizes avoidance, minimization, and compensatory mitigation under the Clean Water Act (CWA).

5.1.1 Overview of Mitigation

NEPA requires federal agencies to consider appropriate mitigation measures to avoid, minimize, rectify, reduce, or eliminate, and/or compensate for specific impacts (Council on Environmental Quality [CEQ] 1981; CEQ 2011). Consideration of project mitigation is a continuous process through completion of the EIS and Record of Decision (ROD). This includes efforts made as part of the project design or standard procedures; best management practices (BMPs), industry standards, or standard permit requirements; and assessment of measures recommended for consideration during the NEPA process.

Additionally, the US Army Corps of Engineers (USACE), pursuant to Section 404 of the CWA, has very specific requirements for mitigation, including a sequence of: 1) impact avoidance; 2) minimization; and 3) compensatory mitigation for unavoidable impacts under their jurisdiction, as determined on a case-by-case basis. USACE and the Environmental Protection Agency (EPA) signed a Memorandum of Agreement (MOA) in June 2018 (USACE and EPA 2018) that provides guidance on flexibility of Section 404 of the CWA mitigation requirements in the state of Alaska. The MOA sets forth the flexibility in existing CWA regulations and approaches that can be employed in Alaska due to its abundance of wetlands and unique circumstance involved with Section 404 of the CWA permitting in the state. Pursuant to 33 Code of Federal Regulations [CFR] Part 320.4(r)(2), all compensatory mitigation required by USACE will be for significant resource losses that are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment. In addition, mitigation will be directly related to the impacts of the proposal, appropriate to the scope and degree of those impacts, and reasonably enforceable.

Mitigation measures are also developed through other processes, such as consultation under Section 106 of the National Historic Preservation Act (NHPA), permit authorization by other federal and state agencies, and monitoring and adaptive management associated with specific permit requirements.

5.1.2 Definitions and Process

General descriptions of the key terms used in this chapter are provided in Table 5-1.

5.2 AVOIDANCE AND MINIMIZATION MEASURES UNDER NEPA

This section describes avoidance and minimization measures that would be incorporated as an integral component of the proposed project, and additional measures identified or recommended during the NEPA process that have been compiled and would be considered by USACE and cooperating agencies as part of their permit decisions to further minimize project impacts.

Table 5-1: Terminology Used in the EIS

Term	Description
Mitigation	Measures that avoid, minimize, rectify, reduce over time, or compensate for specific impacts of a proposed action, as outlined in 40 Code of Federal Regulations (CFR) Part 1508.20.
Applicant's Proposed Avoidance and Minimization	Impact-reducing actions or designs that an applicant has committed to as part of their proposed project. Commonly referred to as avoidance and minimization or design features. These measures would be implemented by Pebble Limited Partnership (PLP) as integral components of the proposed project design.
Best Management Practices and Industry Standards	Best management practices (BMPs) and industry standards are predictable actions necessary to comply with regulations and standard permit requirements that are designed to reduce impacts to the environment. These are typically reflected in the applicant's design, and are analyzed as part of the proposed project. For example, the Construction General Stormwater Permit for Storm Water Discharges for Large and Small Construction Activities (2016 CGP, AKR100000) would require a Storm Water Pollution Prevention Plan (SWPPP).
Additional Mitigation for Post-NEPA Agency Consideration	Relevant and reasonable measures (not already included in the proposed project) that could prevent or minimize damage to the human environment.[1] Note: These measures are not considered part of the proposed project, and are not considered in the impact assessments in Chapter 4, Environmental Consequences. Special conditions are added to Department of the Army permits when such conditions are necessary to satisfy legal requirements or to otherwise satisfy the public interest requirement. Permit conditions will be directly related to the impacts of the proposal, appropriate to the scope and degree of those impacts, and reasonably enforceable. The decision document prepared following completion of the EIS will identify those mitigation measures that the federal agencies are adopting and committing to implement (CEQ 2011).
Compensating for Unavoidable Impacts	Compensating for an impact by replacing or providing substitute resources or environments is one way an agency can use mitigation to reduce environmental impacts associated with proposed projects (40 CFR Part 1508.20; CEQ 2011). Compensatory mitigation may be required under the CWA for impacts to waters of the US (WOUS) that cannot be avoided or minimized. Compensatory mitigation requirements are identified in the ROD based on the Final EIS.
Monitoring and Adaptive Management	Through monitoring, appropriate data are collected to assess predicted project impacts and the effectiveness of mitigation after initial and ongoing implementation. Mitigation that is not proving to be effective can be adapted. Adaptive management is often defined as "a structured, iterative process of robust decision-making in the face of uncertainty, with an aim of reducing uncertainty over time via system monitoring." Mitigation monitoring can incorporate elements of adaptive management if monitoring results indicate a basis for changes to a mitigation program.

[1] Human environment is defined by NEPA Regulations (40 CFR Part 1508.14) as the natural and physical environment and the relationship of people with that environment.

5.2.1 Best Management Practices, Industry Standards, and Standard Permit Requirements

Numerous state, federal, and local government permits and approvals are required before development and operation of a mining project in Alaska can begin. Appendix E describes the relevant permits and regulatory requirements for the Pebble Project. These permitting processes and regulatory requirements are established to ensure that projects are designed, operated, and reclaimed in a manner consistent with applicable laws and regulations. Standard BMPs, agency permit requirements, and industry standards applicable to the project are a form of mitigation, and were considered when assessing the impacts of the project on the resources, as described in Chapter 4, Environmental Consequences.

5.2.1.1 Permitting for Large Mine Projects in Alaska

Many of the permits required for approval of the Pebble Project are under the jurisdiction of the State of Alaska (see Appendix E). To coordinate state agency permitting and integrate federal and

local permitting for large mining projects, the State of Alaska has developed a Large Mine Permitting Team (LMPT) process. The LMPT is an interagency group of regulatory experts that works cooperatively with large mine applicants and operators, federal resource agencies, and the Alaska public to ensure that projects are designed, operated, and reclaimed in a manner consistent with state laws and regulations. The goal of the LMPT process is to coordinate the sequencing and intergovernmental review of the numerous permits required of a large, complex hard rock mine; particularly, the Alaska Department of Natural Resources (ADNR), Alaska Department of Environmental Conservation (ADEC), and the Alaska Department of Fish and Game (ADF&G). The following is a summary of the general process the state follows (ADNR 2018h).

Pre-Application—One of the first tasks for the LMPT is to work with the potential applicant to ensure the pending permitting process and regulatory requirements are understood; that appropriate baseline environmental data are collected; to define application information requirements; and develop a realistic schedule (Note: PLP is currently in the pre-application step).

Permit Application—The applicant submits an application package, typically consisting of the Plan of Operations, Reclamation Plan, Waste Management Plan, reclamation and closure cost estimates, associated monitoring and management plans, and baseline study reports. The LMPT reviews the package to make sure that all the necessary information for a complete review is included.

Review and Analysis—The LMPT collaboratively reviews the proposed plans and supporting documents to inform their respective agencies' permitting decisions and ensure that the project design complies with all applicable state laws and regulations.

Issues Resolution—The LMPT works with the applicant to resolve issues, usually resulting in modifications to the project design, operations, and monitoring plans.

Public Notice and Permit Issuance—Draft Plan of Operations Approval, the Reclamation Plan Approval, the Integrated Waste Management Permit, and financial assurance costs are posted for public review, together with final proposed plans and supporting documents from the applicant. Public comments are reviewed by the LMPT, and incorporated, as appropriate, into final agency approvals, which are then posted on the ADNR Large Mine Project website.

Post-Permit Issuance—Once the permits are issued and construction and operations begin, the LMPT is actively involved in permit maintenance, site inspections, and compliance monitoring.

Reclamation and Final Closure—The LMPT ensures that reclamation and closure objectives are met, including long-term environmental management, and that financial assurances are in place to provide for an orderly and stable closure.

ADNR, ADEC, and ADF&G each have regulatory authority to condition their respective authorizations, if issued and as necessary, to ensure that the approved activities comply with applicable state laws. Permit conditions (also referred to as "stipulations") are legally binding for the applicant and enforceable by the issuing agency. Additional information on the state's regulatory framework for large mine projects in Alaska is included in Appendix E.

5.2.1.2 Best Management Practices

Pebble Limited Partnership (PLP) would follow BMPs, industry standards, and standard permit requirements that are designed to reduce impacts to the environment. A list of standard BMPs, permit requirements, and/or industry standards that would likely be required for the Pebble Project is provided below. This is not intended to be a complete list; rather, it reflects the most predictable actions for this type of project that would be necessary to comply with regulations, and standard permit requirements designed to reduce impacts to the environment. Many of these are also captured in PLP's proposed mitigation measures, which are discussed in the following section.

- Using secondary containment for the storage of all fuel and hazardous chemicals during all phases of the proposed project to prevent potential releases from fuel handling, tank failures, or contaminated stormwater from reaching the aquatic environment.
- Designing stream crossings (culverts and bridges) to be appropriately sized to maintain hydrology and not block movement of aquatic life.
- Implementing Storm Water Pollution Prevention Plans (SWPPPs) and Erosion and Sediment Control Plans (ESCPs), and following industry standard BMPs for sediment and erosion control.
- Developing and maintaining Oil Discharge Prevention and Contingency Plans (ODPCPs); Spill Prevention, Control, and Countermeasure (SPCC) Plans; and Facility Response Plans (FRPs).
- Using BMPs, such as revegetation planning, watering, and using dust suppressants to control fugitive dust.
- Complying with ADNR Dam Safety requirements through certificates of approval to construct and operate dams, following ADSP guidelines for seismic and hydrologic analysis through final design, preparation of Emergency Action Plans, completion of a Failure Modes Effects Analysis, and meeting requirements for construction Quality Assurance/Quality Control (QA/QC), inspections, and closure.
- Providing the appropriate bonding/financial assurance required by ADNR and ADEC to fund closure activities and post-closure monitoring and embankment inspections, and comply with other ADNR mine reclamation and closure requirements.
- Complying with ADNR Temporary Water Use Authorization conditions for water withdrawal, such as screening requirements to avoid fish entrainment or injury; establishing water withdrawal rates and volumes, and as appropriate, timing water withdrawal to avoid impacts to fish migration, spawning, and incubating eggs.
- Monitoring water withdrawals to ensure that permitted limits are not exceeded.
- Verifying that project vessels are equipped with proper emergency towing equipment in accordance with 18 Alaska Administrative Code (AAC) 75.027(f).
- Applying industry-standard BMPs relating to invasive species prevention and management.
- Complying with provisions and standard permit conditions of EPA's Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP)[1].
- Developing a Cultural Resources Management Plan (CRMP) as part of the Section 106 process, which would define the specific actions for identifying and evaluating historic properties and avoiding and minimizing impacts to historic properties, as well as specific measures for resolving adverse effects on historic properties.
- Verifying pipeline integrity with visual and other non-destructive inspections of welds, hydrostatic testing, the use of in-line inspection tools (such as intelligent pigging[2]), and aerial inspections. In-line inspection would detect any changes in the pipeline geometry, pipe deformation, and estimate any strain in the pipe wall.

[1] Vessel Incidental Discharge Act (VIDA) of 2018 legislation extends the 2013 VGP's provisions, leaving them in effect until new regulations are final and enforceable.
[2] Intelligent pigging is an inspection technique whereby an inspection probe, often referred to as a "smart" pig, is propelled through a pipeline while gathering data, such as the presence and location of corrosion or other irregularities on the inner wall of the pipeline.

- Monitoring the tailings storage facility (TSF) seepage collection systems and making adjustments in the location of wells, or adding additional wells or other systems if seepage is escaping the system.
- Conducting a detailed tsunami analysis for the port in accordance with current industry standards (ASCE 2017a), which would provide site-specific elements of a maximum event. These elements would be incorporated into the final port elevation and design.
- Complying with laws and regulations pertaining to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.
- Complying with laws and regulations pertaining to the Marine Mammal Protection Act (MMPA) and following the requirements of any authorizations issued under the MMPA.
- Implementing systems for proper screening, acceptance, storage, and transport of dangerous cargo.

5.2.2 Applicant's Proposed Avoidance and Minimization Incorporated into the Project

The Applicant-proposed measures to avoid and minimize impacts, as provided by PLP, are outlined in Table 5-2. Applicant-proposed mitigation measures are measures incorporated into the design of the project by PLP to reduce potential impacts on resources. These measures would be non-discretionary because they are included in the project design. USACE views these elements as part of the project, and considers PLP's proposed mitigation measures as inherent to the proposed project, as well as applicable components of the other action alternatives. To the extent possible, these measures, including any potential impacts associated with these measures, were considered when assessing the impacts of the project on the resources, as described in Chapter 4, Environmental Consequences. Where there is insufficient detail to determine a measure's effectiveness, the measure could not be incorporated into the impact analysis, but serves to inform the public of PLP's commitments. PLP has provided additional detail on various applicant-proposed mitigation measures in responses to Requests for Information (RFIs), as cited herein.

Additionally, changes to the Applicant's proposed project subsequent to the Pebble Project Department of the Army Application for Permit POA-2017-271 (PLP 2019a), which have led to the identification of the Applicant's Preferred Alternative in the Final EIS (FEIS) (see Chapter 2, Alternatives) and have further reduced project impacts, are summarized in Table 5-3. These changes were introduced as a result of agency and/or public comments received during the scoping and Draft EIS (DEIS) comment periods, as a result of the analyses presented in the DEIS, or as a result of ongoing optimizations of the project by the Applicant to further reduce environmental impacts and improve project safety. Engineering design and construction, operations, or closure-phase procedures are often preliminary at the time that an EIS is prepared; typically, final engineering designs and construction and operations plans are finalized during the successive state permitting phase.

It is important to note that the NEPA process is an informative process and the EIS does not identify the mitigation measures that USACE, or any other permitting agency, would select in their post-NEPA permit decisions. Design criteria and mitigation measures necessary to comply with Section 10 Rivers and Harbors Act and Section 404 CWA regulations, including those necessary to address 404(b)(1) guidelines and to ensure that the project is not contrary to the public's interest, will be evaluated as part of the ROD and incorporated in the Department of the Army permit, if issued. Compliance with the permit would be required, and measures to ensure compliance would include monitoring, reporting, and compliance inspections.

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
PLP has designed the project to minimize impacts to wetlands, and with eventual reclamation in mind. At closure, wetlands will be restored where practicable.	Minimize long-term impacts to wetlands by restoring wetlands functions at closure.	General	Closure	Wetlands and Other Waters/Special Aquatic Sites
Where feasible, mine facilities would be reclaimed in such a manner as to create new wetland areas and ponds.	Reclamation of mine facilities would minimize long-term losses of wetlands and habitat values by restoration of some wetland areas.	General	Closure	Wetlands and Other Waters/Special Aquatic Sites
Overburden removed during construction would be stockpiled for use in reclamation in compliance with State regulations and best practices. As needed, berms built of NPAG/Non-ML rock would surround the stockpiles to contain the material and increase stability. The berms would be shaped and seeded to promote stability and prevent erosion and sediment-laden runoff through operations.	Use of native overburden during physical reclamation and closure helps promote establishment of self-sustaining native plant communities, and would eliminate the need for importing soils, thereby minimizing the introduction of invasive plant species.	General	Closure	Soils; Vegetation
Cultural resource experts would be retained during construction activities, including the offshore construction activities, to respond to any potential cultural sites identified during construction. PLP would comply with all requirements and commitments for timely reporting (and site protection) of any discoveries to the appropriate state and federal agencies and landowners.	Use of cultural experts during construction would help reduce the potential for the loss or destruction of cultural resources during construction activities through quick identification, preservation, and/or curation of artifacts.	General	Construction	Cultural Resources
Access agreements with ANCSA Village Corporations would include bidding and employment preferences, revenue sharing, and other benefits to enhance local employment and revenue generation.	Project use of traditional Native lands may impact other uses such as subsistence harvesting. Agreements with ANCSA corporations provide revenue to be distributed to shareholders and employment for local residents, increasing income in affected communities and regionally and offsetting potential impacts to the subsistence harvest.	General	Construction/ Operations	Needs and Welfare of the People—Socioeconomics; Environmental Justice

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A draft Restoration Plan has been prepared outlining short-term and long-term restoration objectives for restoring temporarily impacted areas to a condition that resembles the pre-construction condition or that of adjacent lands undisturbed by the project (Owl Ridge 2019a; PLP 2019-RFI 123). Measures PLP proposes to implement to meet the restoration goal and objectives include: • Minimize construction impacts on temporary work areas by preserving the native vegetation root mass where practical and safe. • Use proper soil management techniques, including stripping, stockpiling, and reapplying topsoil to establish surface conditions that would enhance the development of diverse, stable, and self-generating native plant communities. • Establish stable surface and drainage conditions with the use of erosion control measures as needed to minimize soil erosion and off-site sedimentation. • Re-establish terrain elevations that blend with the surrounding landscape. • Establish a permanent plant cover of native shrubs and grasses. • Use certified seed (11 AAC 34.075) mixtures as suggested in the Alaska revegetation and erosion control guides. • Clean up trash or other construction debris (e.g., flagging, survey lath, plastics). • Monitor during and after construction phases to ensure the achievement of short- and long-term restoration objectives.	A restoration plan helps ensure that habitat loss associated with construction activities is temporary and that impacted areas are appropriately restored to their pre-construction conditions.	General	Construction	Wetlands and Other Waters/Special Aquatic Sites; Soils; Vegetation; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A draft RCP has been prepared (SRK 2019d; PLP 2019-RFI 115) and a final RCP would be developed during feasibility design work to support state permitting. The RCP would be updated on a regular basis and regular site compliance audits would be conducted as required by state regulations. The project would fully bond for reclamation and closure costs before commencing construction and the bonding amounts would be updated on a regular basis to address any changes. The final RCP would document the plan for long-term closure of the site in a stable condition in compliance with all applicable closure criteria and regulations; and would serve as the basis for the development of the closure cost estimate and associated bonding.	An RCP ensures that state reclamation and closure objectives are met, including long-term environmental management, and that financial assurances are in place to ensure an orderly and stable closure. The RCP and bonding would also minimize potential future financial effects on the land owner, and reduce the likelihood and extent of impacts on downstream water and sediment quality through long-term contact water capture, treatment, and discharge.	General	Construction/ Operations/ Closure	Land Ownership, Management, and Use; Health and Safety; Water and Sediment Quality; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Reclamation plans would include clear goals with measurable objectives and performance standards, and discuss all phases of development to include interim and final reclamation. Depending on the phase of development during interim or post-operations reclamation, data collected may include the following: • Ground cover (composition and density), including plant cover with percent of desirable species and variety of desirable species, percent not covered (bare ground), and the percent and type of invasive species (see conservation measures for invasive species). • Streambank and wetland stability. • Channel monitoring to determine diversity of aquatic species; may be counted by species or trophic groups (e.g., forage fish, juvenile, nursery, piscivorous). • Measurement of erosion control success (e.g., evidence of rilling, gullies, rutting, slumping). • Evidence of wildlife (e.g., tracks, scat, nests). • Photo documentation.	Avoid impacts to vegetation, wetlands, and other aquatic resources resulting from erosion and sedimentation due to a failure to reestablish ground cover in compliance with reclamation standards.	General	Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Reclamation monitoring would be conducted as appropriate for all phases of the project.	Avoid impacts to vegetation, wetlands, and other aquatic resources resulting from erosion and sedimentation due to a failure to reestablish ground cover in compliance with reclamation standards.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Water and Sediment Quality; Fish Values; Wildlife Values
The project would establish a local advisory committee to facilitate communications and address concerns during construction and operations.	Good communication and coordination with residents and local service providers help to mitigate operational impacts such as road traffic and address community safety concerns.	General	Construction/ Operations/ Closure	Transportation and Navigation; Subsistence; Environmental Justice
The project would provide for controlled use of the road corridor (and ferry under Alternative 1 and 1a) for local residents, improving the supply of goods and reducing the cost of importing goods. Controlled use could include scheduled convoys for the transport of private vehicles and supplies, qualification and limited use authorization of third-party vehicles and drivers using the access infrastructure, or other similar arrangements.	Use of the transportation corridor for the supply of goods to local communities can help reduce the cost of living in those areas.	General	Construction/ Operations/ Closure	Transportation and Navigation; Needs and Welfare of the People—Socioeconomics; Environmental Justice
The project would implement workforce development programs and training to prepare local residents for employment at the project.	Training programs help local residents obtain employment with the project, which increases income in the region, and also helps to stop out-migration and school closures.	General	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice
The project would have a no hunting, fishing, or gathering policy for non-local employees. This would prevent additional competition for local resources.	A policy of no hunting, fishing, or gathering for non-local employees prevents additional competition for local subsistence resources.	General	Construction/ Operations/ Closure	Subsistence; Commercial and Recreational Fisheries; Environmental Justice
A conceptual FDCP has been prepared to identify project design features and BMPs that would be implemented to minimize fugitive dust emissions (PLP 2019 – RFI 134). Detailed implementation plans would be developed based on final project designs and permit conditions and the FDCP would be updated, as required, to support state permitting. This would include establishing a	Implementation of the FDCP would help minimize potential adverse effects to the nearby environment, prevent public nuisance from airborne dust, and promote a healthy work environment for project staff. Within the limits of its regulatory authority,	General	Construction/ Operations/ Closure	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Vegetation; Wetlands and Other

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
requirement for the development and implementation of an industry standard O&M plan prior to construction that would identify specific dust control measures implementation triggers, equipment-specific requirements, individual responsibilities and contact details, training requirements, and other measures. The objective of the FDCP is to reduce the potential for airborne dust and control fugitive dust emissions from the activities associated with the construction, operations, and closure of the mine.	ADEC can require an assessment of ambient air quality to verify whether fugitive dust is causing or significantly contributing to concentrations of particulate matter above ambient air standards.			Waters/Special Aquatic Sites
Heavy equipment would be washed to reduce dust that collects on the wheels, body, and undercarriage of heavy equipment.	Reduce fugitive dust emissions and resultant impacts to air quality.	General	Operations	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
A Wildlife Interaction Plan would be developed and implemented to minimize human-wildlife interactions and resolve any potential conflicts. The goal of the plan would be to prevent problems resulting from human-wildlife interactions to a manageable and acceptable level and to ensure that wildlife can continue to thrive in the project area. This plan would be managed through an adaptive management approach. Wildlife report sightings and interactions reported would be used to assess the effectiveness of mitigation measures or guide project personnel in the establishment of additional mitigation measures as required. This plan would describe education and training for project personnel and contractors, control measures to avoid and minimize human-wildlife interactions deterrence and hazing procedures for reporting wildlife sightings and interactions, and an adaptive management approach.	Implementation of a Wildlife Interaction Plan would help minimize human-wildlife conflicts. Incorporation of adaptive management would help resolve and avoid potential conflicts that are identified as the project advances.	General	Construction Operations/ Closure	Wildlife Values; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A detailed bear interaction plan designed to minimize conflicts between bear and humans would be incorporated into the Wildlife Interaction Plan. PLP would coordinate with ADF&G on development of this plan. At a minimum, the plan would include measures to: • Minimize attraction of bears to facility sites • Organize layout of buildings and work areas to minimize interactions between humans and bears • Warn personnel of bears near or on facilities and the proper actions to take • If authorized, deter bears from facility sites • Provide contingencies in the event bears do not leave the site • Provide for the proper storage and disposal of food, garbage, or other industrial materials that may be attractants to bears • Provide for the proper storage and disposal of materials that may be toxic to bears; • Provide a systematic record of bears on the site and in the immediate area • Additional measures as developed in consultation with ADF&G.	Avoid attracting bears to project facilities, and the resulting habituation and hazing or lethal action required to manage habituated bears.	General	Construction Operations/ Closure	Wildlife Values; Health and Safety
Specific wildlife safety mitigation measures and design features proposed for the Amakdedori port, transportation corridor, and food and garbage management are outlined in response to RFI 122 (PLP 2019-RFI 122). Measures from RFI 122 would be incorporated into the project's Wildlife Interaction Plan. Examples include: Port Wildlife Safety: • The port facility would be fenced-in using chain-link fences and possible electrical fences. The road entrance would have a gate, and the fence would extend onto the causeway as needed to	Implementation of measures outlined in PLP 2019-RFI 122 would help minimize human/wildlife conflicts.	General	Construction Operations/ Closure	Wildlife Values; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
limit access from the intertidal zone (specific to Alternative 1a and Alternative 1). • Secure bear-resistant storage would be used for handling food and garbage. [Note: see commitment for use of bear-proof containers below]. • Food would be kept inside buildings and only permitted inside vehicles for short periods, when workers are unable to use the dining facilities. Food and garbage would be disposed of in dedicated trash containers at each site, and routinely emptied to limit buildup of odors that could attract wildlife. Transportation Corridor Wildlife Safety: • Wildlife present on the road would be given the right-of-way. Traffic would stop, if necessary, to allow the safe passage of wildlife (e.g. a bear or moose crossing, or walking along, the road). • The maximum speed limit for the road system would be set at 35 miles per hour. Speed limits would be reduced as required in areas of high seasonal wildlife use and at known crossing points. Vehicle speeds would be posted along the road and all drivers would be monitored using mobile GPS fleet tracking technology to ensure compliance. • As practical, snowbank height during the winter would be minimized to increase driver visibility. • Any wildlife injuries or mortalities would be immediately reported as appropriate. The carcasses of any road-killed animals would be removed and disposed of in a timely manner so that they do not serve as an attractant to bears or other wildlife. PLP would coordinate with ADF&G on the salvage of fresh, useable game species for community food.				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Food and Garbage Management: • Feeding and attracting of wildlife by project personnel would be prohibited. • Food would be kept inside buildings and only permitted inside vehicles for short periods, when workers are unable to use the dining facilities. Food and garbage would be disposed of in dedicated trash containers at each site, and routinely emptied to limit buildup of odors that could attract wildlife. • Trash containers inside fenced areas would be located away from the fence line to minimize wildlife attraction. • Any food wastes that could attract wildlife would be temporarily stored in enclosed containers, and periodically backhauled to the mine site for incineration and disposal.				
Bear-proof containers and bear-proof trash receptacles would be used for food and garbage. Food would only be left inside vehicles or other unsecured locations when staff are present and can remove the food source in response to wildlife attracted to the food source.	Avoid attracting bears to project facilities, and the resulting habituation and hazing or lethal action required to manage habituated bears.	General	Construction/ Operations/ Closure	Wildlife Values; Health and Safety
PLP would consult with ADF&G on additional wildlife surveys that may be required prior to construction.	Minimize impacts to wildlife resulting from project activities.	General	Construction	Wildlife Values
Encounters with an occupied brown bear den that has not previously identified by ADF&G would be reported to the Division of Wildlife Conservation, ADF&G, within 24 hours. Mobile activities would avoid such discovered occupied dens by 0.5 mile unless alternative mitigation measures are approved with concurrence from ADF&G. Non-mobile facilities would not be required to relocate. Before commencement of any activities, PLP would consult with ADF&G to identify locations of brown bear den sites. Additional surveys may be required pre- and post-construction to determine denning areas and changes in denning use due to project impacts.	Minimize impacts to denning brown bears resulting from project activities.	General	Construction/ Operations/ Closure	Wildlife Values; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Mandatory training would be required for mine workers on ethical behavior around brown bear populations (e.g., strict use of bear safe trash cans; strict prohibition of bear feeding and harassing).	Avoid attracting bears to project facilities, and the resulting habituation and hazing or lethal action required to manage habituated bears.	General	Construction/ Operations/ Closure	Wildlife Values; Health and Safety
Employees and contractors would be instructed on relevant rules and regulations that protect wildlife. See the Fish and Wildlife Service webpage on regulations and policies (https://www.fws.gov/birds/policies-and-regulations.php).	Minimize impacts to avian wildlife resulting from project activities.	General	Construction/ Operations/ Closure	Wildlife Values
Specific wildlife awareness training would be required for drivers operating in the area.	Avoid and minimize impacts to wildlife.	General	Construction/ Operations/ Closure	Wildlife Values; Health and Safety
PLP would follow USFWS Land Clearing Timing Guidance for Alaska to avoid destruction of active bird nests. https://www.fws.gov/alaska/pages/nesting-birds-timing-recommendations-avoid-land-disturbance-vegetation-clearing	Minimize impacts to nesting and breeding raptors resulting from land clearance activities.	General	Construction	Wildlife Values
The project would employ protocols to ensure that helicopters and fixed-wing planes do not harass wildlife. These protocols, listed below, would remain in place throughout construction and the life of the mine. • Do not harass or pursue wildlife. • Fly 500 feet above ground level or higher when possible and safe to do so. • When wildlife (especially bears, caribou, moose, wolves, raptor nests, flocks of waterfowl, seabirds, or marine mammals) are observed, avoid flying directly overhead and maximize lateral distance.	Established protocols for operators of helicopters and fixed-wing planes being used for the project would minimize disturbance to wildlife.	General	Construction/ Operations/ Closure	Wildlife Values; Subsistence
Appropriate flight restrictions (e.g., elevation restrictions) would be established to reduce caribou hunting impacts.	Impacts to human and wildlife use resulting from aircraft noise.	General	Construction/ Operations/ Closure	Wildlife Values; Subsistence

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
PLP prepared an ISMP (PLP 2019–RFI 133). PLP would implement the ISMP through training and communicating with project personnel and contractors throughout the life of the project, including during planning, construction, operations, reclamation, and closure. The goal of the ISMP is to prevent, minimize, and control the spread of invasive species. It includes training requirements, development of an HACCP plan prior to construction, prevention measures, EDRR, and control treatment options. PLP has received proposed edits to the ISMP from USFWS and agrees to adopt and incorporate the edits into the next version of the ISMP, with the exception of the comment regarding "the use of suppression for an established species in a particular area"; PLP believes it is important to retain this strategy as an option of last resort in the event that there is a pre-existing infestation that has not been identified (PLP 2020-RFI 071d).	Implementation of the ISMP and use of BMPs for the prevention, control, and management of invasive species would eliminate or minimize opportunities for introducing invasive species to the project area, and prevent their spread if detected in the project area.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values
PLP would maintain and update the ISMP, which will address project construction, operations, and closure for all project facilities.	Avoid and minimize the spread of invasive species as a result of project activities, and resultant impacts to native species, waters, and other aquatic resources.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values
Boats, trailers, and other boating equipment would be inspected, and any visible plants, animals, or mud would be removed before leaving any waters or boat-launching facilities for transport to new waters.	Avoid and minimize the spread of invasive species as a result of project activities, and resultant impacts to native species, waters, and other aquatic resources.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values
Boats, trailers, equipment, clothing, boots, and waders would be cleaned, drained, and dried before transporting to new waters.	Avoid and minimize the spread of invasive species as a result of project activities, and resultant impacts to native species, waters and other aquatic resources.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites
Water would be drained from the motor, live well, bilge, and transom wells while on land before leaving the vicinity.	Avoid and minimize the spread of invasive species as a result of project activities, and resultant impacts to native species, waters and other aquatic resources.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Where seeding is the preferred approach to reestablishing vegetation, PLP would use native weed-free applied at specified rates in compliance with the approved Closure and Reclamation Plan.	Promote rapid and healthy revegetation and avoid the introduction of invasive species.	General	Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Certified weed-free materials, including gravel, topsoil, hay/straw, or erosion control tubes, would be used, especially when working near sensitive habitats such as streams and wetlands.	Avoid the introduction of invasive species.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites;
Bare soils would be revegetated with approved techniques as soon as feasible to avoid the possible establishment of invasive plant species.	Avoid the introduction of invasive species.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites;
Vehicles and equipment would be cleaned in accordance with the requirements of the ISMP.	Avoid the introduction of invasive species.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites;
Cleaning equipment would be avoided in waterways or wetlands, which are particularly sensitive to invasion and could result in changes to aquatic organism habitat function.	Avoid the introduction of invasive species.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Locations of known invasive plant infestations would be identified, and activities planned accordingly to manage infestations.	Avoid the spread of invasive species.	General	Construction/ Operations/ Closure	Vegetation, Wetlands and Other Waters/Special Aquatic Sites
An ARMP would be developed for the project. The ARMP would be developed in consultation with the ADF&G and ADNR as part of the plans of operation during state permitting. The ARMP would assess the effects of mine operations on aquatic habitats and verify, through biomonitoring, that waste management control measures at the mine site are protective to the aquatic environment. ARMP elements would be applicable to all project phases. The elements of the ARMP are described in the response to RFI 135 (PLP 2019-RFI 135).	Implementation of an ARMP with the objective of monitoring for change to aquatic communities would allow for adaptive management to address any project-related impacts.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Water and Sediment Quality
The project's water management strategy is based on the managed release of surplus water to maximize downstream fish habitat in areas impacted by flow reductions resulting from mine construction. Details are available in the PHABSIM modeling reports (PLP 2019-RFI 147 and PLP 2019-RFI 149 [R2 Resource Consultants 2019a]), the watershed modeling reports	Enhancement of existing habitat through flow management and restoration of access to fish habitat would help compensate for long-term losses of fish habitat in the project footprint.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Surface Water Hydrology

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
(PLP 2019-RFI 109f), and the Water Balance and Water Quality Model Report (PLP 2019-RFI 021g), which collectively outline the project's water management strategy. PLP is proposing to replace damaged fish passage culverts to reopen access to anadromous fish habitat in other areas as part of its draft Compensatory Mitigation Plan, subject to USACE concurrence with the proposal). Additional culvert replacement, or other habitat access enhancement strategies, may be proposed as mitigation during state permitting of fish habitat impacts.				
A CRMP would be developed for the project as part of the Section 106 consultation process and as dictated by the draft PA. The draft PA lays out the methods for identifying, evaluating, assessing, and consulting on the mitigation of adverse effects to historic properties and outlines what must be included in the CRMP, which would include details on how to carry out the mitigation measures. The CRMP would describe the equipment, methodology, training, and assessment techniques that would be used to identify, evaluate, assess, monitor, and/or mitigate impacts to historic properties on State and private lands impacted by the project. The plan would describe the process for managing effects to these resources, and ensure that agreed-on protocols and procedures are established and followed if any unanticipated cultural resources or human remains are discovered.	A CRMP would reduce the impacts to cultural resources by providing specific procedures for avoiding, minimizing, and mitigating impacts to historic properties, as well as specifying the process for resolving unanticipated impacts to cultural resources, if discovered.	General	Construction/ Operations/ Closure	Cultural Resources; Historic Properties
A PCP would be developed for the project prior to construction commencement. The PCP would establish the methodology and infrastructure that would be used to keep local residents, guides, and other users informed about upcoming and ongoing activity.	Good communication with residents and local service providers is important for coordinating operations and minimizing safety concerns.	General	Construction/ Operations/ Closure	Recreation; Subsistence; Transportation and Navigation; Recreational and Commercial Fisheries
Drug and Alcohol Abuse Prevention, Cultural Sensitivity, Safety, and other workplace programs would be developed for all employees. The programs would be designed to provide employees with the training and resources needed to allow for a safe, healthy, and conflict-free workplace. These programs would be implemented for all project staff and contractors prior to construction commencement.	Workplace programs allow for safe and healthy workplaces, while creating a culture of cultural sensitivity and conflict management.	General	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project would develop a SWPPP and follow BMPs for stormwater management. The SWPPP would describe the BMPs (equipment, methodology, training, and assessment techniques) that would be used for the management of stormwater on the project, in compliance with state and federal requirements, to minimize the transfer of sediment and other pollutants in stormwater associated with project activities. The SWPPP would be developed during detailed design, and would be in place prior to construction commencement.	Development of a SWPPP would provide approved processes for managing stormwater runoff, and thereby reduce the potential for impacts to surface water and sediment quality.	General	Construction/ Operations/ Closure	Water and Sediment Quality; Wetlands and Other Waters/Special Aquatic Sites; Fish Values
The project would develop an ESCP and follow BMPs for erosion and sediment control. The ESCP would describe the BMPs (equipment, methodology, training, and assessment techniques) that would be used to minimize erosion and sedimentation associated with project activities. The ESCP would be developed during detailed design, and would be in place prior to construction commencement.	Development of an ESCP would provide processes for managing erosion and sedimentation, and thereby reduce the potential for impacts to surface water and sediment quality.	General	Construction/ Operations/ Closure	Soils; Water and Sediment Quality; Wetlands and Other Waters/Special Aquatic Sites; Fish Values
Erosion control measures such as silt fences, silt curtains, and cofferdams would be used to trap and prevent sediment and pollutants from being transported into surrounding waterbodies (e.g., lakes, streams, wetlands, coastal waters, temporary diversion channels).	Prevent sediment from being transported into surrounding wetlands and waters, which may impact water quality and aquatic life.	General	Construction/ Operations/ Closure	Fish Values; Water and Sediment Quality, Wetlands and Other Waters/Special Aquatic Sites
Where appropriate and feasible, PLP would use plastic-free erosion and sediment control products.	Avoid impacts to wildlife and aquatic resources resulting from entanglement in netting and the introduction of plastic products into waters.	General	Closure	Fish Values; Water and Sediment Quality, Wildlife Values
Design features for the avoidance and minimization of spills would include specialized tanks/containers for the storage and transport of diesel and concentrate; locking mechanisms on concentrate container lids; the use of ice-rated vessels for transportation as required for winter operations; the use of double hulled fuel barges for fuel transport; and the implementation of pipeline leak detection systems for the gas, concentrate, and return water pipelines.	Design features would aid in the avoidance and minimization of potential spills and resulting adverse effects.	General	Construction/ Operations/ Closure	Health and Safety; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Operational measures for preparedness, prevention, response, and the natural gas pipeline would be implemented as described in the response to RFI 126 (PLP 2019-RFI 126).	Implementation of the operational measures described in the response to RFI 126 would avoid and minimize the occurrence and the potential adverse effects of spills.	General	Construction/ Operations/ Closure	Health and Safety; Spill Risk
Secondary containment would be used for all fuel and hazardous chemical storage, and the project would use BMPs for the handling of fuel and hazardous materials.	Use of secondary containment around fuel and chemical storage areas would reduce the risk of an uncontrolled release of contaminants to the environment.	General	Operations	Health and Safety; Spill Risk
The project would contract with a Spill Response Organization (e.g., Alaska Chadux Corporation) to provide on-call response services, and would also stockpile spill response equipment at all appropriate locations.	Ready access to a response organization and prepositioned equipment would reduce the response time and minimize the environmental effect of spills, should they occur.	General	Construction/ Operations/ Closure	Spill Risk; Health and Safety
The project would offer to negotiate a PILT to the LPB as an alternative to the borough severance tax, to allow for predictability in annual revenues.	The project may result in additional costs accruing to the LPB as a result of project activities and additional municipal and school district costs as a result of reduced outflow from the region due to additional employment opportunities. Severance taxes would offset the cost of these requirements, but can vary from year to year, resulting in unpredictable budgets for the Borough. A PILT negotiation allows for predictability in annual borough revenues, which supports local government services and enhances the quality of life for residents in the region.	General	Operations	Needs and Welfare of the People—Socioeconomics, Environmental Justice
A shift schedule would be established to enable local employees to maximize opportunities to remain active in subsistence harvest activities.	A shift schedule allows employees to participate in subsistence activities, many of which require long periods of uninterrupted time.	General	Operations	Subsistence; Needs and Welfare of the People—Socioeconomics; Environmental Justice

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The use of natural gas and a combined-cycle power plant to generate power would reduce air impacts and remove the need to transport large amounts of diesel fuel.	Using natural gas instead of diesel for power generation reduces air emissions and the risk of diesel spills.	General	Operations/ Closure	Air Quality; Transportation and Navigation
The natural gas pipeline design has been oversized to allow for regional access to gas, which could reduce regional power costs and dependence on diesel fuel shipments. PLP would engage with state and/or local governments about options to continue operation of the pipeline when it is no longer required by the project.	High energy costs are a limiting factor of the quality of life in communities adjacent to the region. The widespread use of diesel for power generation has resulted in impacts to waters from spills and to air from emissions. Community access to natural gas would reduce the cost of power, reduce the potential for fuel spills, and improve air quality in the region.	General	Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice; Health and Safety; Spill Risk; Water and Sediment Quality; Air Quality
Blasting during construction would be done following the guidelines established in the 2013 ADF&G Technical Report (No. 13-03) Alaska Blasting Standard for the Proper Protection of Fish (Timothy 2013).	Following the BMPs and methods outlined in this report would help minimize impacts to fish from blasting in or near fish-bearing waterbodies.	General	Construction	Fish Values
Periodic third-party audits of the Pebble Mine facility would be completed as part of the state permitting program. The purpose of the facility audit would be to verify compliance with applicable environmental laws associated with the Reclamation Plan Approval and Integrated Waste Management Permit, if issued, by evaluating both PLP's management and state permit administration for reasonable assurances that the facility and environmental controls are functioning as intended. The environmental audit would include an evaluation of the adequacy of the approved financial assurance.	This measure does not mitigate a specific impact but would allow for adaptive management if the audit finds that the facility and environmental controls are not functioning as intended.	General	Operations	Health and Safety; Spill Risk; Water and Sediment Quality
The construction area (temporary disturbance footprint) associated with the project would be marked, using flagging or other methods, prior to any brush clearing and construction activities (PLP 2019–RFI 071b).	Clear marking of the construction area would minimize the potential for disturbance to soils, vegetation, and wetlands outside the permitted work area.	General	Construction	Vegetation; Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Fugitive dust emissions from the primary crushers, the coarse ore conveyor, and the coarse ore stockpile would be controlled using covers, enclosures, and dust collection systems (baghouses). The crushers, conveyor system, and coarse ore stockpile would all be constructed with covers. Enclosures would be installed at the crusher dump pockets and at the transfers to and from the coarse ore stockpile. Dust emissions from the crushers and coarse ore stockpile reclaim feeders would be captured and controlled by dust collection systems (PLP 2020-RFI 071d). See the conceptual FDCP for more information (PLP 2019-RFI 134).	Enclosing these processing facilities and including air control equipment would reduce fugitive dust from crushing operations.	Mine Site	Operations	Air Quality; Health and Safety; Water and Sediment Quality; Wildlife Values; Fish Values
If emissions remain high enough to trigger PSD permitting, a BACT analysis would be completed for the mine site as part of the State's air permitting program. BACT would be implemented for emissions sources as required by the BACT analysis.	A BACT analysis would ensure, through the air permitting program, that the project design would incorporate the best available technology that could result in the reduction of project-related air pollutants (emissions). This would support the mitigation of impacts to air quality from project-related emissions.	Mine Site	Construction/ Operations/ Closure	Air Quality; Health and Safety
The main WMP is proposed to be a fully lined facility, with the embankment constructed on competent bedrock and an overall downstream slope of approximately 2H:1V and an overall upstream slope of 3H:1V. In addition to the geomembrane liner, the embankment would include a filter/transition zone. The basin and upstream embankment face would include a layer of materials above the liner to provide ice protection during freezing conditions (PLP 2018-RFI 101).	The main WMP design minimizes instability risks associated with potential undetected weak foundation conditions	Mine Site	Design/ Construction	Geohazards and Seismic Conditions
PLP would establish an independent engineering review panel to review the design, construction, operation, and closure of the tailings and water storage facilities. Such panels typically meet multiple times a year during design and construction to review progress with the design and construction team and annually or biannually during operations with additional meetings if required. The panel	Independent review of embankment planning, design, construction, and operations by dam and tailings experts helps identify potential weaknesses that lead to design, construction, and operations improvements; address closure and	Mine Site	Design/ Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Groundwater Hydrology; Surface Water Hydrology

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
prepares a report of each meeting with its conclusions, recommendations, and ongoing comment register for use by the project owner.	post-closure considerations; and minimize the risk of dam failure and tailings and water spills.			
A trade-off study would be completed in detailed design to determine the preferred closure cover system for the bulk TSF, which would include an evaluation of cover material efficacy, longevity, and maintenance requirements (PLP 2019-RFI 130).	The cover design and long-term performance have implications for reducing infiltration and seepage and enhancing stability of the embankment in post-closure.	Mine Site	Closure	Geohazards and Seismic Conditions; Groundwater Hydrology; Water and Sediment Quality; Spill Risk
Dry closure of the bulk TSF would be implemented to reduce both the likelihood and consequence of potential TSF failure post-closure. • This would be achieved by removing the pond, promoting runoff, limiting infiltration, and allowing for consolidation and long-term internal drainage of the tailings. • Stability and seepage analyses specific to closure conditions would be completed during detailed closure design and updated throughout the latter stages of operations, and would be reviewed by the independent engineering review panel. • If required to achieve drainage and stability goals (maintaining reduced phreatic surface and pore pressures at the embankments), alternative drainage-enhancing features would be considered, such as vertical or horizontal drains (PLP 2019-RFI 130).	Dry closure would eventually result in a stable landform for the bulk tailings, reducing the potential for dam failure and the resulting safety and environmental impacts.	Mine Site	Operations/ Closure	Spill Risk; Water and Sediment Quality; Geohazards and Seismic Conditions
In post-closure, the pit lake would be maintained at a level that promotes long-term hydraulic containment of pit water, protecting site and regional groundwater quality.	Maintaining a groundwater sink would control the flow of groundwater out of the mine site area, and allow for water to be captured and treated prior to discharge.	Mine Site	Closure	Surface Water Hydrology; Groundwater Hydrology; Water and Sediment Quality
The pit lake would be maintained at a level that allows for an inward flow of groundwater while providing for additional storage capacity to allow for treatment downtime due to water treatment plant maintenance or other problems, without over-topping.	Maintaining a buffer in containment capacity, while ensuring maintenance of a groundwater sink, would allow for unplanned operational interruption.	Mine Site	Closure	Surface Water Hydrology; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Both TSF locations and mine facility locations were selected to minimize impacts to spawning habitat in the middle reaches of the SFK and UTC watersheds.	The siting of the TSFs and mine facilities minimize impacts to spawning habitat in the middle reaches of the SFK and UTC watersheds.	Mine Site	Construction/ Operations/ Closure	Fish Values
The layout was designed to consolidate the majority of the site infrastructure in a single drainage, the North Fork Koktuli, and avoid the placement of waste rock, tailings, and primary mine infrastructure in the UTC drainage.	Limiting the affected footprint of the mine site would reduce the geographic extent of impacts.	Mine Site	Construction/ Operations/ Closure	Surface Water Hydrology; Fish Values
The project would use only non-pit quarried rock, or NAG pit waste that is confirmed not to be neutral metal leaching, in site construction. PLP has determined from the characterization of quarry materials planned for use in construction that they contain negligible sulfide minerals, are NAG, and contain trace element contents at levels comparable to globally typical values for unmineralized rock. PLP's primary approach to selecting rock that achieves the objective of meeting water quality criteria for metals and other parameters without treatment of runoff in perpetuity is to source construction materials from the quarries and test the rock operationally to confirm sulfur and element characteristics. During operations, PLP would assume that all waste rock from the pit requires management in the pyritic TSF unless test work (blast hole, drill core, and pit face sampling) and geologic mapping demonstrate that the rock is not potentially acid generating and/or metal leaching and can safely be segregated from the PAG/metal leaching waste rock for use in project construction activities. The State of Alaska would require the final determination of site-specific NP/AP ratio used for separation of rock material to be determined in coordination with the State during the permitting process.	Confirmation and use of NAG material in construction would reduce the risk of impacts to water and sediment quality from ARD.	Mine Site	Construction/ Operations/ Closure	Water and Sediment Quality
The project design uses flattened TSF downstream slopes of 2.6 horizontal:1 vertical to improve PLP's proposed static factor of safety (1.9) beyond the industry norm of 1.5.	Use of flatter slopes on the TSF embankment would increase the factor of safety and reduce the risk of a failure.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Additional geotechnical investigations and detailed assessment of embankment foundation conditions would be completed as design progresses to support refinements of stability and seepage analyses. Future programs would include additional investigation along embankment alignments to further evaluate their location relative to faults, clays, or other weak zones. Potential weak foundation materials or conditions would be mitigated by detailed stability analyses to determine their effect on embankment stability, removal of the materials, or flattening of downstream slopes if required (PLP 2018-RFI 008a; PLP 2019-RFI 006c, 008g, 014b).	Site-specific evaluation of foundation conditions informs stability and seepage analyses and detailed design, and reduces risks to embankment stability and groundwater quality.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Water and Sediment Quality
Additional tailings and engineered filter zone materials testing would be conducted as design progresses, and the results used to validate the bulk TSF seepage analysis and confirm the phreatic surface used in the stability analyses. The additional tailings test work would include index testing (materials classification), slurry settling, air drying, and consolidation, permeability, and strength testing. Durability testing of filter materials would be completed to confirm their suitability for controlling drainage and material migration (PLP 2019-RFI 008h). Refined seepage analyses in detailed design would consider the additional tailings testing, the plan for tailings discharge (e.g., spacing of spigots, discharge time from each point), and a range of sensitivity analyses (PLP 2019-RFI 006c).	Site-specific evaluation of tailings and embankment materials and refined seepage analyses inform the stability analyses and water balance modeling, and reduce risks to embankment stability and water management and treatment.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology; Water and Sediment Quality
Seismic hazard analyses that predict ground-shaking effects on mine site embankments would be updated in final design, incorporating updated ground motion data and models, and using acceleration time-history records from past earthquakes to model deformation from different types of MCEs (PLP 2018-RFI 008c, PLP 2019-RFI 008h).	Incorporation of updated ground motion models into embankment design reduces seismic risk to embankment stability.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Detailed seismic stability and deformation modeling of mine site embankments, including the use of numerical modeling techniques, would be completed during a later design phase to better define embankment displacements in an earthquake (PLP 2018-RFI 008a; PLP 2019-RFI 008g, 008h).	Use of numerical modeling techniques allows refinement of embankment and engineered filter zone design and reduces seismic risk to embankment stability.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
The recency of activity and location of Lake Clark fault splays with respect to mine site structures would continue to be investigated as design progresses, which may include field studies and the examination of additional LiDAR and high-resolution aeromagnetic data in collaboration with Alaska DGGS and USGS (Knight Piésold 2019d; PLP 2019-RFI 139).	The distance and maximum earthquake assigned to faults inform ground shaking predictions, which are incorporated into embankment design so that they withstand impacts from a major earthquake.	Mine Site	Operations	Geohazards and Seismic Conditions; Spill Risk
Additional data would be collected to characterize the hydraulic properties of the bedrock in the vicinity of the interpreted fault mapped along the western margin of the bulk TSF to inform design of the facility.	Avoid impacts to ground and surface water resulting from uncontrolled seepage.	Mine Site	Construction	Groundwater Hydrology; Water and Sediment Quality
Piezometers would be installed in the bulk TSF tailings mass to monitor pore pressures during fill placement, and trigger levels established to monitor the development and dissipation of pore pressures during construction. If excess pore pressures develop adjacent to the upstream edge of the centerline portion of the embankment, fill placement procedures may be modified or stopped in certain locations to allow pore pressures to dissipate (PLP 2019-RFI 008g, 008h).	Embankment stability relies on the control of water levels and pore pressures adjacent to the upstream edge of the embankment to reduce the load on the embankment.	Mine Site	Construction/ Operations	Geohazards and Seismic Conditions; Spill Risk
An OMS manual would outline maintenance and monitoring requirements for the bulk TSF and would be continually updated as required throughout operations and closure. An emergency action plan would be defined as part of the OMS manual that would include maximum operating pond levels for the TSFs and a response plan to be implemented (e.g., adding pumping capacity to reclaim systems, temporarily reducing or stopping tailings discharges) if water levels exceed defined maximum operating levels (PLP 2019-RFI 008h).	Embankment stability relies on the control of water levels to prevent overtopping and high pore pressures in embankment materials.	Mine Site	Operations	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The Monitoring and Adaptive Management Plan would identify how the monitoring could be used to assess impacts from mine operations.	Allow for early detection of any impacts to ground and surface water resulting from mine operations.	Mine Site	Operations	Groundwater Hydrology, Water and Sediment Quality
Water management plans and models would be updated during operations, closure, and post-closure until pit lake conditions reach steady state.	Avoid impacts to ground and surface water resulting from outdated management strategies.	Mine Site	Operations/ Closure	Groundwater Hydrology, Water and Sediment Quality
Long-term monitoring of embankment stability in post-closure would include ongoing surface runoff and seepage monitoring, regular cover inspections, annual dam safety inspections, and inspections conducted in response to specific events (e.g., earthquakes, large storms) (PLP 2019-RFI 130).	Long-term monitoring would minimize the effects of precipitation, seepage, and earthquakes on embankment stability.	Mine Site	Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology
BMPs and design guidelines would incorporate avian protection for all powerlines.	Incorporation of standard BMPs and design guidelines for powerlines would minimize avian impacts.	Mine Site	Construction/ Operations/ Closure	Wildlife Values
Construction laydown areas would be reused as material stockpiles or other storage facilities to minimize project footprint.	Reduces wetlands and vegetation impacts.	Mine Site	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Two separate operations WTPs are proposed to avoid co-mingling mine water and contact water, and optimize treated water quality.	Design and use of multiple WTPs would provide increased efficiency, reduced risk of treatment failure, and an increase in the capacity to manage unplanned interruption in operation or unexpected flow increases.	Mine Site	Operations/ Closure	Water and Sediment Quality
During closure and post-closure, equipment and personnel would be maintained at the mine site to support ongoing water treatment, maintenance, and monitoring activities. Redundant mechanical equipment would be stored onsite and available if any repairs are required (PLP 2019-RFI 130).	Onsite personnel and redundancies in equipment throughout post-closure reduce the risk of a contact release to the environment in the event of an upset condition such as a pump or reclaim pipeline failure.	Mine Site	Closure	Water and Sediment Quality; Spill Risk; Fish Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Excess site water would be treated and released into the Upper Talarik, North Fork Koktuli, and South Fork Koktuli watersheds. Discharge water would be distributed between the three watersheds in a way that optimizes water levels and thereby available downstream fish habitat based on PHABSIM modeling of the three watersheds in consultation with ADF&G. PLP will work with ADF&G to further optimize the project water discharge strategy through state permitting. This could include the evaluation of alternate discharge strategies, discharge locations, or the use of constructed wetlands to further optimize the plan (PLP 2020-RFI 071d).	Minimizes impacts to fish habitat in downstream areas affected by mine-related flow reductions.	Mine Site	Operations	Fish Values; Surface Water Hydrology; Water and Sediment Quality
The project would use pit blasting techniques that minimize the amount of explosives per delay, thereby reducing the overall vibration associated with the blast.	Modifications to the blasting process that reduce vibrations would in turn reduce noise effects.	Mine Site	Operations	Noise
Mining only near surface portions of the deposit reduces strip ratio and eliminates the need for a permanent waste rock storage facility.	Near-surface mining minimizes the permanent footprint and potential waste rock effects on water quality.	Mine Site	Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Water and Sediment Quality
Storage of all PAG and/or metal leaching waste rock in the pyritic TSF and placement of that waste rock back into the open pit at closure improves the site post-closure surface and groundwater quality by removing the requirement for perpetual management of runoff and seepage resulting from a separate aboveground waste rock storage facility. (The open pit would require long-term monitoring and treatment and discharge of water with or without the PAG waste rock.)	Storage of PAG materials in a subaqueous environment during operations and closure would minimize oxidation and acid generation, thereby reducing the potential for development of ARD.	Mine Site	Operations/ Closure	Water and Sediment Quality
Segregation of bulk and pyritic tails and placement of pyritic tails back into the open pit at closure improves the site post-closure surface and groundwater quality by removing the need for perpetual management of seepage from the pyritic TSF, and also removes any potential for post-closure failure of the pyritic TSF. (The open pit would require long-term monitoring and treatment and discharge of water with or without the pyritic tails.)	Final storage of PAG materials in a subaqueous environment would minimize oxidation and acid generation, thereby reducing the potential for development of ARD and removing the potential for embankment failure.	Mine Site	Operations/ Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The pyritic TSF would be a fully lined facility to minimize water quality impacts during operations and facilitate closure by allowing the complete recovery of pyritic tailings for placement back into the open pit.	Placement of a liner below the pyritic TSF would minimize potential impacts on underlying groundwater quality.	Mine Site	Operations/ Closure	Water and Sediment Quality
Liner material specifications for the pyritic TSF and main WMP would be finalized in detailed design, and current industry standard QA/QC monitoring would be used during installation (Knight Piésold 2018b; Piteau Associates 2018a).	Liner selection and installation monitoring would minimize the potential for seepage from defects.	Mine Site	Operations	Water and Sediment Quality; Groundwater Hydrology
The bulk TSF would be designed as a flow-through facility, reducing pore pressures and allowing for improved tailings consolidation, reducing the impacts of a potential TSF failure. Details of engineered filter zone gradations, design flow capacity for underdrains, and QA/QC plans for construction would be developed during detailed design. Operational practices to manage tailings segregation, promote beach development and maintain minimum beach widths, and prevent plugging and hindrance of seepage flow out of the bulk TSF would be identified in a tailings deposition plan included in an OMS manual prior to operations (PLP 2018-RFI 006, 006a; PLP 2019-RFI 006c, 008g).	Reduction of pore water in the tailings impoundment would aid in the development of a more stable landform. Engineered filter zone design specifications and placement of coarse tailings near the embankment are important for reducing the phreatic surface and the risk of internal erosion, and avoiding impacts to embankment stability.	Mine Site	Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
The bulk TSF south and SCP embankments would have an upstream face liner (or low permeability core zone) connected to a grout curtain to contain seepage flow. The depth and lateral extent of the grout curtain would be confirmed during detailed design and ongoing site investigations (PLP 2018-RFI 006a).	Liner and grout curtain would keep contact groundwater from reaching the downgradient resources.	Mine Site	Construction/ Operations/ Closure	Groundwater Hydrology; Water and Sediment Quality; Geohazards and Seismic Conditions
Excess pond water from the bulk and pyritic TSFs would be pumped to the main WMP to enhance embankment stability and reduce the potential for TSF failure or spills resulting from overtopping.	Reduction of pore water and maintenance of a safety buffer in TSF storage would reduce the risk of embankment failure and overtopping.	Mine Site	Operations/ Closure	Spill Risk; Health and Safety
Treated water would be discharged through buried chambers designed to provide energy dissipation, erosion control, and freeze protection.	Minimizes impacts to streams from erosion and resuspension of suspended solids at the proposed discharge locations.	Mine Site	Operations/ Closure	Fish Values; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Settling ponds, bale check dams, and silt fences would be used to prevent sediment from reaching downstream waterbodies.	Use of sediment capture processes and measures would reduce the inflow of sediment to waterbodies, and reduce the effects on water quality and aquatic habitat.	Mine Site	Construction/ Operations	Water and Sediment Quality; Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Fish Values
The pyritic TSF liner would be protected from damage during waste rock placement by placing processed materials (sand and gravel) on top of the liner to minimize the risk of damage from equipment.	Placement of protective materials would reduce likelihood of liner damage and leakage to groundwater.	Mine Site	Operations	Water and Sediment Quality
Detailed characterization of quarry bedrock and open pit overburden materials, materials balance, and a pit pre-stripping plan would be completed during detailed design to confirm material availability and segregate different material types to be stockpiled for construction and closure. If required, additional rockfill materials would be sourced by lowering the base elevation of the quarries, and additional low permeability materials would be sourced from embankment foundation excavations, other mine site preparations, or deconstruction of certain facilities at closure (PLP 2018-RFI 015a, PLP 2019-RFI 129).	Site-specific evaluation of quarry and pit overburden material avoids the need for additional footprint for material sources, and would confirm that sufficient material is available and suitable to meet the specifications for embankment zones, liner bedding, and bulk TSF closure cover design that minimize the migration of contact water to the environment.	Mine Site	Construction/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Water and Sediment Quality; Groundwater Hydrology
Underdrains would be constructed beneath the main WMP and pyritic TSF to achieve hydraulic containment of groundwater and promote seepage collection and drainage beneath the liner systems (Knight Piésold 2019c; PLP 2019-RFI 109e). The aggregate underdrains would be oversized to account for higher than expected seepage flows or potential cementation of the materials during the life of the facility (Knight Piésold 2019c; PLP 2019-RFI 109e).	Underdrains and hydraulic containment would minimize the likelihood of contaminant migration away from these facilities.	Mine Site	Operations/ Closure	Water and Sediment Quality; Groundwater Hydrology
Closure of the WMPs and pyritic TSF would include groundwater monitoring in the facility footprints after closure for contaminated water that may have leaked through the liners to shallow groundwater. If required, impacted groundwater would be collected in wells and sent to the pit lake (Knight Piésold 2018b) for as long as needed to meet applicable regulatory requirements.	Prevent impacts to groundwater quality.	Mine Site	Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
In the event of a tailings spill, a variety of remedial actions would be implemented to address health and safety concerns, such as recovery of spilled tailings, repair of erosion damage, downstream water quality monitoring, etc. (Knight Piésold 2018o, 2018p).	Reduce the long-term potential for TSS and sedimentation, ARD and ML from spilled tailings; and rehabilitate downstream areas.	Mine Site	Operations/ Closure	Water and Sediment Quality; Spill Risk; Fish Values
Groundwater levels surrounding the pit would be monitored throughout closure to determine if the control elevation would need to be adjusted to prevent groundwater outflow from the pit (Knight Piésold 2018n).	Maintaining groundwater gradient toward the pit to prevent the potential for migration of contaminated groundwater out of the mine site.	Mine Site	Operations/ Closure	Water and Sediment Quality
Groundwater levels would be monitored during operations in piezometers along the ridge and downstream of the bulk TSF embankment, and operational rules established to maintain hydraulic containment. If seepage through the ridge is detected, contingencies such as relief wells and/or seepage recovery wells would be implemented (Knight Piésold 2018n).	Monitoring would confirm hydraulic containment beneath the bulk TSF and allow adaptive management if groundwater levels indicate potential loss of hydraulic containment at the bulk TSF.	Mine Site	Operations/ Closure	Water and Sediment Quality
Monitoring of groundwater conditions would be conducted around the pit to confirm that hydraulic containment is maintained.	Avoid impacts to groundwater and surface water near the pit resulting from undetected seepage away from the pit.	Mine Site	Closure	Groundwater Hydrology; Water and Sediment Quality
During detailed design of WTPs, additional process water and mass balance modeling, heat transfer engineering, and pilot plant test work would be performed to provide updates to water quality predictions in support of APDES permitting (PLP 2019-RFI 021h).	Additional modeling and pilot plant testing would further evaluate the feasibility of WTP processes, assess maintenance requirements, reduce uncertainties, and refine discharge water quality predictions.	Mine Site	Design/ Operations	Water and Sediment Quality, Fish Values
During closure WTP planning, likelihood, and potential impacts associated with the events listed below would be assessed and potential design contingencies would be identified to accommodate them if warranted (PLP 2020-RFI 071d). • Pit wall failure resulting in lake destratification or mixing, requiring treatment of water with higher concentrations.	Upset conditions in WTP operations and pit lake containment.	Mine Site	Closure	Groundwater Hydrology, Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• Major earthquake that could alter groundwater flow conditions under which hydraulic containment is maintained, potentially requiring increased pumping rates. • Failure of major WTP components exacerbated by remoteness, weather, or unforeseen conditions that require repairs lasting longer than the 1-year estimate of lake level rise to reach loss of containment (see Appendix K4.17, Groundwater Hydrology).				
Several adaptive management strategies would be employed in the design and operations of the WTPs: sizing with more hydraulic capacity than the predicted maximum inflows; having a backup treatment train at each WTP; monitoring to identify influent conditions that could trigger additional treatment capacity; adding iron to WTP sludge disposed in the pyritic TSF to prevent selenium redissolution; and installation of additional trains and WTP building expansion if needed (PLP 2019-RFI 021e, HDR 2019g).	Adaptive management strategies reduce the likelihood of WTP discharges not meeting water quality standards, and minimize the buildup of excess recirculated WTP waters that do not meet standards in on-site storage facilities.	Mine Site	Design/ Operations/ Closure	Water and Sediment Quality, Fish Values
Conduct the following evaluations of WTP processes during design engineering and permitting: • Further evaluate proposed treatment solutions to confirm the nature and potential for remobilization of precipitation solids. • Further evaluate conditions in the pyritic TSF and the potential for remobilization of salt mass to validate treatment assumptions. • Further evaluate the proposed removal efficiencies for various constituents to fully assess proposed treatment solutions; in particular, review the use of biological treatment technologies for selenium removal.	Avoid impacts to water quality resulting from water treatment plant discharges that do not meet approved water discharge requirements.	Mine Site	Construction	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The following adaptive management steps would be implemented with regard to the WTPs: • If proposed treatment strategies for managing TDS treatment and salt buildup in the pyritic TSF prove to be ineffective, modify the WTPs with additional unit processes to maintain approved discharge requirements. • Further evaluate whether engineering and construction for such significant changes to the treatment processes can be completed within the 3-year period of available mine site water storage capacity (PLP 2019-RFI 021h).	Avoid impacts to water quality resulting from water treatment plant discharges that do not meet approved water discharge requirements.	Mine Site	Operations	Water and Sediment Quality
To detect changes to water quality and its effects to fish and wildlife, water quality would continue to be monitored on a regular basis until the mine reclamation is complete. Results would be reported to the State of Alaska in compliance with permit requirements and management plans.	Avoid impacts resulting from undetected releases of process contacted water to surface and groundwater.	Mine Site	Construction/ Operations/ Closure	Water and Sediment Quality; Fish Values; Wildlife Values
WET testing on effluent, WET trigger limits, and response actions would be implemented as follows (PLP 2020-RFI 071d): • Use of standardized WET testing procedures and species for testing at project outfalls, unless otherwise directed by ADEC • Work with ADEC on identifying procedures for the implementation of WET testing that best meet agency and project requirements. • Incorporate WET testing results into the project AMP, and appropriate responses would be implemented if any testing, including WET testing, identifies problems associated with the discharges. • Work with ADEC and ADF&G through the state permitting process to identify specific testing requirements for the project.	Toxic effects on aquatic organisms.	Mine Site	Operations	Water and Sediment Quality; Fish Values; Wildlife Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• Work with ADF&G prior to construction to implement a biomonitoring program. The value of developing bioaccumulation factors would be evaluated at that time. • Biomonitoring results would be incorporated into the project AMP; appropriate responses would be implemented if any testing, including biomonitoring, identifies problems such as evidence of mercury or selenium buildup.				
To confirm the ability of the bulk tailings to segregate, additional test work would be conducted during the design phase and through the State dam safety permitting process to confirm the settling characteristics of the tailing's solids (PLP 2020-RFI 071d).	Instability of the bulk TSF embankment.	Mine Site	Design	Spill Risk
The project would not have a secondary gold recovery plant that uses cyanide, thereby eliminating the need to use cyanide on the project.	Elimination of cyanide from the mining process eliminates the potential for the release of cyanide to the environment, either from spills during transportation or from residual cyanide in tailings/contact water.	Mine Site/ Transportation Corridor	Operations	Health and Safety; Water and Sediment Quality; Spill Risk; Fish Values
Hydrocarbon concentration and related compounds would be measured in surface and groundwater during the periodic water quality monitoring events where appropriate as identified in the project monitoring plans.	Monitor for potential spills to minimize impacts to water quality resulting from hydrocarbon spills.	Mine Site/ Transportation Corridor	Construction/ Operations/ Closure	Water and Sediment Quality
Bear denning surveys would be updated prior to construction.	Minimize impacts to denning brown bears resulting from project activities.	Mine Site/ Transportation Corridor	Construction	Wildlife Values
PLP would follow BMPs with respect to powerline design and placement to minimize the potential for bird collisions. This could include the use of flight diverters and other deterrent devices.	Minimize impacts to birds resulting from power infrastructure required for the project.	Mine Site/ Transportation Corridor	Construction	Wildlife Values
Interim seeding and other BMPs would be used to address surface runoff and erosion from overburden stockpiles during operations.	Prevent sediment from being transported into surrounding wetlands and waters and impacting water quality and aquatic life.	Mine Site	Operations	Fish Values; Water and Sediment Quality, Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
During reclamation, slopes would be contoured to blend with surrounding topography where feasible, and erosion control measures would be implemented to stabilize slopes	Minimize visual impacts post-closure by mimicking local undisturbed conditions. Promote plant growth and reduce water runoff and sedimentation.	Mine Site	Closure	Vegetation, Aesthetic Resources, Fish Values; Water and Sediment Quality, Wetlands and Other Waters/Special Aquatic Sites
PLP would implement measures that may include the use of dust suppressants to reduce dust from the bulk TSF during and after closure, until the tailings can be permanently capped.	Reduce fugitive dust emissions and resultant impacts to air quality.	Mine Site	Operations/ Closure	Air Quality; Health and Safety
Non-toxic palliatives/dust BMPs would be used to reduce fugitive dust.	Avoid potential impacts to air and water quality resulting from the use of toxic palliatives.	Mine Site/ Transportation Corridor	Construction/ Operations/ Closure	Air Quality; Water and Sediment Quality; Health and Safety
The design of the lake ferry (relative to using standard tug/barge) significantly reduces the risk of grounding or sinking, thereby reducing the risk of any kind of spill.	Reduces the potential for and magnitude of potential releases to Iliamna Lake.	Transportation Corridor	Operations	Spill Risk
Use of diesel electric propulsion for the ferry reduces noise impacts and air emissions.	Use of a diesel electric propulsion system would reduce the noise output and air emissions.	Transportation Corridor	Operations	Noise; Air Quality
The project would work with communities (and supply funding) to provide for the marking and maintenance of snowmachine trails between communities across Iliamna Lake when lake ice is thick enough to support such traffic (specific to Alternative 1 and Alternative 2 and variants).	Marked and maintained snowmachine trails provide a safe route for local residents when traveling to other communities or to reach subsistence areas.	Transportation Corridor	Operations	Subsistence; Environmental Justice; Transportation and Navigation
Identified high-traffic crossings of the access road would be evaluated for the incorporation of crossing controls such as mandatory stop signs or other traffic control measures.	Improve public safety by reducing the potential for accidents at high-use crossings.	Transportation Corridor	Construction	Transportation and Navigation
PLP would signpost and maintain road crossings for ATV or snowmachine use wherever the access road intersects existing trails.	The crossings would be marked and maintained to avoid impacting the ongoing use of existing trails used by ATVs and snowmachines.	Transportation Corridor	Operations	Transportation and Navigation

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
PLP would work with the State of Alaska and LPB to address road improvement and maintenance costs arising from PLP's use of the existing section of road between the Newhalen/Iliamna airport and the PLP-constructed mine access road.	Project use of the existing road north of the Newhalen/Iliamna airport may require road upgrades and additional road maintenance. The road is currently maintained by the State of Alaska, and this measure would avoid additional costs accruing to the State from PLP's use of the road.	Transportation Corridor	Construction/ Operations/ Closure	Transportation and Navigation
Fuel delivery barges would be double-hulled to reduce spill risk.	Double-hulled barges reduce the frequency of oil spills and the quantity of oil released.	Transportation Corridor/Port	Construction/ Operations/ Closure	Spill Risk
All project-related vessel traffic would be restricted to 10 knots or less when west of the vertical line 153°15′0″ W (Kamishak Bay) to minimize the potential for impacts with marine wildlife.	Controlled speeds reduce the potential for strikes.	Transportation Corridor/Port	Construction/ Operations/ Closure	Threatened and Endangered Species
Provide a response and recovery vessel in the event that the ferry breaks down.	Further reduce the potential for spills associated with a ferry grounding.	Transportation Corridor	Operations	Spill Risk
The following measures are detailed in the NMFS Biological Assessment (Appendix H) and summarized herein. Measures that are already listed elsewhere (such as spill response measures in Table 5-2) are not repeated below. These measures are preliminary, and not considered final until issuance of a biological opinion by the NMFS. • The project would employ PSOs to monitor shutdown exclusion zones during project construction activities that produce underwater noise levels above harassment or injury take thresholds. • To mitigate for construction noise impacts to cetaceans and pinnipeds during construction, the Applicant would develop and implement a 4MP. Details of the 4MP include the use of PSOs, ramp-up procedures, monitoring of zones, and others.	Minimize impacts to threatened and endangered species resulting from project construction and operational activities.	Transportation Corridor	Construction/ Operations	Threatened and Endangered Species

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• Blasting in Iliamna Bay above the high tide line for construction of the Diamond Point port access road would be timed to coincide when tides are at or near minimum elevation to avoid in-water transfer of sound. • Vessel speeds would be limited to 10 knots in lower Cook Inlet north of Augustine Island to mitigate potential vessel strike with marine mammals. The mooring systems and components of the anchor cable would be annually inspected each fall after the close of the Cook Inlet salmon setnet fishery to ensure they are in good working order. Any debris caught on the cables would be removed and properly disposed of at that time.				
The following measures are detailed in the USFWS Biological Assessment (Appendix G) and summarized herein. For measures that are already listed elsewhere (such as spill response measures in Table 5-2), they are not repeated below. These measures are preliminary, and not considered final until issuance of a biological opinion by the USFWS. • The project would employ PSOs to monitor shutdown exclusion zones during project construction activities that produce underwater noise levels above harassment or injury take thresholds for northern sea otter. • To mitigate for construction noise impacts to sea otters, the Applicant would develop and implement a 4MP. Details of the plan include the use of PSOs, ramp-up procedures, monitoring of 984-foot exclusion zones around fill placement activities, and others. • Vessel speeds would be limited to 10 knots for all project construction vessels operating inside the northern sea otter critical habitat.	Minimize impacts to threatened and endangered species resulting from project construction and operational activities.	Transportation Corridor	Construction/ Operations	Threatened and Endangered Species

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• During operations, supply barges, fuel barges, and concentrate bulk vessels would travel at their normal cruising speeds when entering lower Cook Inlet, but would reduce speeds to less than 10 knots when entering sea otter foraging habitat (delimited by the 66-foot depth contour). All lightering barges would operate at speeds less than 10 knots. • Guide cables would not be used to secure the communications tower to minimize avian collision risk. • Develop a lighting plan to reduce construction and operation lights that might attract eiders or implement lighting that might assist eiders in early detection of structures, including: - PLP would follow USFWS best practices for communication tower lighting by avoiding or minimizing the use of lights or using flashing light options that comply with FAA requirements. - Any light stanchions or equipment on the causeway/wharf during the first summer of construction would be lowered or removed before winter if not in use, thereby reducing or eliminating eider collision risk. - Use lighting options for the causeway and jetty that minimize bird attraction (such as orienting the lighting downward) while still providing enough light for safe operational activities. - Mitigation lighting for anchored bulk carriers would also be examined. • Measures to reduce accidental spills include use of marine radar to avoid other vessels and accurately approach the wharf.				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• The concentrate conveyor would be fully enclosed to contain dust and shed snow. The barge loader would be fitted with a mechanical dust collection system, and each barge would have a cover system to minimize fugitive dust and protect the concentrate from precipitation. During lightering operations, the barge's internal system would retrieve and convey concentrate to the bulk carrier via a self-discharging boom conveyor. The boom would be fully enclosed and equipped with a telescoping spout, and would have mechanical dust collection to prevent spillage of fugitive dust.				
PLP would perform a site-specific tsunami runup analysis at the port.	Avoid the potential for impacts to human health and safety and spills resulting from tsunami inundation of the port site.	Transportation Corridor	Construction/ Operations/ Closure	Geohazards and Seismic Conditions, Spill Risk
Coarse granular road base construction materials would be used and additional culverts installed, where technically feasible, to facilitate the flow of water through segmented wetlands impacted by project road construction (PLP 2019-RFI 071b).	Allows for the flow of water through wetlands segmented by road construction, minimizing overall impacts, and minimizing changes to the structure and function of the aquatic ecosystem.	Transportation Corridor	Construction	Wetlands and Other Waters/Special Aquatic Sites
Fill placed below the HTL would consist of select rock fill and armor rock protection. Select rock fill would consist of durable, coarse, free-draining material with minimal fines to minimize sedimentation.	Minimize impacts to wetlands and aquatic resources resulting from impaired flow and sediment release during road construction and operations.	Transportation Corridor	Construction/ Operations/ Closure	Water and Sediment Quality; Surface Water Hydrology; Fish Values, Wetlands and Other Waters/Special Aquatic Sites
PLP would implement measures in the design and construction of culverts/bridges in jurisdictional wetlands or open waters to attenuate flood flows, prevent extreme ponding or drying, maintain floodplain functions, maintain aquatic life movement, maintain sediment transport, and other functions provided by wetlands and open waters, including installing floodplain culverts, permeable roadbeds, or oversized culverts.	Minimize impacts to wetlands and aquatic resources resulting from impaired water movement and flow.	Transportation Corridor	Construction/ Operations/ Closure	Water and Sediment Quality; Surface Water Hydrology; Fish Values, Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A typical specification for shot rock that would be used in permeable roadbeds is: Maximum stone size to be 30-inch, and not more than 20% shall be smaller than 6-inch. Material passing the No. 200 sieve shall not exceed 2% by weight. Rock to be competent and resistant to degradation during placement and compaction. Equalization culverts would be installed and strategically located to facilitate surface water movement within wetland areas. Culverts would be set with the invert below grade or slightly below base water level to maintain equal water levels on both sides of a fill. In area with a natural slope and surface water flow, the culvert would be set a minimum of 30 percent of the culvert diameter below grade, and set with a grade to match the natural ground surface. Equalization culverts used in intertidal areas to maintain ebb and flow of marine waters would be sized and set to promote a near-natural rate of fill and draining of enclosed marine areas. To the extent possible, marine equalization culverts would be designed to allow passage of marine aquatic life. Culvert material used would be selected to endure marine conditions.				
Construction of roads at wetlands/stream crossings would be kept to the narrowest possible footprint.	Minimize impacts to wetlands by minimizing the fill footprint.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology; Fish Values, Wetlands and Other Waters/Special Aquatic Sites
The road includes crossing rivers at a right angle where feasible to minimize impacts in the riparian areas.	Crossing rivers at right angles reduces wetlands, vegetation, and stream impacts and reduces erosion potential.	Transportation Corridor	Construction	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
There would be no relocation of active stream channels in the transportation corridor.	Avoid impacts to wetlands and aquatic resources resulting from impaired water movement and flow.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology; Fish Values, Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Streambank restoration would incorporate bioengineering techniques (e.g., root wads, bundled water-tolerant willows and other measures outlined in the Streambank Revegetation and Protection: A Guide for Alaska [ADF&G 2005]), where possible, to maintain natural velocities, prevent bank erosion, and promote healthy riparian system functions that are important to aquatic species.	Minimize impacts to aquatic resources resulting from project construction activity by restoring streambanks in a manner that promotes a healthy riparian system.	Mine Site/ Transportation Corridor	Construction/ Operations/ Closure	Fish Values; Wetlands and Other Waters/Special Aquatic Sites
Material sidecast from the pipeline trench along the transportation corridor above HTL and outside the road corridor would be segregated by top organics and subsurface layers, and would be replaced back in the trench in the order that they were removed.	Promote restoration of wetlands and natural conditions in areas of temporary impact associated with project construction.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology, Wetlands and Other Waters/Special Aquatic Sites
Material sidecast from trenching of the pipelines along the transportation corridor would be placed in the footprint of the permanent fill or in uplands.	Minimize impacts to wetlands by minimizing the fill footprint.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology, Wetlands and Other Waters/Special Aquatic Sites
To avoid constricting the natural channel and to allow connectivity of the floodplain stream crossings would meet the USFWS culvert design guidelines for ecological function (USFWS 2020).	Avoid impacts to aquatic resources resulting from impaired flow and impaired fish passage.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology; Fish Values, Wetlands and Other Waters/Special Aquatic Sites
Culverts and bridges would be designed to optimize fish passage, and the project would use BMPs for design, construction, and maintenance.	Designing culverts and bridges at fish-bearing streams to optimize fish passage would minimize impacts on fish and fish habitat.	Transportation Corridor	Construction	Fish Values
Road designs, including bridges and culverts, would be completed and construction would be monitored by professional engineers with appropriate experience. Bridge designs would minimize the footprint below the OHW mark to the extent practicable, given the load design criteria. Hydrologic surveys would be completed prior to final design to confirm they accommodate for flow under normal and flood conditions.	Avoid impacts to wetlands, waterbodies, and aquatic resources resulting from impaired flow.	Transportation Corridor	Construction	Water and Sediment Quality; Surface Water Hydrology; Fish Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Culverts along project roads would be monitored for fish passage, and PLP would develop a maintenance plan for culverts that may become blocked by debris or ice or hydrological changes.	Avoid impacts to fish resulting from impaired passage due to malfunctioning culverts.	Transportation Corridor	Construction/ Operations/ Closure	Fish Values
PLP would work with the boroughs, landowners, and the state to develop a road management agreement that provides rules for how the road would accommodate use by borough residents and businesses.	This can result in decreased costs for goods and services for borough residents.	Transportation Corridor	Operations/ Closure	Transportation and Navigation
To minimize infestation and spread of spruce bark beetle, timber along rights-of-way for roads and pipelines would be cut in the fall, and the logs used before the next spring. All slash and logs 4 inches in diameter and larger would be disposed of by burning, burying, chipping, or peeling. Stumps would be cut as low as possible. Trees next to the right-of-way would be examined for beetle attacks in late summer following cutting. If trees are infested, they would be removed. Care would be taken to avoid scarring trunks with mechanical equipment, severing roots, altering drainage patterns, or severely compacting the soil.	Avoid and minimize the spread of invasive species as a result of project activities, and resultant impacts to native species, waters and other aquatic resources.	Transportation Corridor	Construction	Vegetation
Material sites for the transportation and natural gas pipeline corridor would be sampled for ARD and metal leaching potential prior to development during detailed design. Material sites that have the potential for ARD or metal leaching would not be used. Fill materials from the sites used in construction would contain negligible sulfide minerals, be NAG, and contain trace element contents at levels comparable to globally typical values for unmineralized rock. PLP's approach to selecting rock, achieving the objective of meeting water quality criteria for metals and other parameters without the need to treat runoff in perpetuity, is to test the rock prior to construction to confirm sulfur and element characteristics.	The confirmation and use of NAG and non-metal-leaching material in construction would reduce the risk of impacts to water and sediment quality.	Transportation Corridor/Natural Gas Pipeline	Construction	Water and Sediment Quality
Material site design and reclamation and closure plans would incorporate measures to make the sites blend with the natural conditions after closure.	Minimize long-term visual impacts and provide additional habitat for wildlife in the reclaimed material sites.	Transportation Corridor	Construction	Aesthetic Resources, Wildlife Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Use of a ferry to cross Iliamna Lake reduces the road length and associated wetlands impacts and other impacts.	Reducing the total access road length would minimize wetlands and vegetation impacts relative to a longer access road around Iliamna Lake.	Transportation Corridor	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
The ferry crossing would be monitored for evidence of smolt/fish impacts. If birds are observed feeding on disoriented fish, require the ferry to use deterrents such as water spray or streamers to reduce bird predation.	Avoid impacts to smolt resulting from the Iliamna Lake ferry.	Transportation Corridor	Operations	Fish Values; Wildlife Values
Road connections to communities enhance opportunities for local employment while residing at home.	Road connections to communities allow residents to gain employment with the project without relocating. This helps reduce the amount of outmigration in the region.	Transportation Corridor	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice
Road connections to communities enable the use of existing airport facilities, eliminating the need to construct and operate parallel facilities.	Reduces wetlands and vegetation impacts from constructing additional airports.	Transportation Corridor	Construction/ Operations/ Closure	Transportation and Navigation; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Road and ferry terminals are sited to avoid private (non-ANCSA) lands, environmentally sensitive areas, archaeological resources, and areas of known high subsistence use where possible.	Careful siting of project features can be used to avoid impacts to environmentally sensitive areas, archaeological resources, and areas of known high subsistence use.	Transportation Corridor	Construction/ Operations/ Closure	Cultural Resources; Subsistence; Land Ownership, Management, and Use; Environmental Justice
Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry, and eliminates the potential for concentrate dust.	Reduces the potential for elevated metals in soils along the transportation corridor.	Transportation Corridor	Operations	Spill Risk; Air Quality
All reagents would be shipped in their original, approved-for-shipping containers. These original containers would be placed inside steel shipping containers at the factory or consolidation terminal and shipped to the mine site prior to unloading from the steel shipping containers.	Eliminates the potential for the release of reagents to the environment from spills during transportation.	Transportation Corridor	Construction/ Operations/ Closure	Spill Risk; Transportation and Navigation
The use of fuel isotainers to transport diesel fill reduces spill potential while trucking and on the ferry.	Reduces the potential for diesel spills.	Transportation Corridor	Operations	Spill Risk; Transportation and Navigation

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The implementation of wildlife safety measures along the transportation corridor to influence animal behavior and minimize human-wildlife interactions includes: • Any wildlife injuries or mortalities would be immediately reported as appropriate. The carcasses of any road-killed animals would be removed and disposed of in a timely manner so that they do not serve as an attractant to bears or other wildlife. • Vegetation along the right of way would be managed (trimming of shrubs and trees) to reduce attractiveness for large mammals by reducing browsing quality.	Reduces the probability of wildlife being struck by vehicles.	Transportation Corridor	Construction/ Operations/ Closure	Wildlife Values
PLP would evaluate the use of wildlife detection systems at identified high-traffic animal crossings. Animal detection systems use sensors to detect large animals that approach the road. Once a large animal is detected, warning signals are activated to inform the drivers that a large animal may be on or near the road at that time.	Avoid and minimize impacts to wildlife.	Transportation Corridor	Operations	Wildlife Values; Health and Safety
Winter management of snow berms along roadways would include periodic breaks or cleared areas in snow berms to allow wildlife to get off the road during the approach of oncoming vehicles.	Avoid and minimize impacts to wildlife.	Mine Site/ Transportation Corridor	Construction/ Operations/ Closure	Wildlife Values
Ferry bilge water would be collected in holding tanks at the ferry terminals and transported to one of the water treatment plants located at the mine site or Amakdedori port.	Collection and transport of the bilge water to treatment plants at the mine site or port avoids discharge to Iliamna Lake, as previously proposed.	Transportation Corridor	Construction/ Operations/ Closure	Water and Sediment Quality; Fish Values
PLP will review and identify applicable strategies and procedures outlined in the Biosecurity Plan for Alaska Maritime National Wildlife Refuge (Flynn et al. 2020); relevant strategies would be integrated into the project ISMP if appropriate. Examples of relevant information identified for inclusion in PLPs ISMP to date include:	Protect against the introduction and spread of organisms that have the potential to threaten native natural resources and ecology.	Port	Construction/ Operations/ Closure	Wildlife Values; Vegetation

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
• Use of vehicle diagrams and checklists (or similar) for inspection/cleaning of vehicles and heavy machinery. • Use of rodent traps in appropriate locations. • Proper procedures for food waste disposal to prevent germination and growth of non-native species. • Appropriate cleaning of equipment used by project environmental staff and consultants conducting surveys in the region.				
Stability analyses for the caisson dock and trestle would be completed prior to final design, and include additional geotechnical investigation; further evaluation of the Bruin Bay fault to refine ground-shaking estimates, liquification assessment, and analysis of seismic loading; bearing capacity; settlement; and sliding resistance. The additional analyses would be conducted in accordance with accepted industry standards/codes and subject to independent review (Knight Piésold 2019d; PLP 2020-RFI 160).	Stability analyses would minimize damage to the port structures from major earthquakes and ice/wind/wave loading. Additional studies would confirm maximum ground shaking estimates and seismic loading to be incorporated into port design, which would minimize damage to facilities and spill risk in the event of a major earthquake.	Port	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology
The elevation of the port terminal and dock at Amakdedori was raised to +40 feet MLLW to account for tsunami runup. The elevation would be revisited in final design based on site-specific analysis of maximum tsunamis from earthquake and volcanic debris flow sources. The concrete containment barrier wall around the fuel tank farm would be designed to protect against maximum tsunami run-up (PLP 2019b, 2019-RFI 112, 112a).	Structures would be designed to be above the maximum tsunami elevation and/or withstand tsunami forces, resist uplift and scour, and protect against debris impacts and fuel spills.	Port	Construction/ Operations	Geohazards and Seismic Conditions; Water and Sediment Quality; Spill Risk
Operational measures would be employed to protect personnel in the event of a tsunami, such as early warning systems, vertical evacuation structures, and operational procedures and training on when to move to higher ground and secure critical equipment (PLP 2019-RFI 112).	Safety risk to personnel would be reduced in the event of a tsunami.	Port	Geohazards,	Geohazards and Seismic Conditions; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Operational procedures would be in place for vessels to cease lightering operations and move to safer locations in deeper water if a tsunami warning is issued or volcanic debris flow activity is predicted (PLP 2019-RFI 112).	Procedures would reduce the risk of spills and safety impacts on lightering and ore cargo vessels in the event of a tsunami or volcanic activity.	Port	Operations	Geohazards and Seismic Conditions; Spill Risk; Water and Sediment Quality; Health and Safety
Lightering of concentrate at Amakdedori port eliminates the need for dredging a deepwater channel.	Would reduce benthic habitat disturbance and prevent increased turbidity from dredging. Would also eliminate the need to construct an onshore dredged material stockpile.	Port	Construction	Water and Sediment Quality
Natural gas–generated shore power would be provided for vessels that are docked at the port.	Providing natural gas–generated shore power to vessels while they are in port, rather than having the vessels idle, would reduce NO_x at the port.	Port	Operations	Air Quality
Co-location of the road and natural gas pipeline alignment reduces wetlands and other impacts and removes the need for a separate corridor.	Co-location of project facilities reduces the overall footprint and minimizes impacts to wetlands and vegetation.	Transportation Corridor/Natural Gas Pipeline	Construction/ Operations	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
The road/pipeline alignment and material sites were designed to minimize impacts to wetlands.	Siting the road/pipeline alignment to minimize fill in wetlands minimizes the overall project impact on wetlands.	Transportation Corridor/Natural Gas Pipeline	Construction/ Operations	Wetlands and Other Waters/Special Aquatic Sites
The gas pipeline would be attached to bridge crossings, removing the need for HDD under major river crossings, removing the potential for frac-out.	Reduction in the number of required HDD crossings would reduce the potential for frac-out and associated water and sediment quality impacts.	Transportation Corridor/Natural Gas Pipeline	Construction	Surface Water Hydrology; Fish Values; Water and Sediment Quality
Detailed HDD plans would be developed during detailed design for all HDDs that are required, and would be in place prior to construction commencement. The HDD plans would ensure that all HDD work is done in compliance with applicable regulations, and would outline measures to be undertaken to avoid the potential for a frac-out, and measures to respond to a frac-out should one occur.	Carefully managed HDD activities would reduce the potential for impacts to water and sediment quality and existing water supply wells.	Transportation Corridor/Natural Gas Pipeline	Construction	Surface Water Hydrology; Groundwater Hydrology; Fish Values; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
PLP would conduct geotechnical studies at HDD sites.	Reduce the risk of a frac-out and resulting impacts to waters.	Transportation Corridor/Natural Gas Pipeline	Construction	Geohazards and Seismic Conditions, Water Quality
Water used for hydrostatic testing of the pipeline would be obtained from and discharged back to sources local to the section of pipeline being tested, thereby minimizing the potential for the mobilization of invasive species.	Limiting movement of water to localized areas would reduce the potential for transportation of invasive species.	Natural Gas Pipeline	Construction	Water and Sediment Quality; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
The pipeline would use HDD to access deep water from the compressor station area to avoid shoreline impacts from trenching on the Kenai Peninsula.	Use of HDD to construct the portion of natural gas pipeline from onshore Kenai Peninsula to deep water in Cook Inlet would reduce the potential for erosion or other shoreline impacts.	Natural Gas Pipeline	Construction	Soils; Geohazards and Seismic Conditions
PLP would conduct further evaluation of the closest private well to the HDD route at Anchor Point (see Figure 3.17-16), designated well 53874 by ADNR (2016): • Contact owner to confirm status, use, and pumping rate at the well; • Survey location of well compared to HDD final design route; • Modify the HDD design to address any concerns identified during engineering; and • Monitor well flow and quality during all construction activities in the area. PLP would provide and implement (if necessary) contingency plans to provide a comparable source of water in the event groundwater flow or quality at the well is altered as a result of HDD installation.	Reduce the potential for impacts to drinking water resulting from the Anchor Point HDD.	Natural Gas Pipeline	Construction	Groundwater Hydrology, Water and Sediment Quality
Additional engineering analyses would be conducted during pipeline detailed design to further evaluate effects and potential mitigation plans for geohazards such as ground shaking, liquefaction, volcano debris flows, tsunamis, shallow bedrock, and scour (NanaWP and IntecSea 2019a).	The additional analyses and design would minimize potential damage to the pipeline from earthquakes and other geohazards.	Natural Gas Pipeline	Construction/ Operations	Geohazards and Seismic Conditions; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The natural gas pipeline would be equipped with a leak detection system. In the event of a gas release, shut-off valves would be closed to limit the extent of the release. An automatic shut-off system would be installed on the east side of Cook Inlet, near the compressor station. On the west side of the Inlet, at the port site, either an automatic or manual shut-off system would be installed. Port personnel would always be on site and able to respond with manual shut-off if needed.	Reduces duration of natural gas release from potential failure of pipeline.	Natural Gas Pipeline	Operations/ Closure (if pipeline remains operational)	Water and Sediment Quality; Spill Risk; Fish Values
The following measures are detailed in the Draft EFH Assessment (Appendix I) and summarized below. The measures are specifically developed for construction activities and would be implemented by PLP during construction of the project to minimize impacts to EFH. These measures are preliminary and not considered final until the conclusion of EFH consultation. Mine Site Construction: • PLP would develop a plan to prevent fish passage into habitats proposed for removal prior to construction. • Necessary in-water activities would be scheduled when the fewest species/least vulnerable life stages of federally managed species are present, or consistent with permit stipulations. • Spillage of dirt, fuel, oil, toxic materials, and other contaminants into EFH would be minimized through the preparation of spill prevention plans, as appropriate. • Effects of sedimentation on fish habitat would be minimized through implementation of required stormwater management plans and BMPs. Road Building and Maintenance: • Where reasonable, bridges rather than culverts for stream crossings were proposed. Culverts would be sized, constructed, and maintained to match the gradient and width of the stream to	Minimize impacts to EFH.	Mine Site/ Transportation Corridor/Port/ Natural Gas Pipeline	Construction	Fish Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
accommodate design flood flows, and large enough to provide for migratory passage of adult and juvenile fishes. Culvert design will use the culvert guidelines contained in the USFWS Culvert Design Guidelines for Ecological Function (USFWS 2020). • Bridge abutments would be designed to minimize disturbances to stream banks and placed outside of the floodplain whenever possible. • Erosion control measures would be specified in road construction plans as applicable. • Side-casting of road materials would be avoided on native surfaces and into streams. • Native vegetation would be used in stabilization plantings. • Seasonal restrictions would be used on instream activities to avoid impacts to habitat during species critical life stages (e.g., spawning and egg development periods), as required by permit stipulations. • Water diversion methods, under the guidance of the ADF&G, could be employed where in-stream work could obstruct passage of fish for longer than 48 hours. Juvenile and adult fish passage facilities would be incorporated on all water diversion projects (e.g., fish bypass systems) as required by permit. • Roadways and associated stormwater collection systems would be properly maintained as required by stormwater management plans and design requirements. • Blasting for road construction in Iliamna Bay would be done during low tides. Material Sites: • Materials sites would include a reclamation plan and be restored as appropriate prior to closure.				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Water Use: • Water diversion and impoundment projects would be designed to create flow conditions that provide for adequate fish passage, particularly during critical life stages. Low water levels that strand juveniles and dewater redds would be avoided unless authorized by water use permits. Juvenile and adult fish passage facilities would be incorporated on all water diversion projects (e.g., fish bypass systems) as required by permit. Screens at water diversions on fish-bearing streams would be installed, as needed. • Water quality parameters necessary to support fish populations would be maintained by monitoring and adjusting water temperature, sediment loads, and pollution levels in compliance with APDES. • Appropriate flow velocity and water levels to support continued stream functions would be maintained consistent with water use authorization. Discharge of Fill Material: • Fill materials would be tested and be in the neutral range of 7.5 to 8.4 pH. In marine waters; this pH range would maximize colonization of marine organisms. Excessively alkaline or acidic fill material would not be used. Only clean fill would be used. • Only select fill with minimal fines would be used for construction of the road in Iliamna Bay. Vessel Operations, Transportation and Navigation: • Riparian buffers would be left in place to help maintain water quality and nutrient input, where practicable. • Vessels would be operated at sufficiently low speeds to reduce wake energy, and no-wake				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
zones would be designated near sensitive habitats. • BMPs would be implemented to prevent or minimize contamination from ship bilge waters, accidents, shipyard work, and non-point source contaminants from upland facilities related to vessel operations and navigation. • Catchment basins would be used for collecting and storing surface runoff from upland repair facilities, parking lots, and other impervious surfaces to remove contaminants prior to delivery to any receiving waters. • The terminal near Diamond Point would be designed to include practical measures for reducing, containing, and cleaning up petroleum spills. • Oil spill response equipment would be staged at strategic locations. Pile-Driving: • When impact hammers are required due to seismic stability or substrate type, piles would be first driven as deep as possible with a vibratory hammer and then with the impact hammer to drive the pile to its final position. • As required, methods to reduce the SPLs and SELs include, but are not limited to the following: - Because the sound produced has a direct relationship to the force used to drive the pile, use a smaller hammer to reduce sound pressure. - Use a hydraulic hammer if an impact driving cannot be avoided. The force of the hammer blow can be controlled with hydraulic hammers; reducing the impact				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
force will reduce the intensity of the resulting sound. - Use bubble curtains or other sound attenuation devices to reduce the acoustical footprint. Pipeline Installation: • An HDD would be used for the shore transition at Anchor Point where there is a steep erodible bluff adjacent to the intertidal zone. • Excavated wetlands would be backfilled with either the same or comparable material capable of supporting similar wetland vegetation. Impacted sites would be restored to original marsh elevations. Topsoil and organic surface material, such as root mats, would be segregated as practicable and returned to the surface of the restored site. After backfilling, erosion control BMPs would be implemented as needed. • The pipeline would be buried in areas where scouring or wave activity may expose it. • Inactive pipelines that remain in place, would be properly pigged, purged, filled with seawater, and capped. • Install silt curtains or other barriers whenever possible to reduce turbidity and sedimentation near the project site. • Attach pipelines to existing bridges. Invasive Species: • Uphold fish and game regulations of the Alaska Board of Fisheries (AS 16.05.251) and Board of Game (AS 16.05.255), which prohibit and regulate the live capture, possession, transport, or release of native or exotic fish or their eggs. • Adhere to regulations and use BMPs outlined in the State of Alaska Aquatic Nuisance Species				

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Management Plan (ADF&G 2002) and Management Plan for Invasive Northern Pike in Alaska (ADF&G 2010). • Require vessels brought from other areas over land via trailer to clean any surfaces (e.g., propellers, hulls, anchors, fenders) that may harbor non-native plant or animal species. Bilges should be emptied and cleaned thoroughly by using hot water or a mild bleach solution. These activities should be performed in an upland area to prevent the introduction of non-native species during the cleaning process.				

Notes:
4MP = Marine Mammal Monitoring and Mitigation Plan
ACC = Alaska Administrative Code
ADEC = Alaska Department of Conversation
ADF&G = Alaska Department of Fish and Game
ADNR = Alaska Dam Safety Program
ADSP = Alaska Dam Safety Program
ANCSA = Alaska Native Claims Settlement Act
APDES = Alaska Pollutant Discharge Elimination System
ARD = acid rock drainage
ARMP = Aquatic Resources Monitoring Plan
AS = Alaska Statute
ATV = all-terrain vehicle
BACT = best available control technology
BMP = best management practice
CFR = Code of Federal Regulations
CRMP = Cultural Resources Management Plan
EDRR = early detection and rapid response
EFH = essential fish habitat
EPA = US Environmental Protection Agency
ESCP = Erosion and Sediment Control Plan
FAA = Federal Aviation Administration
FDCP = Fugitive Dust Control Plan
GPS = Global positioning system
HACCP = hazard analysis and critical control point
HDD = horizontal directional drilling
HTL = high tide line
ISMP = Invasive Species Management Plan
LiDAR = light detection and ranging
LPB = Lake and Peninsula Borough
MCE = maximum credible earthquake
MLLW = mean lower low water
NAG = non–acid-generating
NMFS = National Marine Fisheries Service
NOx = oxides of nitrogen
NP/AP = neutralization potential/acid-generating potential
O&M = Operations and Maintenance
OHW = ordinary high water
OMS = operations, maintenance, and surveillance
PA = Programmatic Agreement
PAG = potentially acid-generating
PCP = Project Communications Plan
PILT = Payment in Lieu of Taxes
PLP = Pebble Limited Partnership
PSD = Prevention of Significant Deterioration
PSO = Protected Species Observer
QA/QC = Quality Assurance/Quality Control
RCP = Reclamation and Closure Plan
RFI = Request for Information
SCR = selective catalytic reduction
SEL = sound exposure level
SFK = South Fork Koktuli
SPL = sound pressure level
SWPPP = Storm Water Pollution Prevention
TDS = total dissolved solids
TSF = tailings storage facility
TSS = total suspended solids
USACE = US Army Corps of Engineers
USFWS = US Fish and Wildlife Service
UTC = Upper Talarik Creek
VGP = Vessel General Permit
VIDA = Vessel Incident Discharge Act
WET = whole effluent toxicity
WMP = water management pond
WTP = water treatment plant

Source: PLP 2020-RFI 071c, PLP 2020e

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
Mining and milling schedule modification.	Increased the milling rate from 160,000 to 180,000 tons per day. The peak mining rate was reduced from 90 to 70 million tons per year. The total tons mined increased from 1.2 billion to 1.44 billion tons. Project life remained unchanged at 20 years, but mining occurs over all 20 years, not just the first 14 years.	Removed the need for a large low-grade ore stockpile facility, which would generate significant amounts of poor-quality runoff water and seepage. Reduced the peak mining rate and associated mobile equipment and emissions impacts.	May 2018
Separated the bulk and pyritic tailings storage facilities.	Located the pyritic TSF closer to the pit in the location of the previous low-grade ore storage facility.	Facilitated the transfer of PAG waste and pyritic tailings back into the pit at closure for long-term storage below the pit lake. Eliminated the need for long-term water treatment and facility maintenance associated with the pyritic TSF by allowing for removal of the facility at closure. Eliminated all potential for post-closure failure of the pyritic TSF.	May 2018
Enlarged the main water management pond.	The size of the facility was increased, and it was relocated to an area with sufficient space. The pond was resized to allow for water storage for the wettest 20-year period in the available record plus the Probable Maximum Flood event.	The change: 1) Added significant buffering capacity to the water management system by increasing available water storage space outside of the TSFs. 2) Removed any need to store excess water in the TSFs, thereby further reducing any potential for TSF failures during operations. 3) Provided additional certainty for the water supply during dry conditions. 4) Provided backup storage in the event of unplanned water treatment plant shut downs.	May 2018
Natural gas pipeline onshore diameter increased and point of origin changed.	The diameter of the onshore pipeline was increased from 10 to 12 inches. Previously, only the marine and lake sections were 12 inches in diameter. The pipeline point of origin was moved south to the compressor station location.	The diameter was increased to: 1) Provide additional gas capacity to support the increased mill throughput and to allow sufficient capacity for gas to be supplied to surrounding communities, if requested.	May 2018

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
		2) Remove the need for a mid-point compressor with associated environmental impacts at the port site. The origin was relocated, because the existing pipeline running south on the Kenai Peninsula has sufficient capacity to support the project gas offtake requirement. The change avoided the impacts associated with running a second pipeline along the highway.	
The Amakdedori port design and operating concept modification.	The design and operating concept was modified from a deepwater design with a dredged channel that could dock bulk carriers directly to a barge port with offshore lightering of concentrate.	The concept was changed to: 1) Remove the requirement for dredging the channel and subsequent maintenance dredging over 20 years with all the associated offshore disturbance. 2) Remove the requirement to store 20 million cubic yards of dredged material at the port site. 3) Remove the need for the bulk carrier to navigate a narrow in-shore channel, which was identified as an area of safety concern in early scoping comments.	May 2018
Offshore gas pipeline route modification.	A 12-mile segment of the pipeline was rerouted to avoid a previously unknown shipwreck.	The shipwreck site has the potential to be considered a historic property. Relocation of the pipeline to avoid the wreck did not result in an increase in any other impacts associated with the pipeline.	August 2019
Provided additional detail on the anchor design concept for the lightering points.	Following work completed in 2019, PLP confirmed that no drilling would be required to install the anchors at the lightering locations.	To removes the potential for acoustic or turbidity impacts associated with the placement of drilled anchors.	August 2019
Amakdedori port design updates.	The port's overall area and location did not change, but the causeway and dock construction methodology were changed from earthfill with steel sheet pilings to a concrete-caisson-supported design. The port runway location was moved slightly southward to avoid all wetlands.	The enhancements were included in response to the DEIS analysis and public and agency comments received regarding the proposed port design. The caisson-supported dock design: 1) Avoids impeding or modifying current patterns and water flow by allowing for the free flow of water along the shore through the caissons.	August 2019

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
	The terrace elevation was increased to allow for tsunami runup.	2) Reduces the in-water construction time period to 1 year. 3) Significantly reduces impacts to WOUS. 4) Allows longshore passage for fish and land animals in the intertidal zone under the causeway structure. 5) Avoids noise impacts to marine mammals, including threatened and endangered species, associated with driving sheet and round pile. 6) Reduces impacts to Cook Inlet beluga whale and northern sea otter critical habitat. 7) Avoids suspended particulates/turbidity by removing the need to place fill directly into the marine environment.	
Relocated the Sid Larson Creek crossing.	The location of the crossing was moved 800 feet downstream and the bridge approaches were realigned.	The relocation reduced impacts to WOUS and avoided springs on the hill side. The change aligned the crossing perpendicularly with the river, reduced the crossing length, and removed the need for an in-river pier. The change reduced impacts to the creek.	August 2019
Relocated the north ferry terminal and the northern portion of the site access road and pipeline alignment.	Relocated the north ferry terminal from near the mouth of UTC to Eagle Bay. The access road to the site was switched to the alignment evaluated for Alternative 2 of the DEIS. The gas pipeline alignment was changed to come ashore near the community of Newhalen and join the road alignment before the Newhalen River crossing.	The relocation of the road and ferry terminal was done primarily in response to landowner comments and comments received on the DEIS expressing concerns around the use of the UTC location. No similar concerns were expressed regarding the use of Eagle Bay. The relocation: 1) Removed the need for a spur road to Iliamna and reduced the amount of road construction required. 2) Reduced impacts to WOUS and the overall project footprint. 3) Further reduced impacts to the UTC drainage. The change to the pipeline alignment facilitates community access to the gas pipeline.	August 2019

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
Relocated the open pit water management pond.	The open pit water management pond was reoriented and moved westward by about 1,000 feet.	The relocation: 1) Significantly reduces impacts to WOUS. 2) Opens up an additional 0.35 mile of anadromous fish habitat. 3) Reduces construction-related impacts to the SFK.	August 2019
Relocated the South Fork Koktuli discharge point and associated road.	The discharge pipeline and road were relocated to the western flank of the SFK valley and the discharge point was relocated to the northwestern side of Frying Pan Lake.	The relocation: 1) Avoids fragmenting the wetlands in the SFK valley and significantly reduces impacts to WOUS. 2) Minimizes impacts to the SFK aquatic ecosystem.	August 2019
Relocated the North Fork Koktuli discharge point.	The NFK discharge point was relocated approximately 1 mile upstream.	The relocation mitigates flow impacts in the main channel of the NFK due to the construction of the main WMP.	August 2019
Optimized site overburden storage facility locations.	Overburden storage facilities near the quarries, pit, TSFs, and WMPs were optimized for size and location.	The relocations were done to: 1) Optimize the size 2) Reduce impacts to WOUS 3) Facilitate access and use	August 2019
Added temporary river crossing locations for construction.	Temporary crossings were identified for construction at: • Amakdedori Tributary • First Creek • Gibraltar Creek • Newhalen • Eagle Bay Creek • Sid Larson Creek—Upper • Sid Larson Tributary • Talarik Creek—Upper • Trickle Creek • Upper East Kokhanok • Venturi Creek	The crossings are required for construction access and were added as a result of additional engineering work performed in the summer of 2019.	August 2019

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
Optimized locations and sizes for mine support infrastructure.	Locations and sizes were optimized for: • Laydown areas • Seepage collection and sediment ponds • Personnel camps • Temporary stockpiles • Site access gate • Administrative buildings • Water treatment plants • Explosive storage • Site roads	All the optimizations were the result of additional engineering work and are in the same mine area. The objective was to: 1) Minimize overall impacts to WOUS 2) Provide additional design detail to the footprint 3) Improve constructability and operability	August 2019
Optimized material site and overburden stockpile footprints along the access corridors.	Material site footprints were reduced, and some locations were modified. Overburden stockpiles were added at the ferry terminals.	Locations and sizes were optimized as a result of additional engineering work completed. The change was implemented to: 1) Reduce the overall project footprint 2) Reduce impacts to WOUS 3) Reduce associated construction impacts	August 2019
Optimized Amakdedori offshore pipeline route construction temporary impact footprint.	The temporary impact footprint for pipeline construction in Cook Inlet and Iliamna Lake was updated.	The corridor was optimized as a result of additional engineering and survey work completed.	August 2019
Relocated the Newhalen River bridge.	The permanent bridge across the Newhalen River was moved approximately 0.75 mile downstream. Approximately 2.5 miles of approach road and one material site were relocated to accommodate the change.	Avoid impacts to archaeological resources identified at the original crossing location during the 2019 field season.	October 2019
Modified the location of the Diamond Point port and dock facility and dredged channel.	The dock facility and dredged channel and turning basin were moved approximately 0.75 mile to the north in Iliamna Bay. The onshore facility was moved approximately 2.5 miles north. The gas pipeline and fiber-optic cable right-of-way location was updated to reflect the change in port location.	1) Minimized the requirement for new road construction in the intertidal zone by approximately 0.5 mile and reduced permanent impacts below the High Tide Line. 2) Avoided impacts to a private land parcel and Native Allotment #AKAA 004225B.	April 2020
Removed the alternate lightering location west of Augustine Island for the Diamond Point port alternative.	The alternate lightering location west of Augustine Island was removed from PLP's application.	Reduce potential additional impacts to the sea otter population in Kamishak Bay resulting from the longer lightering barge route and the location of the lightering point outside the more heavily used traffic corridor into Iliamna Bay.	April 2020

Table 5-3: Applicant's Project Enhancements and Optimizations

Change	Description	Reason	Date
Diamond Point port design updates.	The causeway and dock construction methodology were changed from earthfill with steel sheet pilings to a concrete caisson supported design.	The enhancements were included in response to the DEIS analysis and public and agency comments received regarding the proposed port design. The caisson-supported dock design: 1) Avoids impeding or modifying current patterns and water flow by allowing for the free flow of water along the shore through the caissons. 2) Reduces the in-water construction time period to 1 year. 3) Significantly reduces impacts to WOUS. 4) Allows longshore passage for fish and land animals in the intertidal zone under the causeway structure. 5) Avoids noise impacts to marine mammals, including threatened and endangered species, associated with driving sheet and round pile. 6) Reduces impacts to Cook Inlet beluga whale and northern sea otter critical habitat. 7) Avoids suspended particulates/turbidity by removing the need to place fill directly into the marine environment.	April 2020
Added an access road to the Pedro Bay airport.	Added an approximately 0.5-mile access road from the transportation corridor to the Pedro Bay airport.	Provide road access to the Pedro Bay airport.	May 2020

Notes:

DEIS = Draft Environmental Impact Statement
NFK = North Fork Koktuli
PAG = potentially acid-generating
SFK = South Fork Koktuli
TSF = tailings storage facility
UTC = Upper Talarik Creek
WOUS = Waters of the US

Source: PLP 2020-RFI 143a

5.2.3 Additional Mitigation Identified for Agency Consideration

Mitigation discussed in this section is used to inform agencies with individual permit reviews and authorizations as an outcome of the NEPA process. Mitigative measures identified or recommended during the NEPA process have been compiled, and will be considered by the USACE and other agencies as part of their permit decisions to further minimize project impacts. However, it is important to note that measures identified during the NEPA process may not be required by the federal agencies in their RODs. For example, the Council on Environmental Quality guidance uses terms such as "reasonable, practicable, and appropriate" when considering potential mitigation and permit conditions. In addition, there may be potential mitigation measures identified through the public process that are not under the federal agencies' authority to require as a condition to a permit. It is also possible that some of the individual mitigation measures listed in this section may be adopted by PLP and incorporated into project plans prior to the finalization of permit decisions. Furthermore, the federal agency decision-makers (USACE, Bureau of Safety and Environmental Enforcement, and US Coast Guard) may continue to refine mitigation subsequent to completion of the EIS, and prior to issuance of their ROD; and other state permitting agencies may do likewise during their permit review processes. Additional mitigation identified during that process may include project modifications that are in part considered feasible from a cost and constructability perspective. The ROD would identify those mitigation measures that the agency has committed itself to adopt, and explain why any other practicable mitigation measures have not been adopted.

It should also be recognized that many of the permits required for approval of the Pebble Project are under the jurisdiction of the State of Alaska. Specific agencies may have clear compliance standards and requirements for monitoring of environmental conditions; future risks associated with unexpected conditions may also be addressed in specific permitting authorizations. Potential measures put forward for consideration in the EIS are not intended to dictate conditions of state permit approval, but to identify potential measures for consideration as applicable. In assessing whether or not to adopt a mitigation measure in a project permit, agencies may further take into account whether they have adequate resources to enforce mitigation or a source of funding to do so, and measurable metrics in the mitigation measure to assess compliance and performance.

Appendix M1.0 includes a list of all mitigation measures suggested by the USACE and cooperating agencies, and those identified by the public during the NEPA process. All measures are assessed based on the following factors, with the goal of disclosing the likelihood that the measures would be adopted by the applicant or implemented as a condition in a state, federal, or local permit (CEQ 1981) by the responsible agencies as part of their permit decisions following completion of the NEPA process.

1. Effective: assessment of the measure's effectiveness in reducing the project-related impact. This factor also considers whether implementation of the measure is supported by the effects analysis in the EIS.
2. Potential Jurisdiction: assessment of potential agency jurisdiction/authority to require the measure.
3. Reasonable: assessment of feasibility from a technical and economic standpoint. This assessment also factors in common sense for what is reasonable. For example, a mitigation measure may not be reasonable if there are other technically and economically feasible mitigation measures that would be just as effective at reducing a potential impact, or if the extra expense is not supported by the effects analysis in the EIS.

See Appendix M1.0 for an assessment of measures identified during the NEPA process.

5.3 AVOIDANCE, MINIMIZATION, AND COMPENSATORY MITIGATION UNDER THE CLEAN WATER ACT

Regulatory standards and criteria for mitigating impacts to aquatic resources that result from work authorized by permit under the USACE Regulatory Program were established on April 10, 2008 by the USACE and the EPA in a rule titled "Compensatory Mitigation for Losses of Aquatic Resources; Final Rule" (33 CFR Part 332 [USACE] and 40 CFR Part 230 [EPA]) (referred to herein as the 2008 mitigation rule). The rule emphasizes the sequence to be followed for mitigating impacts to aquatic resources. All practicable steps to avoid and/or minimize impacts to aquatic resources must be taken before proposing compensatory mitigation to offset project impacts. Once all efforts to avoid and minimize impacts have occurred, remaining impacts may be offset by compensatory mitigation.

Compensatory mitigation can be a critical tool to help the federal government meet the longstanding national goal of "no net loss" of wetland acreage, function, and value, and may be required to ensure that activities requiring a permit comply with CWA Section 404(b)(1) Guidelines. Compensatory mitigation is the restoration (reestablishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances, preservation of aquatic resources to offset unavoidable adverse impacts. Compensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular Section 404 permit, and may be achieved by purchasing credits through mitigation banks or in-lieu fee (ILF) programs, by permittee-responsible mitigation (PRM), or by a combination of the three.

USACE and EPA signed an MOA in June 2018 concerning the mitigation sequence for wetlands in Alaska under Section 404 of the CWA (USACE and EPA 2018). In this MOA, the agencies recognize that specific to the State of Alaska:

- Avoiding wetlands may not be practicable where there is a high proportion of land in a watershed or region that is jurisdictional wetlands.
- Restoring, enhancing, or establishing wetlands for compensatory mitigation may not be practicable due to the limited availability of sites and/or technical or logistical limitations.
- Compensatory mitigation options over a large watershed scale may be appropriate given that compensation options are frequently limited at a smaller scale.
- Where a large proportion of land is under public ownership, compensatory mitigation opportunities may be available on public land.
- Out-of-kind compensatory mitigation may be appropriate when it better serves the aquatic resource needs of the watershed.
- Applying a less rigorous permit review for small projects with minor environmental impacts is consistent with the Section 404 program regulations.

The MOA further specifies that although the USACE considers compensatory mitigation options in the order of: 1) purchase of credits from an approved mitigation bank; 2) purchase of credits from an approved ILF program; and 3) completion of a permittee-responsible mitigation project, in many parts of Alaska, the first two options may not be available or may not provide the appropriate number of resource type of credits to offset the proposed project impacts. In this case, some form of permittee-responsible mitigation is the only option, and permittee-responsible mitigation developed using a watershed approach is preferred.

Mitigation would be considered throughout the NEPA and permitting processes. USACE would complete a public interest review and a 404(b)(1) evaluation for compliance with the CWA prior to issuance of the ROD. Specific mitigation conditions would be determined following completion

of the environmental review, and would be included in the ROD for any permit that may be issued. The sections below summarize PLP's steps to avoid and/or minimize impacts, and further compensate for unavoidable impacts to waters of the US (WOUS).

5.3.1 Applicant's Proposed Avoidance and Minimization

PLP's description of measures to avoid and minimize impacts to wetlands and other WOUS, air quality, wildlife and aquatic habitat, areas of cultural significance, and areas of known subsistence use is included in Tab 23 of the Pebble Project Department of the Army Application for Permit POA-2017-271 (PLP 2020f). Notable measures associated with the protection of wetlands/waters and aquatic resources are listed below. Many of these measures are also captured in Section 5.2, Avoidance and Minimization under NEPA.

Protection of Wetland and Waters

- PLP has designed the project to minimize impacts to wetlands and with reclamation in mind. At closure wetlands will be restored where practicable.
- PLP and all contractors will develop and implement SWPPPs in accordance with State guidelines and follow BMPs for stormwater management to minimize the transfer of sediment and other pollutants in stormwater associated with project activities. The SWPPP will be in place prior to construction commencement.
- PLP will develop and implement an ESCP for the project and follow BMPs for erosion and sediment control. The ESCP will be in place prior to construction commencement.
- The construction area (temporary disturbance footprint) associated with the project will be marked, using silt fencing (as appropriate), flagging or other methods, prior to brush clearing and construction activities.
- Only clean non-pit quarried rock, or non-acid-generating (NAG) pit waste rock that is confirmed not to be neutral metal leaching will be used for project site construction.
- The bulk tailings will only be stored in uplands and wetlands behind the bulk TSF embankments and seepage water will be collected and reused or treated prior to discharge.
- Detailed characterization of all quarry bedrock and material sites (mine site and transportation corridor) and open pit overburden materials will be completed prior to construction.
- All potentially acid-generating (PAG) and/or metal leaching waste rock will be stored in the pyritic TSF and placed back into the open pit at closure.
- The pyritic TSF will be a fully lined facility to minimize water quality impacts during operations and facilitate closure by allowing the complete recovery of pyritic tailings for placement back into the open pit.
- Construction laydown areas will be reused as material stockpiles or other storage facilities to minimize project footprint.
- Construction of roads at wetlands/stream crossings will be kept to the narrowest possible footprint.
- The road will use crossing rivers at a right angle where feasible to minimize impacts in the riparian areas.
- There will be no relocation of active stream channels in the transportation corridor.
- The material sites were located to avoid wetlands to the maximum extent feasible.

- The natural gas pipeline will use horizontal directional drilling (HDD) to access deep water from the compressor station area to avoid shoreline impacts from trenching on the Kenai Peninsula.
- Materials sidecast from trenches above Hight Tide Line (HTL) and outside the transportation corridor will be segregated by top organics and subsurface layers and will be replaced back in the trench in order which they were removed.
- Material sidecast from trenching of the pipelines above HTL will be placed within the footprint of the permanent fill or in uplands.
- Trench plugs will be used where required for pipeline installation to minimize the flow of water through the trench and the associated impacts to wetlands.
- Fill placed below the HTL will consist of select rock fill and armor rock protection. Select rock fill will consist of durable, coarse free-draining material with minimal fines to minimize sedimentation.
- No dredged material from the Diamond Point port will be stored below the HTL or discharged to other WOUS.
- Road designs, including culvert placement and design will be completed and construction will be monitored by professional engineers with appropriate experience. Culverts will be monitored over the project life to identify any problems, and any identified will be addressed promptly.
- Road designs, including bridges will be completed and construction will be monitored by professional engineers with appropriate experience. Bridge designs will minimize the footprint below the OHW mark to the extent practicable given the load design criteria. Hydrologic surveys will be completed prior to final design to confirm they accommodate for flow under normal and flood conditions.
- PLP will implement measures in the design and construction of the access road in jurisdictional wetlands or open waters to attenuate flood flows, prevent extreme ponding or drying, maintain floodplain functions, maintain aquatic life movement, maintain sediment transport, and other functions provided by wetlands and open waters. Measures will include installing floodplain culverts, the use of permeable roadbeds for road construction in wetlands, and the use of oversized culverts where appropriate.
- Equalization culverts will be installed and strategically located to facilitate surface water movement within wetland areas.
- A typical specification for shot rock that would be used for the permeable roadbeds in wetlands is: Maximum stone size to be 30 inch and not more than 20 percent shall be smaller than 6 inch. Material passing the No. 200 sieve shall not exceed 2 percent by weight. Rock must be competent and resistant to degradation during placement and compaction.
- Water used for hydrostatic testing of pipelines will be obtained from and discharged back to sources local to the section of pipeline being tested, thereby minimizing the potential for the mobilization of invasive species.
- Two separate operations water treatment plants (WTPs) will be constructed to avoid co-mingling mine water and contact water, and optimize treated water quality.
- PLP will use non-toxic dust palliatives (i.e., substances applied to a road surface) to reduce airborne dust impacts to wetlands and waters.
- PLP will implement measures, that may include the use of dust suppressants, to reduce dust from the bulk TSF during and after closure until the tailings can be permanently capped.

- PLP will wash heavy equipment to reduce dust that collects on the wheels, body, and undercarriage of heavy equipment.
- The concentrate conveyor will be fully enclosed to contain dust and shed snow.
- The barge loader will be fitted with a mechanical dust collection system and each barge will have a cover system to minimize fugitive dust and protect the concentrate from precipitation. During lightering operations, the barge's internal system will retrieve and convey concentrate to the bulk carrier via a self-discharging boom conveyor. The boom will be fully enclosed and equipped with a telescoping spout and will have mechanical dust collection to prevent spillage of fugitive dust.
- PLP will measure hydrocarbon concentrations and related compounds in surface and groundwater during the periodic water quality monitoring events where appropriate as identified in the Project monitoring plans.

Protection of Aquatic Resources

- Culverts and bridges will be designed to optimize fish passage, and BMPs will be used for design, construction, and maintenance.
- To avoid constricting the natural channel and to allow connectivity of the floodplain transportation corridor stream crossings will meet the USFWS guidelines: (Culvert Design Guidelines for Ecological Function, US Fish and Wildlife Service Alaska Fish Passage Program, Revision 5, February 5, 2020)
- Culverts along project roads will be monitored for fish passage and any problems identified will be corrected promptly.
- Blasting during construction will be done following the guidelines established in the 2013 ADF&G Technical Report (No. 13-03) Alaska Blasting Standard for the Proper Protection of Fish (Timothy 2013).
- Blasting adjacent to tidal waters will be timed to coincide when tides are at or near minimum elevation.
- Excess site water will be treated and released into the Upper Talarik, North Fork Koktuli, and South Fork Koktuli watersheds. Discharge water will be distributed between the three watersheds in a way that optimizes water levels and available downstream fish habitat based on PHABSIM modeling of the three watersheds in consultation with Alaska Department of Fish and Game.
- Treated water will be discharged through buried chambers designed to provide energy dissipation, erosion control, and freeze protection.
- PLP will consult with ADF&G during permitting to evaluate the potential for further optimizing discharge locations.
- PLP will use pit blasting techniques that minimize the amount of explosives per delay, thereby reducing the overall vibration associated with the blast.
- To detect changes to water quality and its effects to aquatic life, water quality will continue to be monitored on a regular basis until the mine reclamation is complete. Results will be reported to the State of Alaska in compliance with permit requirements and management plans.

5.3.2 Applicant's Proposed Compensatory Mitigation

Construction of the project would require the dredge or discharge of fill material into WOUS. This includes direct impacts (permanent and temporary) to wetlands and other waters associated with construction of the mine, transportation corridor, port, concentrate and return water pipelines, fiber

optic cable, and natural gas pipeline (see Chapter 4, Section 4.22, Wetlands and Other Waters/ Special Aquatic Sites). USACE has asked the Applicant to evaluate a full suite of available and practicable compensatory mitigation options to comply with the provisions of the 2008 mitigation rule and the 2018 MOA. PLP has prepared a draft Compensatory Mitigation Plan (CMP) (PLP 2020-RFI 056a) outlining their proposed approach for compensatory mitigation to offset environmental losses resulting from unavoidable impacts to aquatic resources (see Appendix M2.0). The need for compensatory mitigation and the determination if the Applicant's proposal adequately offsets aquatic resource losses would be determined as part of the ROD.

PLP is proposing compensatory mitigation for the project's unavoidable permanent impacts to WOUS and aquatic resource functions in the watersheds. PLP is not proposing compensatory mitigation for the project's temporary impacts, because those WOUS and functions would be expected to recover in the short-term after restoration. PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) describes the process and measures PLP proposes to implement to restore the temporarily impacted areas on land.

According to PLP's draft CMP, the project is not in the service area of an approved bank or ILF program with appropriate credits available. In the absence of mitigation banks or an ILF program in the watersheds, 33 CFR Part 332.3 (b)(4) states that "permittee-responsible mitigation is the only option." Three PRM options are identified in the 2008 mitigation rule and the MOA. PRM projects using a watershed approach consider the needs of the watershed for advancing and sustaining aquatic resource functions, such as the need for specific habitat enhancements, water quality improvements, or flood control, and are most favored. On-site, in-kind PRM projects replace the specific wetland functions and values that are impacted at the same location as the fill site. Off-site, out-of-kind PRM projects focus on preserving, creating, restoring, and enhancing WOUS with different functions and values than the impacted WOUS.

A watershed analysis was completed as part of the draft CMP to characterize conditions in an analysis area (hereafter, CMP analysis area) that encompasses approximately 3,709,208 acres, and includes 15 HUC 10 watersheds. The majority of the CMP analysis area is undeveloped, and wetlands and aquatic resources have little to no degradation. The principal sources of land development in the CMP analysis area are those associated with residential housing, fishing and hunting cabins and lodges, sanitation systems, community energy, and the limited transportation infrastructure associated with villages. Development accounts for less than 1 percent of land use in the CMP analysis area.

Results of the watershed analysis suggest that: 1) wetlands and other waters in the CMP analysis area are abundant and in a natural state; 2) the existing threats to aquatic resources in the affected watersheds are minimal and arise from impacts associated with contaminated sites, community sanitary systems, fish passage barriers, and marine debris; and 3) discharges of fill from the project would result in the loss stream miles of documented Pacific salmon habitat in the Koktuli River Headwaters Watershed, and Pacific salmon are an important component of the local aquatic environment and economies. These factors were considered by PLP in planning compensatory mitigation options for the proposed project.

The draft CMP evaluates compensatory mitigation options based on the results of the watershed analysis, and concludes that: 1) restoration as re-establishment opportunities in the CMP analysis area are unavailable because development in the area is limited and all existing developments are in use or needed; 2) restoration as rehabilitation may be possible through repair, enhancement, or replacement of underperforming sanitation systems that would result in water quality improvements to WOUS, and through removal of marine debris to restore coastal marine wetlands and marine habitat by removing wildlife hazards; and 3) establishment of wetlands is not highly desirable, because wetlands are abundant in the CMP analysis area. A full list of

potential compensatory mitigation projects evaluated can be found in Attachment 2 of PLP's draft CMP.

PLP prepared draft PRM plans identifying their proposed compensatory mitigation projects to offset unavoidable losses to aquatic resources. The proposed PRM plans are summarized below.

PRM Plan for Water Quality Improvement Projects—The goal of the water quality improvement PRM plan (see Appendix M2.0, Attachment 3) would be to enhance water quality in the affected watersheds by improving the quality of discharges from wastewater treatment systems in drainages with identified needs. PLP proposes to perform wastewater management improvements in the three communities adjacent to the project: Kokhanok, Newhalen, and Nondalton. PLP would perform the required mitigation in coordination with the affected communities and would retain responsibility for ensuring that the required compensatory mitigation activities are completed and successful.

PRM Plan for the Removal of Pacific Salmon Passage Barriers—The goal of this PRM plan (see Appendix M2.0, Applicant's Draft Compensatory Mitigation Plan, Attachment 4) would be to rehabilitate 8.5 miles of Pacific salmon habitat by replacing culverts that limit the passage of juvenile and/or adult Pacific salmon. PLP proposes to implement the PRM through ad hoc payments to private individuals, and non-governmental or governmental organizations (partners) that would perform the culvert replacement activity, which would provide the compensatory mitigation for PLP. PLP would retain responsibility for ensuring that the required mitigation activities are completed and successful, as well as any long-term management of the compensatory mitigation project. A list of potential culvert replacement projects is included in the PRM plan.

PRM Plan for Marine Debris Removal at Kamishak Bay—The goal of this PRM plan (see Appendix M2.0, Applicant's Draft Compensatory Mitigation Plan, Attachment 5) would be to address the threat of marine debris to coastal ecosystems in Kamishak Bay by removing and properly disposing of marine debris from 7.4 miles of coastal habitat where large amounts of debris have been documented by PLP personnel and contractors. Marine debris would be removed from the supratidal (the area above spring high tide) and intertidal zones. Approximately 3.3 miles are on State-owned public lands and the remaining 4.1 miles are in the McNeil River State Game Refuge.

5.4 MONITORING

PLP proposes to use monitoring measures through the construction, operations, and closure of the proposed project to assess predicted project impacts and the effectiveness of mitigation measures (PLP 2018k). The monitoring requirements would specify the collection of the appropriate data to fully assess impacts and the effectiveness of the required mitigation. If mitigation is not proven to be effective, then adaptive management would be used to identify, assess, and implement changes to the required mitigation measures, in consultation with the appropriate regulatory authorities.

Permit-specific mitigation and monitoring requirements would be developed in consultation with the various agencies as the project advances through the permitting phase. PLP would operate the proposed project in compliance with all federal, state, and local requirements, including all mitigation and monitoring requirements identified through the NEPA and permitting processes. For example, plans prepared to support the state permitting process, such as a Plan of Operations, Waste Management Plan, and Reclamation Plan, and their associated approvals (described above) would identify specific monitoring requirements and/or the requirement for the development of a monitoring plan specific to that approval. These documents are updated on a regular interval (typically 5 years) as the authorizations are renewed.

PLP's monitoring summary report (PLP 2019-RFI 135) provides a conceptual-level overview of the management and monitoring plans (MMPs) expected for the project, and focuses on the monitoring aspects of 11 selected MMPs (Table 5-4). Draft or conceptual-level plans have been developed for several of these MMPs in response to RFIs, as noted in Table 5-4, and provide information on preliminary monitoring activities. Specific monitoring locations are included in the monitoring summary report. Additionally, PLP has committed to implement adaptive management strategies for all MMPs, except where certain actions are explicitly required by a permit or regulation (PLP 2019-RFI 135). As noted in PLP's monitoring summary report, the state permitting process, which is ongoing, plays an important role in determining MMP criteria and requirements. The preliminary list of plans and monitoring elements described in the monitoring summary report is contingent on final approval by the appropriate agency.

PLP's draft Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) and draft Reclamation and Closure Plan (RCP) (SRK 2019d; PLP 2019-RFI 115) are included in Appendix M of the EIS (Appendix M3.0 and M4.0, respectively). The Restoration Plan is specific to temporary habitat loss associated with project construction, and outlines post-rehabilitation monitoring to evaluate long-term soil stability and vegetative cover and density. Restoration monitoring for the project would include both qualitative and quantitative analyses and would occur for a minimum of 5 years. The RCP provides guidelines for implementing stabilization and reclamation procedures, and focuses primarily on final reclamation and closure of permanent facilities associated with the project after operations cease.

Table 5-4: Selected Management and Monitoring Plans

Management and Monitoring Plan	Project Component(s)	Project Phase[1]
Water Management Plan[2]	Mine Site	CO, OP, RC, PC
Tailings Management Plan	Mine Site (Tailings Storage Facility)	CO, OP, RC, PC
Reclamation and Closure Plan[3]	Mine Site	CO, OP, RC, PC
Water Quality Monitoring Plan	Mine Site	CO, OP, RC, PC
Aquatic Resources Monitoring Plan	Mine Site	CO, OP, RC, PC
Pipeline Operations and Maintenance Plan	Natural Gas Pipeline	CO, OP, RC, PC
Invasive Species Management Plan[4]	Mine Site/Transportation Corridor/ Port/Natural Gas Pipeline	CO, OP, RC, PC
Wildlife Management Plan	Mine Site/Transportation Corridor/ Port/Natural Gas Pipeline	CO, OP, RC, PC
Restoration Plan[5]	Transportation Corridor/Natural Gas Pipeline	CO, OP
Air Quality/Fugitive Dust Control Plan[6]	Mine Site/Transportation Corridor/ Port/Natural Gas Pipeline	CO, OP, RC, PC
Stormwater/Erosion & Sediment Control	Mine Site/Transportation Corridor/ Port/Natural Gas Pipeline	CO, OP, RC, PC

Notes:
[1]Project Phase: Construction (CO), Operations (OP), Reclamation and Closure (RC), Post-Closure (PC).
[2] Operations Water Management Plan (Knight Piésold 2018a); Closure Water Management Plan (Knight Piésold 2018d).
[3] Reclamation and Closure Plan (SRK 2019d; PLP 2019-RFI 115).
[4] Invasive Species Management Plan (PLP 2019-RFI 133).
[5] Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123).
[6] Fugitive Dust Control Plan (PLP 2019-RFI 134).

Source: Monitoring Summary Report (PLP 2019-RFI 135)