APPENDIX M—MITIGATION

M1.0—MITIGATION ASSESSMENT

M1.0 MITIGATION ASSESSMENT

As discussed in Chapter 5, Mitigation, mitigation measures to avoid and minimize impacts are required to be considered for the project. Appendix M (Table M-1) includes a comprehensive list of measures identified during the National Environmental Policy Act (NEPA) process, including those suggested by the US Army Corps of Engineers (USACE), cooperating agencies, and from the public during the scoping process and Draft Environmental Impact Statement (EIS) public comment period. All suggested mitigation measures were assessed with the goal of determining the likelihood of adoption by the Applicant or implementation as a condition in a state, federal, or local permit (Council on Environmental Quality [CEQ] 1981), if issued for the project. Four categories of likelihood are used in Table M-1:

- Adopted by Applicant: the Applicant has adopted the measure, or has adopted a similar measure(s) that achieves the intent of the suggested measure, as part of their proposed mitigation incorporated into the project (see Chapter 5, Mitigation, Table 5-2).
- Probable: implementation of this measure is likely to occur.
- Possible: implementation of this measure may occur.
- Unlikely: implementation of this measure would not be likely to occur.

To determine the likelihood of implementation, the suggested measures were assessed for the following three factors:

1. Effective: assessment of the measure's effectiveness in reducing the project-related impact. This factor also considers if implementation of the measure is supported by the effects analysis in the EIS for the resource(s) identified in Table M-1 as potentially affected.
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 considers 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.

Measures meeting none or only one of the factors were determined unlikely to be implemented. Measures meeting two of the factors were determined possible of being implemented. Measures meeting all three were determined probable of being implemented.

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
MITIGATION MEASURES			
Require specific wildlife awareness training for drivers operating in the area.	Wildlife Values; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. Worker awareness training is often required by operators for contractors. PLP's Wildlife Interaction Plan would be developed during feasibility design work to support state permitting, and would include education and training for project personnel and contractors (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Install sensors to detect and warn drivers of wildlife near roads.	Wildlife Values; Health and Safety	1. Effective—Yes. Radar detection would likely be the most effective detection system for large animals. Radar also provides information on the speed and volume of traffic. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. PLP has committed to evaluating 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.	Possible
Winter management of snow berms along roadways should include periodic breaks or cleared areas in snow berms to allow wildlife to get off the road during the approach of oncoming vehicles.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—LPB. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
To improve the effectiveness of the dust control plan, state within the Conceptual FDCP that an operations and maintenance plan will be developed and implemented prior to construction. The O&M plan should include key aspects such as: 1) More stringent commitments regarding implementation; 2) Set cut points for plan activation (e.g., after a specified number of days without rain/snow, or on detection of dust plumes); 3) An indication of when the filter baghouse would be operated (e.g., year-round); 4) A list of staff positions responsible for each measure, and a way to contact them (this would appropriately include a list of staff positions that can trigger a dust control measure); and 5) A specific list of training (e.g., who gets trained, and to what level).	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety	1. Effective—Yes. The additional specifications would improve the effectiveness of the dust control plan. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Use dust palliatives (i.e., substances applied to a road surface) to reduce airborne dust.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure for use of non-toxic palliatives (see Chapter 5, Mitigation, Table 5-2). Additionally, PLP's conceptual FDCP addresses controlling fugitive dust from site activities and wind erosion; control measures could include speed limits, use of approved chemical dust suppressants, and application of water (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Use chip seal on surfaces to reduce airborne dust.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sties	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Other technically and economically feasible dust control measures would be just as effective at reducing impacts.	Unlikely
Post/enforce lower speed limits for drivers and project roads to reduce driving hazards and the potential effects of airborne dust on air and local water quality and human health.	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Signs/notices are feasible. It is likely enforcement would be primarily the responsibility of PLP.	Possible
Develop a quieter ferry to reduce impacts and water disturbances on the lake and affects to wildlife.	Noise; Wildlife Values	1. Effective—No. PLP has proposed using diesel electric propulsion for the ferry to reduce noise impacts and reduce emissions. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Technology is beyond what has already been tested and may not be available.	Unlikely

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Bury the pipeline below the seafloor to prevent creating a barrier to crab movement.	Fish Values	1. Effective—Potentially. However, the 12-inch-diameter pipeline would not have population-level effects on crab movement. 2. Potential Jurisdiction—State of Alaska; USACE; BSEE. 3. Reasonable—Partially. The pipeline would be buried over most of the Cook Inlet traverse, except for an approximately 11-mile-long segment southeast of Augustine Island (Owl Ridge 2019b). It is not reasonable to bury the pipeline along the entire Cook Inlet crossing because it is not supported by the effects analysis (i.e., such a small pipeline is not expected to be a barrier for crabs).	Unlikely
Build a moveable bridge for open ice snowmachine passage across Iliamna Lake during the winter.	Transportation and Navigation; Health and Safety	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. A moveable bridge would be complicated and potentially dangerous to deploy on a daily basis after the ferry passes. PLP has committed to marking a trail around the open lead on each end of the lake.	Unlikely
Where access roads intersect existing trails, provide bridged or culverted underpasses or overpasses depending on level of trail use and trail, road, and terrain elevations.	Transportation and Navigation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. These measures are shown to add to public safety in areas where high-use trails intersect with high-use roads. However, the amount of truck traffic predicted by the project is relatively low. Except in cases of no visibility (from curves or vegetation), proper trail marking and vegetation clearing would provide crossing safety.	Possible
Pave the mine/port access roads to reduce dust.	Air quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Measures identified in PLP's Conceptual FCDP are reasonable to reduce impacts associated with fugitive dust.	Unlikely
Measure hydrocarbon concentration and related compounds in surface and groundwater during the periodic water quality monitoring events.	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Consider mitigation banks and in-lieu fee programs as forms of compensatory mitigation.	Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—USACE. 3. Reasonable—No. The project is not in the service area of an approved bank or in-lieu fee program with appropriate credits available.	Unlikely
For compensatory mitigation, evaluate inactive mines to see if there are orphan mine sites with no viable financially responsible party, and determine if they provide mitigation opportunities. Additional orphan mine sites can be found outside the immediate watershed. Possible hard rock and placer sites in the immediate watersheds surrounding Pebble mine include: • State land sites – Shot, Synneva (Scynneva) Creek, and Bonanza Creek. • Federal land sites – Red Top, Unnamed (near tributary to Arcana Creek), and Monk's Hood.	Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Potentially. Further investigation needed. 2. Potential Jurisdiction—USACE. 3. Reasonable—Potentially. Further investigation needed.	Possible
Avoid discharging bilge water into Iliamna Lake or contain and treat bilge water to remove more than oil before discharging to protect lake ecology.	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—EPA's VGP is currently the mechanism by which treated bilge water discharges are regulated; this authority will transfer to the USCG in the next few years under the VIDA of 2018. 3. Reasonable—Yes. PLP committed to collecting ferry bilge water in holding tanks at the ferry terminals and transporting to one of the water treatment plants located at the mine site or Amakdedori port (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Construct and assemble the ice-breaking ferry at an alternate location to allow for naval architectural oversight and engineering support.	Transportation and Navigation	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. If constructed and assembled at an alternative location, the ferry would be too large to transport to Iliamna Lake. The ferry would require naval architecture oversight and engineering support regardless of construction/assembly location.	Unlikely

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Construct the natural gas pipeline in the winter to reduce environmental impacts.	Surface Water Hydrology; Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Not for the project. PLP proposes to co-locate the natural gas pipeline with the road to minimize impacts. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—No. The extra expense is not supported by the effects analysis for the project. The pipeline would be installed in the disturbed area for the road for most of the pipeline corridor and PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) outlines 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.	Unlikely
Design culverts with software that can better predict stress and deflection in heavily loaded, complex soil structures, and interaction-dependent culvert structures.	Soils; Water and Sediment Quality; Fish Values; Surface Hydrology	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria, but would require modern design for state permitting of culverts and bridges.	Possible
Design the open span of all water crossings to be 1.5 times the stream width at ordinary high water, with abutments placed in uplands.	Water and Sediment Quality; Surface Hydrology; Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; potentially USACE. 3. Reasonable—Potentially. Road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria, but would require modern design for state permitting of culverts and bridges.	Possible
Establish flight restrictions (e.g., elevation, no-fly zones) to reduce caribou hunting impacts.	Wildlife Values; Subsistence	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. In many cases it may be reasonable to avoid flying over caribou and/or hunters at low altitudes. PLP has committed to employing protocols to ensure that helicopters and fixed-wing planes do not harass wildlife (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Develop a detailed construction noise mitigation plan, including scheduling of noise-producing activities, the proper design and implementation of practical and site-appropriate noise-reducing measures, and sound level monitoring to check for compliance with the outdoor EPA guidance threshold, to help minimize the magnitude of construction noise.	Noise	1. Effective—Yes. 2. Potential Jurisdiction—The Kenai Peninsula Borough has noise ordinances for material sites that may be applicable. 3. Reasonable—Potentially. A noise mitigation plan would be feasible, although monitoring may not be.	Possible
Provide automatic isolation valves and leak detection systems for the concentrate pipeline variant under Alternative 3—North Road Only, and the tailings delivery pipelines at the mine site under all alternatives.	Soils; Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. Would enable a quicker response to pipeline incidents. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP committed to a similar measure to incorporate an automated pressure-based leak detection system into the design of the concentrate pipeline and tailings pipelines (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Consider alternatives to the effluent outfall locations identified in the project that could reduce impacts (e.g., further reduce dewatering impacts).	Water and Sediment Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Alternative locations were not identified during the NEPA process. There are additional opportunities to modify locations post-NEPA; notably during design and State of Alaska permitting.	Possible
Manage treated effluent discharges on a daily timestep using the modeled changes to the baseline hydrograph for each receiving water/reach without effluent as the discharge cap. Treated discharges would be used to restore the modeled flow losses and maintain the baseline hydrograph in each receiving water/reach. For example, discharges to the NFK would be managed based on the modeled change without effluent of NFK Reach A discharge. Maintaining the flow pattern within NFK Reach A would automatically maintain the hydrograph of downstream reaches. Maintaining the hydrographs of receiving waters would require storing some treated effluent for discharge later. For example, storage of treated effluent in April for discharge during May. Proposed storage in the water management ponds may be enough to meet this need. Additional storage capacity could be developed by constructing wetlands north and south of the mine site.	Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Potentially 2. Potential Jurisdiction—State of Alaska (ADF&G) 3. Reasonable—Potentially. PLP has stated that they are committed to working with ADF&G to further optimize the project water discharge strategy during the State permitting process. This could include the evaluation of alternate discharge strategies, discharge locations, or the use of constructed wetlands to further optimize the plan. However, PLP believes their proposed combination of storage, multi-train water treatment, and targeted water release to optimize salmon habitat provides a system that best achieves the goal of mimicking the natural hydrograph and maximizing salmon habitat within the limits of operability and climate variability.	Possible

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Storing treated effluent in constructed wetlands prior to discharge to receiving waters would facilitate maintaining the baseline hydrographs and: replace some wetland functional losses, replace some lost aquifer recharge, moderate the chemistry and temperature of treated effluent to more closely reflect the receiving waters. The constructed wetlands could be designed to have a surface connection with receiving waters during periods of high flow/high runoff, providing off-channel habitat and reducing erosion/sediment/scour impacts from point source discharges.			
Provide a double liner system under the pyritic TSF and main water management pond WMP.	Water Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Not likely. PLP has proposed that these facilities would be reclaimed after the proposed 20 years of mining, and the liner systems removed and disposed. PLP has also demonstrated that groundwater containment would be achieved should the liner system leak.	Possible
End-dump PAG waste rock in pyritic TSF in lifts smaller than 20 feet to minimize the risk of liner damage (AECOM 2018k).	Water and Sediment Quality, Spill Risk	1. Effective—Potentially. Would have less impact on liner integrity, although liner would have a layer of liner protection (sand and gravel). 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. May add to overall waste rock placement time, slow other activities, and increase fuel usage.	Possible
Use of a neutralization potential /acid-generating potential (NP/AP) ratio of 2 to 3 to provide a more conservative designation for PAG waste material.	Water and Sediment Quality, Geology	1. Effective—Yes. Would provide updated predictions of water quality inputs to water treatment plans. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable – Possibly. Would require design changes to accommodate increased volumes of tailings and waste rock designated as PAG.	Possible
Revisit liner defect assumptions at pyritic TSF and main WMP based on final liner design and specifications; and update groundwater, water balance, and water quality model predictions in final design.	Water and Sediment Quality, Groundwater Hydrology	1. Effective—Yes. Would provide updated predictions of water quality inputs to water treatment plans. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Probable
Install deep, continuous drains around the perimeter of the main WMP (instead of monitoring/pumpback wells) to intercept potential seepage (AECOM 2018k).	Water and Sediment Quality, Groundwater Hydrology	1. Effective—Possibly. Continuous drains could minimize the risk of liner leakage migrating in between monitoring/pumpback wells; further modeling analysis would be needed to evaluate whether continuous drains would perform better than wells. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Possibly. Continuous drains would likely be less cost-effective and have additional footprint impacts.	Possible
Consider back-filling the mine pit with additional bulk tailings material to reduce or eliminate impacts to geology during the post-reclamation period.	Geology	1. Effective—Yes. Would stabilize the exposed pit slopes by buttressing them; however, major geology impacts are not expected. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Would facilitate grading and closing the bulk TSF into a landform that could result in de-listing of the main and south embankments as jurisdiction dams. However, hauling tailings from the bulk TSF to the pit would be a major effort that is likely not reasonable from economic and safety standpoints.	Possible
Incorporate measures to deter birds from the pit lake and other process water ponds; such as active hazing (boat and/or drone) or other deterrents. Waterfowl and other birdlife should be prevented from using standing water that does not meet water quality standards (i.e., metals, acidity) in mine pits, tailings ponds or other retention ponds for as long as water does not meet water quality standards.	Wildlife Values	1. Effective—Yes. Active hazing can prevent bird use of waterbodies or limit the amount of use. 2. Potential Jurisdiction—USFWS; potentially State of Alaska. 3. Reasonable—Potentially. Modeling suggests that surface water would not be acutely toxic to birds. PLP would be required to monitor the water quality of the pit lake in closure and post-closure.	Possible
Build at least three sanitation facilities along the transportation corridor.	Needs and Welfare of the People – Socioeconomics; Land Ownership, Management, and Use	1. Effective—No. There would be sanitation facilities at the ends of each road segment and the roads are less than 40 miles in length. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Constructed sanitation facilities are unnecessary for project-related activities (assumes portable toilets would be used for construction/maintenance projects along the corridor).	Unlikely
Create a borough service area to include the mine site and allow access to mine site services (e.g., landfill and incinerator) for nearby residents.	Needs and Welfare of the People–Socioeconomics; Land Ownership, Management, and Use	1. Effective—No. A mine site safety boundary has been identified by PLP as the minimum area needed to safely conduct mine construction, operations, and reclamation (PLP 2018–RFI 058). 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Mine operations could not accept unregulated waste over which they have no control. The project would provide revenues to the borough, allowing local government to provide these services as needed.	Unlikely

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Build two public campgrounds with sanitation facilities.	Recreation	1. Effective—No. It is not clear what project impact this would mitigate. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. The project would provide revenues to the borough, allowing local government to provide these services if requested by the community.	Unlikely
On closure and flooding of the open pit, stock with fish for recreational purposes.	Commercial and Recreational Fisheries	1. Effective—No. More desirable recreational fishing opportunities are abundant in the region. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Pit access would be controlled for safety reasons during post-closure so there would be no legal access.	Unlikely
Develop a mitigation plan to help villages and people with energy resources (i.e., subsistence resources) that would be affected by the project.	Food and Fiber Production; Subsistence	1. Effective—Potentially, but not supported by results of impact analysis. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. However, PLP has already committed to the establishment of a Local Advisory Committee, which could serve as a venue to address any concerns regarding subsistence.	Unlikely
Develop a subsistence plan documenting subsistence harvest levels during construction and operations of the project. The goal would be to monitor potential impacts to subsistence and implement adaptive management strategies as needed to support sustainable levels of subsistence harvest.	Food and Fiber Production; Subsistence	1. Effective—Potentially, but it would be more effective to monitor subsistence resources, such as fish, freshwater seals, land mammals, and vegetation. 2. Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. PLP has committed to the establishment of a local subsistence advisory committee that could serve as a venue to address concerns regarding subsistence. Measures could be taken to reduce impacts to subsistence resources with more useful results.	Unlikely
Consider use of snow sheds for portions of the road alignment between Williamsport and Pile Bay where avalanches and heavy rain-induced rock fall could occur.	Transportation and Navigation; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Snow and rock containment requirements would be defined and addressed during detailed design.	Possible
Provide a boat launch facility at any bridge crossing a river or creek that is navigable by non-motorized or motorized craft.	Transportation and Navigation	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. There is existing access for motorized craft to the upper Newhalen River and the Gibraltar River. None of the other river crossings are suitable for navigation by craft that would require launching facilities. This would increase project impacts for no defined benefit.	Unlikely
Conduct a coastal and ocean engineering analysis for both Iliamna Lake and the port, and assess environmental conditions to which vessels would be exposed.	Transportation and Navigation	1. Effective—Yes. Information from a coastal engineering study would help ensure the port facilities are properly designed for conditions and project vessels are fit-for-purpose. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. PLP would likely conduct this during final design.	Possible
The Borough expects to work with landowners, the state, and the Applicant to develop a road management agreement that provides rules for how the road will accommodate use by borough residents and businesses.	Transportation and Navigation	1. Effective—Yes. 2. Potential Jurisdiction—LPB; State of Alaska. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Apply principles established by the International Dark Sky organization to minimize visual effects associated with trash light.	Aesthetic Resources	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Project lighting requirements would be defined and addressed during detailed design. PLP would incorporate best practice to address lighting impacts to wildlife and minimize overall lighting requirements, while meeting operational and safety needs.	Possible
Prepare a lighting plan to mitigate light impacts from key observation points.	Aesthetic Resources	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially. Project lighting requirements would be defined and addressed during detailed design. PLP would incorporate best practice to address lighting impacts to wildlife and minimize overall lighting requirements, while meeting operational and safety needs.	Unlikely
Provide bracing for concentrate containers to secure them in the event of an earthquake	Geohazards and Seismic Conditions; Spill Risk; Health and Safety	1. Effective—No. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—No. Loaded concentrate containers would be stacked three high in the yards at the port, ferry terminals, and mine site. Stacks on a flat hard surface would be unlikely to collapse, even during earthquakes. In the unlikely event they do collapse, a major container breach is unlikely (see PLP 2018-RFI 045). Any concentrate spill to the yard surface would be immediately recoverable.	Unlikely

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Conduct additional paleoseismic studies on the Lake Clark fault splays using higher-density light detection and ranging (LiDAR) than previously flown; and optimal seasonal timing, followed by geophysical surveys and/or trenching studies if warranted by LiDAR results.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. Would further identify or rule out the location of potential fault splays close to the mine site and their recency of activity. 2. Potential Jurisdiction—State of Alaska (ADNR; ADSP). 3. Reasonable—Yes. PLP has committed to a similar measure to conduct additional studies of the potential for Lake Clark fault splays in the vicinity of the project (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Consider cycloning tailings either before thickening or after thickening, and selective placement of the thickened fines and sands in the bulk TSF, to provide better control over tailings segregation in the bulk TSF.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Possibly. Could reduce uncertainty in tailings segregation, resulting in better control of the phreatic surface and pore pressure dissipation, and improved embankment centerline raise stability. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable— No. Cycloning would require two tailings pump and pipe discharges (fines and sands) into the bulk TSF. Cycloning is typically used if sands are needed for other uses, such as mine backfill or embankment construction. The fines and sands discharge pipes are totally separate systems. For embankment construction, fines discharge into the TSF, and sands discharge to the embankment outer face. Cycloning two streams to the bulk TSF would be difficult and unsafe because it would need fines discharge piping over the continually rising loose sands that workers and equipment cannot safely access.	Unlikely
Consider if implementation issues described above for cycloning tailings to allow for selective placement of fines and sands in the bulk TSF could be overcome by placing the fines behind the sands instead of on top of the sands and/or using automatic tailings pipeline and spigotting control that does not rely on equipment and workers being on top of the tailings during deposition, for example.		1. Effective—Possibly. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. The suggested mitigation measure (place coarser tailings against the embankment with the finer tailings placed in the center of the impoundment) entails different operational issues than those encountered by other typical tailings cycloning operations. However, to further evaluate this issue and confirm the ability of the tailings to segregate PLP has committed to conduct additional test work during the design phase and through the State dam safety permitting process to confirm the settling characteristics of the tailings solids (see Chapter 5, Mitigation, Table 5-2). See response to RFI 071d (PLP 2020-RFI 071d) for additional information.	Possible
Conduct geotechnical characterization and rate-of-rise tracking of tailings as they build up behind bulk TSF main embankment by surface elevation monitoring, cone penetration tests, drilling and sampling, and laboratory rheology, index, gradation, strength, permeability and consolidation tests, for purposes of monitoring tailings segregation and pore pressures, confirming feasibility of centerline construction, and providing input parameters for raise designs and seepage, stability, and liquefaction analyses under static and seismic conditions.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would provide geotechnical data for centerline raise designs, especially in early years of tailings disposal during highest tailings rates of rise, and would further identify sensitivities in embankment raise design and stability to potential upset conditions (e.g., lack of tailings segregation, tailings too soft and loose near embankment for centerline raise construction, cannot maintain a small surface water pond, high tailings porewater pressures not dissipating, high tailings groundwater table). 2. Potential Jurisdiction—State of Alaska (ADNR; ADSP). 3. Reasonable—Yes.	Probable
Stability analyses of the bulk TSF main embankment that study the effects of tailings liquefaction and high embankment pore pressures (PLP 2019-RFI 008g, 008h) should continue to be evaluated as design progresses and future test data are available (e.g., tailings testing); and should include consideration of the following: liquefaction to total depth of tailings, liquefaction during strong ground motions, deeper slide planes (through centerline portion of embankment) with failures in downstream direction, and higher phreatic surfaces (assuming plugging in rockfill shell) (AECOM 2019n).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further identify sensitivities in embankment design and stability to potential upset conditions (e.g., lack of tailings segregation, high water table, plugging in engineered filter zone or rockfill). 2. Potential Jurisdiction—State of Alaska (ADNR; ADSP). 3. Reasonable—Yes.	Probable
Perform numerical analyses on the bulk TSF main embankment to study the effects of horizontal seismic forces (parallel to longitudinal axis of dam) on potential development of transverse cracks.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further address potential seismic risk and possibly lead to developing additional design and construction mitigation. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Possible
Incorporate seasonal conditions (such as active zone annual thaw estimates) into future seepage sensitivity analyses performed during detailed design.	Surface Water Hydrology, Geohazards and Seismic Conditions	1. Effective—Potentially, would minimize risk of under- or overestimating water volume needing to be managed. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Possible
The emergency action plan for mine site embankments (required under ADSP) should include procedures for dealing with water levels that approach or exceed maximum operating levels.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. Would further address potential seismic risk and possibly lead to developing additional design and construction mitigation. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes.	Possible
Perform additional site-specific tsunami runup analysis at Amakdedori port that takes into account a combination of high tides, storm surge, waves, subsidence (seismic or fill settlement), and sea level rise.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. Site-specific analyses committed to by PLP would already incorporate most of these factors. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to a measure to perform a site-specific tsunami runup analysis at the port (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Conduct additional modeling of the potential for tsunamis in Iliamna Lake from landslide or submerged seismically induced sources prior to final design of shore-based structures (Higman and Riordan 2019).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Potentially.	Possible
Perform subsurface geotechnical investigation at the port site (to industry-standard depth) to inform the additional stability analyses prior to final design (PLP 2018-RFI 005, 2019-RFI 160).	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. PLP committed to performing additional stability analyses for the caisson dock and trestle prior to final design (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Perform structural analyses for the causeway and dock to evaluate displacements and stresses created by vessel lateral loads; gravity, wave, wind, and ice forces; and soil-structure interaction.	Geohazards and Seismic Conditions	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. Additional analyses and design would be industry standard approach.	Possible
Conduct additional design for potential pipeline displacement to minimize damage from potential rupture along unknown faults.	Geohazards and Seismic Conditions, Spill Risk	1. Effective—Possibly, if new faults identified as potentially active. 2. Potential Jurisdiction—US Department of Transportation PHMSA. 3. Reasonable—Possibly, if new faults identified as potentially active; special design not typically done if no evidence of recent activity.	Possible
Conduct geotechnical work at HDD sites and avoid areas that have high risk of frac-out.	Geohazards and Seismic Conditions, Water Quality	1. Effective—Yes. 2. Potential Jurisdiction—PHMSA; State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure for conducting geotechnical studies at HDD sites (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Conduct further evaluation to protect the closest private well to the HDD route at Anchor Point (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 • Consider moving HDD route further south, and/or adjusting depth to provide additional distance or stratigraphic separation from private well aquifer • Designate a surface buffer around wellhead during construction • Monitor well flow and quality during all construction activities in the area • Provide and implement (if necessary) contingency plans for response in the event groundwater flow or quality at the well is altered, up to and including replacement of the private well, water line, and associated activities (engineering, construction, permitting, water testing, temporary water supply, and related costs) needed to acquire new source of comparable water quality and quantity.	Groundwater Hydrology, Water Quality	1. Effective—Yes. 2. Potential Jurisdiction—PHMSA; State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure for conducting further evaluation of the closest private well to the HDD route at Anchor Point (see Chapter 5, Mitigation, Table 5-2). Contingency for well replacement may or may not be necessary.	Adopted by Applicant
Return the bulk tailings to the open pit at close of mining, eliminating the perpetual open pit lake.	Spill Risk	This was originally suggested as an alternative and assessed in Appendix B as Option TSF-030. Option TSF-030 was eliminated from detailed consideration as an alternative because it is not reasonable. Not reasonable options are also not likely to be required as mitigation.	Unlikely
Install additional secondary containment downstream of the TSFs to capture spilled tailings in the event of a release.	Spill Risk	This was originally suggested as an alternative and assessed in Appendix B as Option TSF-027. Option TSF-027 was eliminated from detailed consideration as an alternative because it would increase the overall impacts as compared to the project. Options that increase impacts are also not likely to be required as mitigation.	Unlikely
Design thicker retaining walls on the TSFs.	Spill Risk	1. Effective—Not necessarily. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. Note that the bulk TSF design includes very substantial buttressing. The thickness of the retaining walls on the TSFs would be determined by engineering design, and the design would maximize the Factor of Safety within practicable limits. Specifying a minimum thickness not driven by engineering design is not likely to occur.	Unlikely

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Consider deposition of tailings on ice in the winter (practiced at Red Dog Mine) to mitigate the possibility of uneven deposition of tailings around the perimeter of the bulk TSF (because of spigot spacing and segregation of thickened tailings).	Spill Risk	1. Effective—No. PLP is proposing to operate the bulk TSF with a small pond and large tailings beaches to minimize water against the dam. Uneven deposition of tailings piles would not compromise the integrity of the facility. 2. Jurisdiction—State of Alaska. 3. Reasonable—No. There would be a small pond in an area intended to be low to allow water to accumulate back from the dam. Filling this low area would be counter to management objectives.	Unlikely
Provide a response and recovery vessel in the event that the ferry breaks down.	Spill Risk	1. Effective—Yes. Would provide additional transportation capacity to address recovery efforts and transportation needs during a potential event. 2. Potential Jurisdiction—potentially State of Alaska. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
To reduce impacts to fish and aquatic life from potential spills, maintain a minimum 200-foot setback from waterways when storing hazardous or toxic material, and stage oil-spill response equipment (e.g., containment booms) adjacent to vulnerable fish-bearing wetlands, streams, and rivers during major construction activities.	Spill Risk	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. PLP would comply with all regulatory requirements and Best Management Practices (BMPs) for the storage and handling of fuel and hazardous substances. The project Spill Prevention, Control, and Countermeasure and Facility Response Plans would outline requirements for storage.	Possible
During fuel or hazardous substance transfer, ensure that a secondary containment is placed under all inlet and outlet points, hose connections, and hose ends.	Spill Risk	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska 3. Reasonable—Yes. PLP would comply with all regulatory requirements and BMPs for the storage and handling of fuel and hazardous substances. The project Spill Prevention, Control, and Countermeasure and Facility Response Plans would outline requirements for fuel transfer.	Probable
Implement operational measures to reduce spill risk and to respond to spill events, such as training personnel in port-specific fuel offloading and use of an automated tracking system for trucks hauling oil or hazardous materials to facilitate the identification of truck accidents and expedite response activities.	Spill Risk	1. Effective—Yes. Implementation of the operational measures would help avoid and minimize the occurrence and the potential adverse effects of spills. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. Operational measures for preparedness, prevention, response, and the natural gas pipeline would be implemented as described in response to RFI 126 (PLP 2019-RFI 126).	Probable
If sulfides are found prior to closure, cap the bulk TSF with crushed limestone to minimize acid-generating potential.	Water and Sediment Quality	1. Effective—Yes, subject to field and laboratory testing and analyses to determine the chemical reactions that could occur. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes, despite the fact that the process is designed to recover sulfides from the ore, and based on test work completed, the bulk tailings would be non-acid generating.	Probable
Cover tailings during operations to minimize wind migration by planting native vegetation.	Water and Sediment Quality; Air Quality	1. Effective—No. The tailings would be dewatered during operations and would be actively managed (moved around) to maximize beach area (away from the embankments). The vegetation would not be able to establish. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. This is not reasonable during operations because vegetation planted would be quickly inundated by new tailings. A fugitive dust management plan would be implemented and would specify measures to minimize wind erosion. The reclamation and closure plan would outline areas to be revegetated at closure.	Unlikely
In addition to backhauling the pyritic rock waste, the pH of the pit lake should be raised using calcium carbonate or other benign pH buffering material to bring the lake to a pH similar to that found in the surrounding area.	Water and Sediment Quality; Wildlife Values	1. Effective—No. This has not proven effective for large pit lakes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. Would require locating, mining, and transporting limestone to the pit. The costs for transporting would be enormous and the technology has not been proven effective.	Unlikely
Apply dust suppressants on the bulk TSF during and after closure until the tailings can be permanently capped.	Air Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. 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 (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Implement measures to address dust that collects on the wheels, body, and undercarriage of heavy equipment.	Air Quality; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2). Additionally, mine operations traffic and access road traffic would be segregated to avoid cross contamination, as outlined in the Conceptual FDCP (PLP 2019-RFI 134).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Require use of BACT air pollution controls, such as SCR for NOx reduction on the flue gases, due to the proximity to federal wildlife preserves.	Air Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Potentially. PLP would be required to obtain the appropriate air permits from the ADEC. All permits would comply with Clean Air Act requirements, and would address requirements for BACT on emissions sources as necessary.	Possible
Use non-toxic palliatives/dust BMPs to reduce fugitive dust.	Air Quality	1. Effective—Yes. 2. Jurisdiction—State of Alaska (ADEC; ADNR). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Provide natural gas-generated shore power to vessels while they are in port, rather than having the vessels idle, to reduce NOx at the port.	Air Quality	1. Effective—Yes. 2. Jurisdiction—No clear agency jurisdiction. Not likely to be included as a permit condition. 3. Reasonable—Yes. PLP has committed to providing shore power for vessels at the port facility (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Use the highest-tiered vehicles available for all mobile sources, to reduce engine emissions.	Air Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. The mine large vehicle fleet would be compliant with Tier 4 standards, or whatever standards are in force, at the time of purchase. It is possible that higher-tiered vehicles would be available but not required by regulation, and it would not be reasonable to require the Applicant to procure vehicles that exceed regulation.	Unlikely
Enclose the primary crushers and the transfer point between the crushers and ore conveyor and include air control equipment in the crusher building to reduce fugitive dust from crushing operations.	Air Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure in Section 3.1.7 of the conceptual FDCP (PLP 2019-RFI 134). 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 (see response to RFI 071d [PLP 2020-RFI 071d]).	Adopted by Applicant
Develop a wildfire mitigation plan to address potential effects of wildland fires on project infrastructure as a result of climate change.	Health and Safety; Climate Change	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (Fire Marshal, Division of Public Safety, Division of Life and Fire Safety). 3. Reasonable—Yes. Wildfire response would be addressed in the project emergency response plans developed prior to construction.	Probable
Consider changing environmental conditions and projections when designing road culverts to avoid velocity barriers from increased winter streamflow. Changes in the timing of life history events should also be considered when formulating timing windows to protect sensitive life stages.	Fish Values; Climate Change	1. Effective—Yes. Recent environmental conditions will be considered. 2. Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. It is reasonable to consider recent streamflow/weather, and road culverts would be designed in accordance with best practice and ADF&G guidance at the time of final design.	Probable
If there is no compensatory mitigation identified that would offset project impacts to aquatic resources, include a dredge and fill restriction that would deny use of a defined area in the South Fork Koktuli River, North Fork Koktuli River, and Upper Talarik Creek watersheds if the following mine activities would occur: • The loss of five or more linear miles of streams with documented anadromous fish. • The loss of 19 or more linear miles of streams where anadromous fish are not currently documented, but that are tributaries of documented anadromous streams. • The loss of 1,100 or more contiguous acres with either documented anadromous streams or tributaries of those streams. • Streamflow alterations of daily flow in 9 or more linear miles of documented anadromous streams.	Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Potentially. Would reduce impacts to wetlands and fish resources. 2. Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. USACE reviews projects on a case-by-case basis to determine if identifiable adverse impacts to jurisdictional waters would occur from a proposal and if compensatory mitigation would be required to offset those impacts. Additionally, USACE evaluates proposed mitigation for sufficiency, appropriateness and practicability. If the project is determined to require compensatory mitigation and the Applicant cannot provide the compensation, the application would be denied. Additionally, there are no specific linear thresholds or acreages that “must” require compensation.	Unlikely
Identify applicable strategies and procedures outlined in the Biosecurity Plan for Alaska Maritime National Wildlife Refuge (Flynn et al. 2020) to protect against the introduction and spread of organisms that threaten native natural resources and ecology.	Wildlife Values; Vegetation	1. Effective—Yes 2. Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has agreed to review the biosecurity plan in detail and integrate relevant strategies and procedures into the project ISMP if appropriate. See response to RFI 071d (PLP 2020-RFI 071d) for examples of relevant information PLP identified for inclusion in the project ISMP to date.	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Review the USFWS comments on the ISMP and provide a response as to if the project can adopt those measures identified in the comments.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values	1. Effective—Yes 2. Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has agreed to adopt the edits and will incorporate them into the next version of the Project ISMP, with the following exception: for the comment regarding “the use of suppression for an established species in a particular area” (USFWS comments on Page 8.7), 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 (see response to RFI 071d [PLP 2020-RFI 071d]).	Adopted by Applicant
Use control measures to reduce the potential for spreading invasive organisms. Hull-fouling organisms (e.g., barnacles, mussels, sponges, algae, and sea squirts) attach themselves to the hulls of ships, fouling these wetted hull surface areas. These organisms then colonize the hull and “hitch a ride” from one port or bioregion to the next. Invasions can occur when these fouling organisms come in contact with structures in a new port or release their larvae into its waters, possibly establishing themselves in the new port and spreading to nearby areas in that bioregion.	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach outlined in Section 9 of the plan. PLP would comply with USCG indigenous species reduction practices (33 CFR Part 151.2050) that require rinsing of anchors and chains when anchor is retrieved; and the removal and disposal of fouling organisms from vessel hulls, piping, and tanks on a regular basis. PLP would comply with EPA’s VGP which sets additional requirements for the minimization of biofouling.	Adopted by Applicant
Inspect boats, trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Clean, drain, and dry everything that comes into contact with water (e.g., boats, trailers, equipment, clothing, boots, waders) before transporting it to new waters; if practicable, rinse with hot clean water.	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. PLP has committed to a similar measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Drain water from motor, live well, bilge, and transom wells while on land before leaving the vicinity.	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Exchange ballast water in mid-ocean to control the unintentional introductions of invasive species. Exchange water at distances greater than 200 nautical miles from shore, and in waters greater than 1,640 feet deep.	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—USCG; EPA; State of Alaska. 3. Reasonable—Yes. PLP would operate in compliance with an Invasive Species Management Plan (PLP 2019-RFI 133). PLP would operate large commercial vessels in compliance with interim regulations from USCG (33 CFR Part 151.2050, which sets requirements for the operation of a ballast water management system); EPA (VGP, which sets ballast water discharge standards for concentration of viable organisms and microbes); and AS 46.03.750, Ballast Water Discharge. Note: VIDA 2018 extends the 2013 VGP’s provisions, leaving them in force and effect until future regulations are enforceable.	Probable
If floatplanes are used: inspect floatplanes and remove weeds from floats, wires, cables, water rudders, and pump floats; avoid taxiing through heavy surface growths of weeds before takeoff; and raise and lower water rudders several times to clear off plants. If weeds are picked up during landing, clean off the water rudders before take-off. On takeoff, raise and lower water rudders several times to free weed plant fragments while over original body of water or over land. If weeds remain visible on floats or water rudders, return to waterbody and remove plants	Wetlands and Other Waters/ Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP would operate in compliance with an Invasive Species Management Plan (PLP 2019-RFI 133). PLP would operate marine vessels in compliance with USCG guidance and any applicable regulations. PLP would comply with ADNR’s 2014 quarantine that prohibits the transport, trade, or transplant of five invasive aquatic plant species in Alaska.	Probable
To minimize infestation and spread of spruce bark beetle, timber along rights-of-way for roads and pipelines should be cut in the fall and the logs used before the next spring. All slash and logs 4 inches in diameter and larger should be disposed of by burning, burying, chipping, or peeling. Stumps should be cut as low as possible. Trees next to the right-of-way should be examined for beetle attacks in late summer following cutting. If trees are infested, they should be removed. Care should be taken to avoid scarring trunks with mechanical equipment, severing roots, altering drainage patterns, or severely compacting the soil.	Vegetation	1. Effective – Yes 2. Potential Jurisdiction – USDA US Forest Service Region 10 Forest and Grassland Health 3. Reasonable – Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
To avoid impacts to shoreline habitats and wildlife movements, the port pad limits should be placed back from the upper tidal area to provide an upland habitat fringe along the shoreline, with free spans over this fringe and the shorezone to allow for wildlife and recreational traffic passage along the shore.	Wetlands and Other Waters/ Special Aquatic Sites; Wildlife Values	1. Effective—Yes 2. Potential Jurisdiction—USACE; State of Alaska (ADNR). 3. Reasonable—Yes. The caisson-supported dock design for Alternative 1a and Alternative 3 addresses this measure (see Chapter 5, Mitigation, Table 5-3).	Probable

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Establish a 30-mile no hunting or trapping zone around all sides of the McNeil River Sanctuary to minimize impact to the park from hunting bears in and adjacent to the sanctuary.	Wildlife Values	1. Effective—No. The transportation corridor would be in an area north of the sanctuary currently open to hunting. The project would not improve access to the area by the public (roads are proposed to be closed to the general public). 2. Potential Jurisdiction—State of Alaska (Alaska Board of Game, ADF&G). 3. Reasonable—No. This measure would prohibit current sustainable legal hunting activities outside the McNeil River State Game Sanctuary and Refuge. PLP has committed to a no hunting, fishing, or gathering policy for non-local employees to minimize competition for local resources. The impact analysis gives no indication that the project would result in increased hunting pressure on brown bears. Additionally, the McNeil River State Game Refuge, located between the project and the sanctuary, is closed to brown bear hunting.	Unlikely
Use bear-proof containers and bear-proof trash receptacles for food and garbage. Food should 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.	Wildlife Values; Health and Safety	1. Effective—Yes 2. Potential Jurisdiction— State of Alaska (ADNR) 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
A lessee who encounters an occupied brown bear den not previously identified by ADF&G must report it to the Division of Wildlife Conservation, ADF&G, within 24 hours. Mobile activities shall avoid such discovered occupied dens by 0.5 mile unless alternative mitigation measures are approved with concurrence from ADF&G. Non-mobile facilities will not be required to relocate. Before commencement of any activities, lessees shall 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.	Wildlife Values; Health and Safety	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADF&G) 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
The USFWS recommends the Applicant incorporate additional measures into their project plans to offset impacts to large mammals such as bears during construction and operation of the proposed project, especially along the transportation corridor. Implementation of mitigation measures to reduce wildlife-vehicle collisions have been shown successful to varying degrees, with the most successful measures consisting of road design features, methods to modify driver behavior, and methods to modify animal behavior (Ament et al. 2007, Clevenger and Huijser 2011, Ministry of Transportation 2016). Additional minimization and mitigation measures that could be incorporated into project operations to reduce the impacts of roads and traffic on large mammals include, but are not limited to: • Temporary road closures to reduce or eliminate traffic during critical time-periods; this may include restricting traffic during times when animals are more active (e.g., evening and night), or during the breeding season. • Installation of speed control systems or “governors” into company vehicles to warn of excess speed and increase compliance with posted speed limits. • Installation of wildlife crossings (underpasses and/or overpasses) along the road corridor in high wildlife use areas, where appropriate. These minimization and mitigation measures for large mammals may also be beneficial as part of an adaptive management strategy for impacts along the transportation corridor, especially if project impacts occur in numbers, locations, or ways not previously considered. Finally, implementation of site-specific road mitigation strategies that minimize traffic and wildlife conflicts, especially those caused by large mammals, will increase operational efficiency and safety (Ministry of Transportation 2016).	Wildlife Values	1. Effective—Yes, in high wildlife use areas and high traffic volumes. 2. Potential Jurisdiction—State of Alaska; LPB 3. Reasonable—Partially. Road traffic for the Applicant’s Preferred Alternative (Alternative 3 with the concentrate and return water pipelines) is estimated to include an average of 18 truck round trips per day. This equates to one truck every 40 minutes. Additionally, PLP has previously proposed reasonable and effective wildlife safety mitigation measures and design features in RFI 122 (PLP 2019-RFI 122) (see Chapter 5, Mitigation, Table 5-2). Given the low level of traffic and previously adopted measures, it may not be reasonable to implement temporal road closures and install wildlife crossings along the corridor. However, PLP has committed or previously committed to: - Using real-time GPS monitoring technology to enforce speed limits on the road. These systems use real time warnings to the driver and real time reporting to supervisory staff, combined with a zero-tolerance policy for violations, to enforce compliance. - Implementing a comprehensive tracking and reporting system to as serve a basis for the implementation of adaptive management.	Adopted by Applicant (partially, see PLP 2020-RFI 071d)
Design and operate facilities to minimize sight and sound impacts in areas of high recreational and subsistence use and important wildlife habitat. Methods may include providing natural buffers and screening to conceal facilities, sound insulation of facilities, or by using alternative means approved in consultation with ADF&G and the appropriate land manager.	Wildlife Values; Recreation; Subsistence	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes.	Possible

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Require mandatory training 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).	Wildlife Values; Health and Safety	1. Effective—Yes. 2. Potential Jurisdiction—USFWS; State of Alaska (ADF&G). 3. Reasonable—Yes. PLP has committed to the development of a Wildlife Interaction Plan that would establish requirements for the education and training of all project staff and contractors (see Chapter 5, Mitigation, Table 5-2). The plan would address: • 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. • Adaptive management approach.	Adopted by Applicant
Avoid fragmenting large, contiguous tracts of intact habitat, especially if habitat cannot be fully restored after construction.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Co-location of facilities and footprint minimization to reduce all environmental impacts was a primary consideration in the design of the project. Additional avoidance opportunities do not appear to be available.	Unlikely
Co-locate activities into disturbed areas to the maximum extent practicable to reduce disturbance of migratory bird habitat.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Collocation of facilities to reduce all environmental impacts was a primary consideration in the design of the proposed project. Additional avoidance opportunities do not appear to be available.	Unlikely
Clear natural or semi-natural habitats outside the nesting season. Please refer to the Service's "Timing Recommendations for Land Disturbance and Vegetation Clearing" for nesting season recommendations by habitat type and region (https://www.fws.gov/alaska/fisheries/fieldoffice/anchorage/pdf/USFWS%20Timing%20Recommendations%20for%20Land%20Disturbance%20&%20Vegetation%20Clearing.pdf).	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. Vegetation clearing activities would follow—to the maximum extent practicable—the USFWS Recommended Time Periods for Avoiding Vegetation Clearing in Alaska. If clearing outside of recommended time periods becomes necessary, PLP could coordinate with the USFWS for guidance on other acceptable methods to prevent disturbance to nesting birds.	Probable
Minimize prolonged human presence near nesting birds during construction and maintenance actions.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. PLP has committed to the development of a Wildlife Interaction Plan that would establish requirements for the education and training of all project staff and contractors (see Chapter 5, Mitigation, Table 5-2). The plan would address: • 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. • Adaptive management approach.	Probable
Instruct all employees, contractors, and/or site visitors of 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).	Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
To reduce bird collisions, place transmission lines associated with the development underground, where possible. In particular, powerlines should be installed underground in areas of high avian use such as waterfowl around ponded areas, and coastal shorelines.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—No. Burial of powerlines is not practicable or safe in many instances. PLP would follow BMPs with respect to the design and placement of overhead powerlines to avoid impacts to birds.	Unlikely
If overhead powerlines are used, site them away from areas used by high numbers of birds crossing between roosting and feeding areas, or between lakes, rivers, and nesting areas. Orientation of powerlines relative to biological characteristics (e.g., flight behavior, season, habitat, and habitat use) and environmental conditions (e.g., topographical features and weather patterns) can influence collision risk. If overhead powerlines are sited in migratory bird habitat, attach bird flight diverters (i.e., flappers) or related deterrent devices that are durable and visible to reduce collision risk.		1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. PLP has committed to a similar measure for incorporating BMPs and design guidelines for avian protection for all powerlines (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Lights should be down-shielded and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe night-time access to the site. Security lighting for on-ground facilities and infrastructure should be motion-detective or heat-sensitive types of lighting.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. Similar measures are detailed in the USFWS Biological Assessment and have been committed to by PLP (see Chapter 5, Mitigation, Table 5-2). Project lighting requirements will be defined and addressed during detailed design. PLP would incorporate best practices to address lighting impacts to wildlife and minimize overall lighting requirements, while meeting operational and safety needs.	Adopted by Applicant
If material sites are established by excavating the sides of hills, a natural contour should be established rather than a high wall on one or more sides. If these sites are more like dug pits that are expected to fill with water, they should be contoured to form emergent wetlands along the edges, rather than deep steep-sided pits.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USACE and landowners. 3. Reasonable—Yes. PLP has committed to a similar measure for contouring slopes to blend with surrounding topography (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Work with the local residents to manage access and the potential increased harvest of fish and wildlife due to the additional access provided by the roads and infrastructure development associated with the project.	Wildlife Values	1. Effective—No. 2. Potential Jurisdiction—State of Alaska and landowners. 3. Reasonable—No. The Applicant would have no role in managing use of the roads by local residents for hunting and fishing (they have committed to prohibiting employees from hunting and fishing while working).	Unlikely
Reduce the frequency of truck traffic on the port access road using convoys or closure periods to reduce impacts to brown bears crossing the road.	Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Closure periods when bears are most likely to be traveling may be reasonable. The locations of closures and timing may change in synchrony with seasonally abundant resources along the transportation corridor.	Possible
Update bear denning surveys prior to construction.	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Recommendations for how to avoid disturbing raptor nests should be followed, and species-specific buffer zones and temporal restrictions should be established based on empirical research (e.g., Richardson and Miller 1997).	Wildlife Values	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. Implementation of avoidance buffers during construction would reduce potential impacts to nesting eagles protected by the Bald and Golden Eagle Protection Act and other migratory bird protected by the Migratory Bird Treaty Act. 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).	Possible
Complete a detailed Bear Interaction Plan designed to minimize conflicts between bears and humans that would be incorporated into the Wildlife Interaction Plan. The plan should be coordinated with ADF&G. At a minimum, the plan should 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.	Wildlife Values	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Where possible, incorporate flight elevation restrictions for flying above 1,500 feet to prevent disturbance of wildlife.	Wildlife Values	1. Effective—Yes. Flying above 1,500 feet would likely prevent disturbance to most species. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. PLP has committed to flying 500 feet above ground level or higher when possible and safe to do so.	Possible

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Complete brown bear, moose, and caribou habitat use, movement, and bear denning surveys to determine important habitat use areas to be avoided or to implement design features.	Wildlife Values	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADF&G). 3. Reasonable—Yes. PLP would consult with ADF&G on additional wildlife surveys that may be required prior to construction.	Probable
The following measures are detailed in the NMFS Biological Assessment (Appendix H) 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 NMFS. • The project would employ PSOs to monitor shutdown exclusion zones during project 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. • Blasting in Iliamna Bay above the high tide line for construction of the Diamond Point port access road would be timed to coincide when low tides are at or near minimum elevation to avoid in-water transfer of sound. • Vessel speeds would be limited to 10 knots within 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.	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—NMFS. 3. Reasonable—Yes. PLP has committed to these measures (see Chapter 5, Mitigation, Table 5-2). Although these measures are in draft form, they may be required in the final version of the biological assessment and included in the biological opinion issued by NMFS. Additional reasonable and prudent measures may be included in their biological opinion.	Adopted by Applicant
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 USFWS. • The project would employ PSOs to monitor shutdown exclusion zones during project 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. • 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 will 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.	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Yes. PLP has committed to these measures (see Chapter 5, Mitigation, Table 5-2). Although these measures are in draft form, they may be required in the final version of the biological assessment and included in the biological opinion issued by USFWS. Additional reasonable and prudent measures may be included in their biological opinion.	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
• 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. • The concentrate conveyor would be fully enclosed in a tubular structure 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 prevent 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.			
Implement measures detailed in the Biological Opinion on Lease Sale 244 (Consultation 2016-F-0226) (USFWS 2017). Some of these applicable measures, briefly summarized, include: • Protected species monitoring during project operations. PSOs will be station aboard project vessels and will watch for and identify listed species and initiate mitigation measures. • Operators of vessels should maintain a distance of 328 feet from sea otters. • Vessels should reduce speed when near sea otters or during periods of reduced visibility. • Vessels must not operate in a way to separate members of a group of sea otters. • All aircraft must conduct their activities at the maximum distance possible from sea otters, with fixed-wing aircraft operating at altitudes no lower than 300 feet when near sea otters. Helicopters may not hover or circle over marine mammals or flocks of birds, and must not operate below 1,000 feet when near sea otters. • Lighting protocols will be implemented that minimize the outward radiation of light. High-intensity work lights on vessels will be minimized, especially beyond the 66-foot bathymetric contour. • Report avian and sea otter encounters/collisions with vessels.	Threatened and Endangered Species	1. Effective—Yes. 2. Potential Jurisdiction—USFWS. 3. Reasonable—Potentially. Although these measures are specific to a consultation between the Bureau of Ocean Energy Management and USFWS, similar measures may be required by USFWS for Pebble project consultation.	Possible
To avoid constricting the natural channel and to allow connectivity of the floodplain, at minimum, stream crossings should meet the USFWS and USFS guidelines, which can be found at: https://www.akfishhabitat.org/ and https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054564.pdf.	Fish Values; Water and Sediment Quality; Surface Hydrology	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to a measure to meet the USFWS guidelines for stream crossing: Culvert Design Guidelines for Ecological Function, U.S. Fish and Wildlife Service Alaska Fish Passage Program, Revision 5, February 5, 2020 (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Stream crossing designs should use bridge structures and appropriately sized culverts to maintain hydrology, allow natural stream and river channel processes, and provide passage of all fish species and life stages, whenever possible.	Fish Values; Water and Sediment Quality; Surface Hydrology	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to several measures that would meet the intent of this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Culverted stream crossings should be composed of an arch or oversized culvert at minimum of 120% of the channel width measured at ordinary high water mark.	Fish Values; Water and Sediment Quality; Surface Hydrology	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria, but would require modern design for state permitting of culverts and bridges.	Possible
Climate projections should be considered when designing road culverts to ensure velocity barriers from increased winter streamflow are avoided, and changes in the timing of life history events should be considered when formulating timing windows to protect sensitive life stages.	Fish Values	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. Road culverts would be designed in accordance with best practices and ADF&G guidance at the time of final design. ADF&G has indicated that they do not have formal design criteria, but would require modern design for state permitting of culverts and bridges.	Possible
To maintain downstream flow of the natural hydrograph and avoid bank erosion or channel incision, when working in streams, mimic the constructed stream channel shape with the instream channel features above and below any stream diversion (e.g., slope, bends, pools, riffles, glides, large rocks).	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP is not proposing to modify streams outside of the project impact footprint. Impacts to streams inside the footprint would be in accordance with project permits.	Probable
Avoid construction in areas of upwelling and downwelling in streams. These areas provide important wetland functions, filter nutrients, provide for movement of aquatic organisms, and water exchange in feeding, rearing, and refugia habitats.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. PLP is not proposing to modify streams outside of the project impact footprint. Impacts to streams inside the footprint would be in accordance with project permits and would not be avoidable.	Unlikely
Site facilities away from waterbodies. Maintain a vegetated riparian stream buffer zone of at least 50 feet to retain natural bank-stabilizing vegetation, maintain the floodplain, improve water quality, and promote terrestrial invertebrate and nutrient inputs.	Fish Values; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. Minimizing impacts to waterbodies was a primary consideration in the design of the project, and has been implemented to the extent feasible.	Probable
Use erosion control measures such as silt fences, silt curtains, and cofferdams to trap and prevent sediment and pollutants from being transported into surrounding waterbodies (e.g., lakes, streams, wetlands, coastal waters, temporary diversion channels).	Fish Values; Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP has adopted this measure. Additionally, PLP would comply with, and has committed to the development of, a Storm Water Pollution Prevention Plan and an Erosion and Sedimentation Control Plan that would address these issues (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Streambank restoration should incorporate bioengineering techniques (e.g., root wads, bundled water-tolerant willows and other measures outlined in 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.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Where possible, avoid disturbance in areas of eelgrass and kelp growth, which provide rearing and refugia habitat for a wide variety of species.	Fish Values	1. Effective—Not applicable. No eelgrass or kelp has been identified within the port footprint. 2. Potential Jurisdiction—USACE. 3. Reasonable—No additional avoidance is reasonable, given that no eelgrass or kelp has been identified within the port footprint.	Unlikely
For docks and access ramps, use light-penetrating materials to protect vegetation (board spacing of 0.5 inch or more is preferred over water) to allow sunlight penetration for vegetative growth (i.e., grasses, sedges, shrubs, and trees) and vegetative bank stabilization provided by plant root.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. The vehicles that would be using the Amakdedori port and Iliamna Lake facilities are too heavy to operate on light-penetrating materials.	Unlikely
Limit in-water construction windows for bridge construction to time periods outside of spawning.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—USACE; State of Alaska. 3. Reasonable—Yes, for work in waters that support spawning.	Probable
Construct the project with eventual reclamation in mind. Avoid wetlands, or at least higher-functioning/value wetlands, avoid construction in sensitive soils (e.g., highly erosive soils, thaw-stable and thaw-unstable permafrost), and reduce permanent habitat modification by restoring wetlands to pre-existing condition (hydrology, grade, vegetation).	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—USACE. 3. Reasonable—Yes. Design-for-closure was a key concept in the development of the project as outlined in the Project Description (see Chapter 5, Mitigation, Table 5-2). The Applicant has documented avoidance and minimization of Waters of the US (WOUS) in Tab 23 of the Department of the Army permit application.	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Plan to sequence construction activities so that existing surface vegetation can initially be removed, followed by grubbing roots of trees (unless whole trees are needed for root wad work in stream restoration), and finally blading remaining organic and topsoil layers for stockpiling for reclamation.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. AS 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 Alaska Administrative Code [AAC] 97.300 – 97.350). At the end of operations, mine facilities would be closed and reclaimed in accordance with permit regulations and following guidance set forth in the draft Reclamation and Closure Plan (RCP), which makes recommendations for the salvage and storage of growth media.	Probable
Salvage the maximum amount of organic material and topsoil (hereafter, jointly referred to as topsoil) practicable, sign it, and store it separately from other overburden for use during reclamation. Often, the organic and topsoil layers are difficult to distinguish; if that is the case, or if topsoil is limited, salvage the uppermost 6 inches of the soil profile.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. AS 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 AAC 97.300 – 97.350). At the end of operations, mine facilities would be closed and reclaimed in accordance with permit regulations and following guidance set forth in the draft RCP, which makes recommendations for the salvage and storage of growth medium. Additionally, PLP has committed to a similar measure to stockpile overburden for use in reclamation, in compliance with State regulations and best practices (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Plan to sequence mining so that topsoil can be directly hauled from the salvage location to a site prepared for reclamation, when practical. Direct hauling increases the viability of native seeds in the salvaged topsoil by allowing them to begin reestablishment as soon as site conditions permit. It also minimizes transportation costs.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. AS 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations; an approved reclamation plan is required by State mining regulations (11 AAC 97.300 – 97.350). The draft RCP makes recommendations for reclamation during construction, concurrent with mining and for areas requiring interim stabilization, all of which provide opportunity for the direct use of salvaged materials without storage.	Probable
If topsoil is stored for more than one growing season, redistribute the topsoil over cut-and-fill areas, around outer boundaries of facilities, embankments, and drainage ditches to keep it viable.	Vegetation	1. Effective—Potentially. Redistribution of stored topsoil is not known to maintain plant propagule viability. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Partially. In accordance with PLP's Restoration Plan, stored topsoil may be redistributed across vegetation test plots and/or interim restored sites to determine its revegetation potential.	Possible
When redistributing topsoil, spread it to a uniform and stable thickness and prevent it from becoming compacted or eroded by wind and water until vegetation is established.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seed bed preparation, growth medium thickness, and the use of soil erosion and sediment migration control measures such as silt fences, straw wattles, rolled erosion control products, and water bars.	Probable
If topsoil would not be spread for use in interim reclamation and would not be used in the first year, it should be placed on a stable area, labeled as topsoil, left undisturbed, and protected from the elements by seeding it with an interim seeding mix.	Vegetation	1. Effective—Partially. If salvaged material is stored with organic matter on top, then germination from the native seedbed, without seed amendments, is likely. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Potentially. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seed bed preparation, seed and seeding.	Possible
Interim seeding, using native plant seed, may be necessary to keep topsoil viable, control erosion, reduce surface runoff, and maintain other habitat characteristics.	Vegetation	1. Effective—Yes. For the interim stabilization of disturbed sites. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP committed to a similar measure for use of interim seeding and other BMPs to address surface runoff and erosion from overburden stockpiles during operations (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Slopes should be contoured to blend with surrounding topography; consider using water bars or contour furrowing on steeper slopes.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP committed to a similar measure for contouring slopes during reclamation to blend with surrounding topography where feasible (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Consider strategically placing root wads, large logs, or rocks after seeding to provide topographical relief and microclimates, and to increase the variety of plant species difficult to establish by seed (e.g., increase habitat complexity).	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seedbed preparation, including ripping and scarification, both of which would serve to increase habitat complexity.	Probable

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
During final reclamation, after final grading and before replacing topsoil and other segregated materials, the regraded land should be ripped to promote root penetration.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's draft RCP makes recommendations for seedbed preparation, including scarification, to promote revegetation success.	Probable
Create surface roughness to help control surface water runoff and reduce sedimentation.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each make recommendations for seedbed preparation, including ripping, scarifying, and tilling.	Probable
Use native weed-free seed (preferably locally collected), specific to the habitat type, applied at specified rates, and cover the seed to specified depth. See the Alaska Department of Natural Resources, Division of Agriculture and the Alaska Plant Materials Center for recommendations.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP committed to a similar measure for use of native weed-free seed in areas where seeding is the preferred approach, applied at specified rates in compliance with the approved Closure and Reclamation Plan (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Vegetative cover should be capable of stabilizing the soil against erosion. Consider use of tackifiers, mulch, or other bonding agents to keep seed in place.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR). 3. Reasonable—Yes. PLP's Restoration Plan, developed to restore temporarily impacted natural habitats, and the RCP, developed to restore permanently impacted areas, each recommend use of soil erosion and sediment migration control measures such as silt fences, straw wattles, rolled erosion control products, and water bars.	Probable
To minimize wildlife entanglement and plastic debris pollution, we recommend the use of plastic-free erosion and sediment control products such as netting manufactured from 100 percent biodegradable, non-plastic materials such as jute, sisal, or coir fiber. Plastic degradable netting is not recommended for use in erosion control for any aspect of the project. Prior to degradation, the netting can entangle wildlife, including amphibians, birds, and small mammals. In addition, because the plastic netting is degradable (not biodegradable), once the plastic does degrade (which takes many years, especially in cold climates), it does not decompose into biological components of the soil. Instead, the plastic degrades into small fragments that are blown or washed into waterways, creating a toxic ingestion hazard for aquatic wildlife for many years.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR; ADEC); EPA. 3. Reasonable—Yes. PLP has committed to a measure for use of plastic-free erosion and sediment control products, where appropriate and feasible (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Identify locations of known invasive plant infestations. Plan activities accordingly to avoid infestations.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Use certified weed-free materials, including gravel, topsoil, hay/straw, or erosion control tubes, especially when working near sensitive habitats such as streams and wetlands.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Revegetate bare soils with native plants as soon as feasible to minimize the possible establishment of invasive plant species.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) is specific to temporary habitat loss associated with project construction, and outlines plans for revegetation using native plant communities. PLP has committed to a measure to revegetate bare soils with approved techniques as soon as possible to minimize the establishment of invasive plant species (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Clean vehicles and equipment regularly to remove dirt, vegetation, and seeds. Wash equipment at the same location, and if contaminated, treat for invasive species as necessary.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach as outlined in Section 9 of the plan. PLP has committed to a measure to clean vehicles and equipment in accordance with the Invasive Species Management Plan (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Avoid cleaning equipment in or near waterways or wetlands, which are particularly sensitive to invasion and could result in changes to aquatic organism habitat/function.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
If working in infested areas, time disturbance activities so that they occur prior to the plants setting seed. Contact the University of Alaska Fairbanks Cooperative Extension Service or the Department of Agriculture (http://plants.alaska.gov) for timing information if you are unsure.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Yes. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133).	Possible
Coordinate with local village or other groups in the project area to identify locations and opportunities to collaborate efforts to minimize invasive infestations.	Vegetation	1. Effective—Potentially. Existing infestations of invasive plants are known; collaboration to minimize future introductions could be effective. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. PLP would implement an Invasive Species Management Plan (PLP 2019-RFI 133), which would be regularly revised using an adaptive management approach as outlined in Section 9 of the plan.	Possible
Procure contracts with native seed growers on the Kenai Peninsula to provide seeds and cutting stock for revegetating degraded or excavated areas in need of restoration. Arranging a supply of seeds and cuttings in advance would allow quick access to materials after a spill requiring excavation and restoration.	Vegetation	1. Effective—Yes. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. PLP's Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123) was developed to restore temporarily impacted natural habitats recommends stockpiling of vegetation and topsoil, as well as the use of certified seed (11 AAC 34.075) mixtures as suggested in the Alaska revegetation and erosion control guides (Czapla and Wright 2010; Czapla and Wright 2012).	Possible
Ship concentrate in containers instead of bulk carriers to eliminate the potential for fugitive dust when the containers are emptied into the ship's hold.	Water and Sediment Quality	1. Effective—Yes. Would reduce the potential for fugitive dust during transfer to bulk carriers. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. PLP has proposed a system that keeps the concentrate in containers with a locked lid until the container is lowered into the ship's hold (PLP 2018- RFI 045 and PLP 2019-RFI 009c) to reduce fugitive dust. Shipping the concentrate in containers would increase the cost of shipping.	Unlikely
Ship concentrate in containers instead of bulk carriers to mitigate for potential loss from the ship if under adverse conditions or an accident. Recommend considering whether leaving the concentrate in the cargo containers would be a better mitigation measure against potential for loss of concentrate to the marine environment in the event of an accident.	Water and Sediment Quality	1. Effective—No. Containers have been lost from container ships. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. Shipping the concentrate in containers would increase the cost of shipping, and containers have been lost in cases of heavy seas and vessel collision.	Unlikely
Redundancy in BMPs: The Water Quality Section includes a statement regarding potential for overwhelming BMPs "resulting in an influx of fine sediment and increased turbidity into gravel-dominated streambeds" (pg. 4.18-19). Recommend redundancy in BMPs in areas near these streams, and that settling basins/ponds/ditches on the mine site be sized to consider extreme events to mitigate against release off site.	Water and Sediment Quality	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially.	Possible
Establish appropriate agreements with GCI Communication Corp that are consistent with standard agreements used in the utility industry to address line crossings and other potential conflicts and comply with the land use authorizations and instruments governing GCI Communication Corp's facilities and third-party uses, including obtaining prior consent from GCI Communication Corp and/or the relevant landowners where required, and adhering to non-interference obligations.	Socioeconomics	1. Effective—Potentially but as stated in the suggested measure, it is standard practice for project proponents to address line crossings and other conflicts with utility owners. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. It would be reasonable for PLP to enter into appropriate agreements with utilities in the project area but it may not be reasonable for a federal agency to include such a condition in permits.	Unlikely
Complete further site characterization, hydraulic testing, and model simulations to support future stages of design in the vicinity of the TSFs and main WMP to address potential seepage.	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADNR, ADEC). 3. Reasonable—Yes.	Probable
Conduct the following evaluations of WTP processes during design engineering and permitting: • Fully assess proposed treatment solutions regarding operational conditions in terms of pH and ORP to produce stable precipitation solids that will not be remobilized.	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Recommendations are considered state-of-the-practice for the industry. With the exception of the suggested mass balance model, PLP has committed to a similar measure to conduct evaluations of the WTP processes during final design (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
• Further evaluate conditions in the pyritic TSF and the potential for remobilization of salt mass to validate treatment assumptions. Consider development of a consolidated mass balance model for the full mine water circuit by project phase to predict where key constituents exit facilities; the potential for accumulation of constituents in facilities (such as salts); and the potential for remobilization of those constituents in subsequent phases. • Further evaluate the validity and reasonableness of proposed removal efficiencies for various constituents to fully assess proposed treatment solutions; in particular, consider the use of biological treatment technologies for selenium removal.			
Adopt the following adaptive management steps 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, such as further RO trains and/or salt removal techniques such as thermal evaporation. • 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).	Water and Sediment Quality	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Incorporate into closure WTP planning and design contingencies for the following events: • Pit wall failure resulting in lake destratification or mixing, requiring treatment of water with higher concentrations • 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 (Appendix K4.17, Groundwater Hydrology).	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. Contingency planning could avoid upset conditions in WTP operations and pit lake containment. 2. Potential Jurisdiction—State of Alaska (ADEC, ADNR). 3. Reasonable—Yes. Contingency planning is cost effective compared to the consequences of upset conditions. PLP has committed to addressing these issues in the closure WTP planning, assessing the likelihood and potential impacts, and identifying potential design contingencies to accommodate them if warranted (PLP 2020-RFI 071d) (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant (partially, see PLP 2020-RFI 071d)
Pumping tailings supernatant to the main WMP could be an additional mitigation measure to enhance stability, by further removing water from a lined TSF.	Safety	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to a similar measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Raise the Alaska mine production royalty fee (Alaska Statute 38.05.212) from the current 3% to a level (e.g., 20%) sufficient to establish a permanent fund similar to the Alaska oil-based permanent fund. This fund could then be used to fund the foreseeable pit lake and water quality maintenance into perpetuity, as well as help offset economic losses related to a loss or reduction of aquatic habitat production potential.	Socioeconomics	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—No. PLP is required to establish financial assurance through an existing process that does not require raising the royalty fund. This mitigation measure would not have adequate funding for reclamation if the Applicant were to cease operations early in the project, whereas the existing process requires bonding/financial assurance at all project stages.	Unlikely
Collect further hydrogeologic data at future stages of project design 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 allow for design of appropriate mitigation (e.g., grouting, partial liner placed over the fault trace, seepage collection wells), should this be necessary.	Groundwater; Water Quality	1. Effective—Yes. Would help maintain hydraulic containment and protect groundwater quality beneath the bulk TSF. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Survey the port footprint and immediately adjacent road corridor with ground-penetrating radar to identify potential areas for cultural resources and historic properties site investigations. Use smaller transects than 15-meter distances, and as appropriate, other on-the-ground investigation to find or clear the area for graves or cultural sites.	Cultural Resources	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—No. The port footprint has been surveyed, and results documented. Any inadvertent discoveries during construction would follow the process as laid out in the Programmatic Agreement.	Possible

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Designate all communities within the Borough as pick-up points where employees are transported free of charge to the project. In addition, the Borough would expect the company to designate areas outside the Borough—such as Kenai or Anchorage—as pick-up points so that employees do not have an incentive to move to the Borough to avoid transportation costs.	Needs and Welfare of the People—Socioeconomics	1. Effective—Yes. 2. Potential Jurisdiction—LPB; State of Alaska. 3. Reasonable—Yes. It is likely that PLP would transport workers to the mine site at no cost to the employee.	Probable
MONITORING AND ADAPTIVE MANAGEMENT			
Baseline water quality and biological surveys should be conducted before the project begins, at a sufficient spatial scale to encompass the affected area and the potentially impacted area. It was recommended that these baseline levels be established in multiple streams/reaches immediately adjacent to the mine site; in several locations and at several distances downstream of the mine site in both the Nushagak and Kvichak watersheds; at Iliamna Lake, both at the ferry port locations and at the outflow from Upper Talarik Creek; and along a sample of the streams that would be crossed by the transportation corridor.	Water Quality; Fish Values; Wildlife Values	1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has already committed to the development of an Aquatic Resources Monitoring Plan. These plans would address requirements for monitoring at project facilities.	Possible
Monitor the ferry crossing 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.	Fish Values; Wildlife Values	1. Effective—Yes. Bird deterrents are used to reduce bird activity around long-line fishing gear. 2. Potential Jurisdiction—State of Alaska; LPB. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
To detect changes to water quality and its effects to fish and wildlife, water quality (at the same locations as baseline monitoring) should continue to be monitored on a regular basis until the mine reclamation is complete (recommendations for both seasonal and annual sampling were received). An annual report detailing the results of this sampling should be provided to the USACE and resource agencies.	Water Quality; Fish Values; Wildlife Values	1. Effective—Yes. Water quality monitoring is effective. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has committed to the development of an Aquatic Resources Monitoring Plan and has adopted a measure to continue to monitor water quality on a regular basis until the mine reclamation is complete (see Chapter 5, Mitigation, Table 5-2). Results would be reported to the State of Alaska in compliance with permit requirements and management plans.	Adopted by Applicant
Reclamation plans should 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 should 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 (evidence of rilling, gullies, rutting, slumping, etc.). • Evidence of wildlife (e.g., tracks, scat, nests). • Photo documentation.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Conduct reclamation monitoring for all phases of development during construction, operations, and final reclamation.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which sets forth monitoring requirements for restoration and performance criteria for revegetation. Additionally, PLP committed to a similar measure to conduct reclamation monitoring as appropriate for all phases of the project (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Reclamation monitoring plans should include nearby reference sites to provide ongoing information through data collection and photographic stations. Reference sites should be nearby and have similar conditions to provide comparable information about environmental conditions (e.g., elevation, topography, species composition, hydrologic function, precipitation).	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which sets forth performance criteria for revegetation, specifically in reference to adjacent, ecologically similar areas not disturbed by project construction activities.	Probable

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Collection of data should be conducted in late summer or early fall during peak plant production. The same data should be collected at both the control/reference sites and the disturbed sites. The reference sites should be used to gauge the success of reclamation at the project site, considering surrounding environmental conditions. Reference sites would also help to determine if the project site is on a trajectory to meet desired objectives, or if adaptive management strategies such as re-planting, invasive species management, additional erosion control measures, or other remedial actions may be necessary.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska; USACE. 3. Reasonable—Yes. PLP would comply with all regulatory requirements and the commitments of the draft Reclamation and Closure Plan (PLP 2019-RFI 115), which makes recommendations for annual monitoring and sets forth performance criteria for revegetation, specifically in reference to adjacent, ecologically similar areas not disturbed by project construction activities. Procedures for the monitoring and control of invasive species are described in PLP's Invasive Species Monitoring Plan (PLP 2019-RFI 133).	Probable
Implement an ongoing environmental studies program to help inform the public that the project is being done safely. Make studies available to the public.	Vegetation; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. An approved Water Quality Monitoring Plan would be a requirement for multiple state permits. PLP has already developed a Restoration Plan for Temporary Impacts (Owl Ridge 2019a; PLP 2019-RFI 123), a draft Reclamation and Closure Plan (PLP 2019-RFI 115), an Invasive Species Monitoring Plan (PLP 2019-RFI 133), and has committed to the development of an Aquatic Resources Monitoring Plan. The results of ongoing monitoring and agency inspection reports would be public documents.	Probable
Monitor for climate change trends and engage with local communities on discussions of ecological and biological communities, plant communities, animal species and communities, and indigenous economies.	Wildlife Values; Fish Values; Subsistence	1. Effective—Potentially. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—Potentially. Community engagement on ecological and biological communities, animal species and communities, and indigenous economies may provide information on changes to these communities due to climate change that may help inform adaptive management needs for wildlife, fish, and subsistence resources.	Possible
Monitor culverts along project roads for fish passage, and develop a maintenance plan for culverts that may become blocked by debris or ice or hydrological changes.	Fish Values	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. PLP has committed to this measure (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Conduct an annual audit (performed by a third party) for compliance with project permits, and to ensure adequate oversight of the mine by state regulators.	General	1. Effective—Yes. 2. Jurisdiction/Enforcement—No specific regulatory requirement. 3. Reasonable—Yes. PLP has committed to periodic third-party audits of the Pebble Mine facility (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Establish an oversight board to represent all those who are economically active in the 'traditional' fishing and wildlife watching community(ies). The board should review scientific data representing the status and trends of fish and wildlife populations through changes caused by global climate change, as well as mining (suggested at intervals no greater than 6 months).	Recreation, Fish Values, Wildlife	1. Effective—No. Other entities already review trends of fish and wildlife. 2. Potential Jurisdiction—No clear agency jurisdiction. 3. Reasonable—No. PLP has proposed to establish a local advisory committee to facilitate communications and address concerns during construction and operations. The ADF&G is responsible for managing most fish and wildlife populations, with additional research conducted by others, including the University of Washington.	Unlikely
Factor in climate change into long-term monitoring plans. Climate change and the predicted increases in water surplus for the region could result in potential changes in streamflow magnitude and seasonality, requiring adaptation to potentially new water management regimes for the water processing facilities.	Surface Water Hydrology; Groundwater Hydrology	1. Effective—Yes. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Yes. Analysis in Section 4.16, Surface Water Hydrology, incorporates climate variability into the mine water management plan model. Acknowledgement of the need to accommodate for change in streamflow magnitude and seasonality resulting in a potentially new water management regime could be incorporated into long-term monitoring plans.	Probable
Monitor subsistence resources for contaminants, and publicize results.	Subsistence; Health & Safety	1. Effective—Yes. Communication with residents about the levels of contamination in subsistence foods could help reduce impacts to human health, as well as reduce avoidance if there is no contamination. 2. Potential Jurisdiction—State of Alaska. 3. Reasonable—Potentially. It may be possible for PLP to coordinate with State agencies to conduct routine monitoring, but it may not be appropriate to include in permit stipulations.	Possible
Monitor differences in pit lake water quality with depth as it stratifies, and adjust pit lake pumping depth to optimize WTP performance.	Water and Sediment Quality	1. Effective—Probably. May avoid unnecessary water treatment. 2. Potential Jurisdiction—State of Alaska (ADEC). 3. Reasonable—Yes. Some constituents may have lower water quality near the lake surface due to pit wall runoff.	Possible
Conduct additional monitoring of actual groundwater conditions (values of hydraulic head) at depth below the pit or near the pit lake to confirm or revise model findings and water pumping plans as needed, and to confirm that hydraulic containment would be maintained.	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. Hydraulic containment should be demonstrated with adequate data in addition to modeling. 2. Potential Jurisdiction—State of Alaska (ADNR, ADEC). 3. Reasonable—Yes. Deep drilling could be conducted outside of the pit, or as in-pit wells as pit advances. PLP has committed to a similar measure to conduct monitoring of groundwater conditions around the pit to confirm that hydraulic containment would be maintained (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant

Table M-1: Assessment of Mitgation and Monitoring Measures Identified During the EIS Process

Proposed Measure	Resource(s)	Assessment of Measure	Likelihood of Implementation
Update watershed, water balance, and groundwater flow models during operations, closure, and post-closure at least every 5 years based on updated water use, streamflow, precipitation, groundwater, and pit lake level monitoring data until pit lake conditions reach annualized steady-state conditions, including consideration of climate change.	Groundwater Hydrology, Water and Sediment Quality	1. Effective—Yes. Updated models based on ongoing monitoring data allow for consideration of changing or newly discovered conditions, and provides better predictions for future water management. 2. Potential Jurisdiction—State of Alaska (ADNR, ADEC) 3. Reasonable—Yes. May be part of closure permitting and would be considered normal state-of-the-practice for modeling long-term impacts. Additionally, PLP has committed to a similar measure to update water management plans and models during operations, closure, and post-closure until pit lake conditions reach steady state (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
In the Monitoring and Adaptive Management Plan (particularly Sections 3.1 and 3.4), identify how the monitoring could be used to assess impacts from the authorized discharges or from an exceedance of a discharge criteria.		1. Effective—Potentially. 2. Potential Jurisdiction—State of Alaska (ADEC/ADNR). 3. Reasonable—Yes. PLP adopted a measure that the monitoring and adaptive management plan will identify how the monitoring could be used to assess impacts from mine operations (see Chapter 5, Mitigation, Table 5-2).	Adopted by Applicant
Incorporate WET testing on effluent, WET trigger limits, and response actions in the project monitoring plan: - WET testing at all outfalls. - EPA approved WET methods are recommended for use that should include organisms as close as possible to those in the receiving waters. - Develop trigger limits for WET testing reflective of no toxics in toxic amounts. - Develop an adaptive management plan that identifies the trigger limits and actions that would be taken, if trigger limits are exceeded, to investigate the cause of toxicity and reduce toxicity.	Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADEC) 3. Reasonable—Potentially. WET testing would likely be required by ADEC at project outfalls. PLP has agreed to adopt the following (see response to RFI 071d [PLP 2020-RFI 071d]). NOTE: not all measures proposed by the suggested mitigation were adopted by the Applicant (See Chapter 5, Mitigation, Table 5-2): - Use of standardized WET testing procedures and species unless otherwise directed by ADEC. - Working with ADEC on identifying procedures for the implementation of WET testing that best meet agency and project requirements. - Incorporating WET testing and biomonitoring results into the project adaptive management plan and implementing appropriate responses if any testing identifies problems associated with the discharges. - Working with ADF&G prior to construction to implement a biomonitoring program. PLP will review the value of developing bioaccumulation factors, but does not commit to that at this time.	Adopted by Applicant (partially, see PLP 2020-RFI 071d)
Bioaccumulation monitoring, limits, and response actions. Incorporate the following bioaccumulation monitoring and controls into the project's Aquatic Resources Management Plan: - In addition to sediment monitoring, develop site-specific bioaccumulation factors for the receiving streams so that effluent concentrations can be used as a measure of bioaccumulation. - Develop effluent limits based on bioaccumulation factors. - Develop a specific adaptive management plan that identifies actions that would be taken if limits are exceeded. Actions should include reduction of mercury and selenium in the discharges.	Water and Sediment Quality; Fish Values; Wetlands and Other Waters/Special Aquatic Sites	1. Effective—Yes 2. Potential Jurisdiction—State of Alaska (ADEC; ADF&G) 3. Reasonable—Partially. Biomonitoring of appropriate resident species in addition to sediment monitoring is reasonable for the project and PLP has adopted a similar measure (see Chapter 5, Mitigation. Table 5-2). However, appropriate limits, based on established state procedures and standards, would be developed through the state permitting process. PLP has previously committed to the development on an adaptive management plan. Biomonitoring results would be incorporated into the plan and appropriate responses would be implemented if any testing, including biomonitoring, identifies problems such as evidence of mercury or selenium buildup. See PLP 2020-RFI 071d for additional evaluation of this measure.	Adopted by Applicant (partially, see PLP 2020-RFI 071d)

Notes:
4MP = Marine Mammal Monitoring and Mitigation Plan
ADEC = Alaska Department of Conversation
ADF&G = Alaska Department of Fish and Game
ADNR = Alaska Dam Safety Program
ADSP = Alaska Dam Safety Program
AS = Alaska Statute
BACT = best available control technology
BMPs = Best Management Practices
BSEE = Bureau of Safety and Environmental Enforcement
CFR = Code of Federal Regulations
EPA = US Environmental Protection Agency
FAA = Federal Aviation Administration
FDCP = Fugitive Dust Control Plan
HDD = horizontal directional drilling
LiDAR = light detection and ranging
LPB = Lake and Peninsula Borough
NEPA = National Environmental Policy Act
NMFS = National Marine Fisheries Service
NOx = oxides of nitrogen
O&M = Operations and Maintenance
ORP = oxygen reduction potential
PAG = potentially acid generating
PHMSA = US Department of Transportation Pipeline and Hazardous Materials Safety Administration
PLP = Pebble Limited Partnership
PSO = Protected Species Observer
RO = reverse osmosis
SCR = selective catalytic reduction
TDS = total dissolved solids
TSF = tailings storage facility
USACE = US Army Corps of Engineers
USCG = US Coast Guard
USDA = US Department of Agriculture
USFS = US Forest Service
USFWS = US Fish and Wildlife Service
VGP = Vessel General Permit
VIDA = Vessel Incident Discharge Act
WET = whole effluent toxicity
WMP = water management pond
WTP = water treatment plant

M2.0—APPLICANT'S DRAFT COMPENSATORY MITIGATION PLAN

DRAFT REPORT

Pebble Project
DRAFT Compensatory Mitigation Plan

January 2020

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Attachment 1 – Figures

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ANCSA	Alaska Native Claims Settlement Act
ANTHC	Alaska Native Tribal Health Consortium
AWM	Alaska Wetlands Map
BBNA	Bristol Bay Native Association
CFR	Code of Federal Regulations
CMP	Compensatory Mitigation Plan
CWA	Clean Water Act
DA	Department of the Army
ECHO	Enforcement and Compliance History Online
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FPID	Fish Passage Inventory Database
HGM	Hydrogeomorphic
HUC	Hydrologic Unit Code
IHS	Indian Health Service
ILF	In-lieu Fee
MOU	Memorandum of Understanding
NLCD	National Land Cover Database
NWI	National Wetland Inventory
OCS	Outer Continental Shelf
PJD	Preliminary Jurisdictional Determination
PLP	Pebble Limited Partnership
PRM	Permittee-responsible Mitigation
RHA	Rivers and Harbors Act
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEAR	Waste Erosion Assessment and Review
WOUS	Waters of the U.S., including wetlands

1. Introduction

Pebble Limited Partnership (PLP) submitted a Department of the Army (DA) application, pursuant to Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act (RHA) of 1899 to the U.S. Army Corps of Engineers (USACE) on December 22nd, 2017 for the Pebble Project (Project) (POA-2017-271). A revised application was submitted in January 2018. The DA application proposed the development of a copper-gold-molybdenum porphyry deposit as a surface mine in Southwest Alaska. A list of relevant PLP DA application submittals and supporting documentation, including upcoming revisions, is provided in Table 1-1. The Project is located on State of Alaska and private (Alaska Native Claims Settlement Act [ANCSA] corporation) lands in Southwest Alaska near Iliamna Lake, primarily within the Lake and Peninsula Borough, with a portion of the supporting infrastructure in Cook Inlet Outer Continental Shelf (OCS) waters, and in the Kenai Peninsula Borough. The Project consists of four primary project elements: the mine site, the transportation corridor, the Amakdedori Port, and the natural gas pipeline.

The associated discharges of dredged or fill materials in Waters of the U.S. (WOUS), including wetlands, are subject to Section 404 of the CWA, except for those of the natural gas pipeline in OCS waters. The construction of Project elements in the navigable waters of Iliamna Lake and Cook Inlet are subject to Section 10 of the RHA, including those in OCS waters. Construction of the Project will permanently fill approximately 2,227 acres of WOUS, including wetlands, subject to Section 404 of the CWA.

PLP is submitting this Draft Compensatory Mitigation Plan (CMP) to the USACE in fulfillment of the requirements established by the Compensatory Mitigation for Losses of Aquatic Resources Final Rule (The Rule) issued by the USACE and the U.S. Environmental Protection Agency (EPA) on April 10, 2008. The Rule emphasized the selection of compensatory mitigation sites on a watershed basis, established the operating standards for mitigation providers, and identified three mechanisms to accomplish compensatory mitigation: 1) mitigation banks, 2) in-lieu fee (ILF) programs, and 3) permittee-responsible mitigation (PRM) plans.

This CMP follows The Rule's requirements and the requirements of the June 15, 2018 Memorandum of Understanding (2018 MOU) between USACE and EPA regarding Mitigation Sequence for Wetlands in Alaska under Section 404 of the CWA (EPA, DA 2018).

PLP's analysis of the three mechanisms to compensate for the loss of wetlands and aquatic resource functions in the watershed is presented in the following sections.

Table 1-1 PLP DA application submissions and supporting documentation to USACE

Submitted to USACE	Document Name	Remarks
December 2017	Department of the Army permit application package (POA-2017-271)	
December 2017	Preliminary Jurisdictional Determination (PJD)	Accepted by USACE on March 20th, 2018.
January 2019	Revised Department of the Army permit application package (POA-2017-271)	A revised DA application reflecting updates to the project description was submitted to USACE.
April 2019	Revised Preliminary Jurisdictional Determination (PJD R2)	Revised wetlands PJD with additional wetlands fieldwork conducted in 2018.
November 2019	Revised Preliminary Jurisdictional Determination (PJD R3)	Revised wetlands PJD with additional wetlands fieldwork conducted in 2019.
January 2019	Draft Conceptual Compensatory Mitigation Plan	*This November 2019 plan supersedes the Draft Conceptual Compensatory Mitigation Plan*

2. Proposed Project

The Pebble Project comprises four primary elements: The mine site at the Pebble deposit location; one port site in Kamishak Bay in Cook Inlet and two ferry terminals in Iliamna Lake; a road corridor connecting the mine site, ferry terminals and port; and a natural gas pipeline connecting to existing infrastructure on the Kenai Peninsula.

- Mine Site. The proposed mine site is in the Iliamna region of Southwest Alaska, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the mine site in a general easterly direction. The fully developed mine site will include the open pit, tailings storage facilities, overburden stockpiles, material sites, water management ponds, milling and processing facilities, and supporting infrastructure such as the power plant, water treatment plants, camp facilities, and storage facilities.

- Transportation Corridor. The proposed transportation corridor will connect the mine site to the proposed Amakdedori Port on Cook Inlet, and includes two main components: 1) a private, double-lane road extending 35 miles south from the mine site to a ferry terminal at Eagle Bay on Iliamna Lake; and 2) a private, double-lane road extending 37 miles southeast from the south ferry terminal to the Amakdedori Port on Kamishak Bay. Separate spur roads will connect the transportation corridor to the villages of Iliamna, Newhalen, and Kokhanok.

- Port and Ferry Terminals. The port site will be located north of the Amakdedori Creek outflow into Kamishak Bay on the western shore of Cook Inlet, approximately 190 miles southwest of Anchorage and approximately 95 miles southwest of Homer. The port site will include shore-based and marine facilities for the transfer, shipment, and temporary storage of concentrate, freight, and fuel for the

Project. The marine component includes a caisson supported causeway extending out to wharf located in 15 feet of natural water depth. Copper-gold concentrate containers will be loaded onto lightering barges at the Amakdedori Port and then transported to one of two lightering locations for transfer to bulk carriers. The primary lightering location is approximately 12 miles offshore due east of the proposed Amakdedori Port, the alternative lightering location is approximately 18 miles east-northeast of the proposed Amakdedori Port between Augustine Island and the mainland. The lightering locations will consist of permanently anchored buoys for mooring the bulk carriers. Two ferry terminals, one on the north shore of Iliamna Lake (located approximately 6.0 miles east of Iliamna) and the other on the south shore of the lake (located approximately 5.1 miles west of the village of Kokhanok), would support the operation of an ice-breaking ferry to transport materials, equipment, and concentrate 28 miles across Iliamna Lake.

- Natural Gas Pipeline and Fiber Optic Cable. Natural gas will be the primary energy source for the Pebble Project. The natural gas pipeline alignment will connect to an existing natural gas pipeline, and new compressor station located north of Anchor River on the Kenai Peninsula. From there, the pipeline heads southwest across Cook Inlet before turning west to a landfall at the Amakdedori Port. The pipeline then follows the transportation corridor from the port to the south ferry terminal. At the south ferry terminal, the pipeline trends north along the lakebed of Iliamna Lake and makes landfall west of the community of Newhalen, where it continues north and rejoins the mine access road. From there, the pipeline continues west towards the mine site following the mine access road. A fiber optic cable would be co-located with the pipeline.

3. WOUS Fill Impacts from Proposed Project

Construction of the Project will require the discharge of fill material into 3,083 acres of WOUS. This includes 2,227 acres of permanent impacts and 856 acres of temporary impacts in WOUS (Table 3-1). Permanent impacts include cut and fill activities at facility locations where the fill cannot be practicably removed from WOUS. Temporary impacts occur where fill is placed into wetlands or WOUS for a limited period during construction to facilitate construction activities, then removed allowing return of wetland functions.

Two categories of temporary impacts have been identified for the Project:

1) Construction of the transportation corridor infrastructure from Amakdedori to the mine site will, in some areas, require the temporary placement of fill consisting of mixed vegetative matter and topsoil, or rock and soil from cuts, into areas adjacent to the toe of the defined roadbed and associated pipeline trench. Any such material would typically be placed on one side (the downslope side) of the road. Typical road construction through wetlands would consist of the placement of a coarse rock fill and/or geotextile and fill directly to the existing surface and should not require the temporary storage of material adjacent to the road toe. Furthermore, wetland areas would be flagged ahead of construction and reasonable efforts would be made to avoid impacts beyond the permanent road footprint. However, to address this potential for temporary construction impacts PLP has assumed a 30-foot buffer on each side of the permanently impacted footprint for the transportation corridor. These construction-related impacts to wetlands will occur over a period of approximately one year.

2) Placement of the heavy-wall pipe on the Cook Inlet seabed and Iliamna Lake lakebed has the potential to result in temporary impacts associated with pipe placement activities (i.e. trenching). These temporary construction-related impacts to wetlands will typically have a duration of a few days to a few weeks at any given location. Cross country construction of the pipeline where it is not coincident with the road will also result in temporary construction impacts and PLP has assumed a 150-foot wide construction corridor for these areas. These construction-related impacts to wetlands will occur over a period of approximately two years.

The Project has prepared a Restoration Plan that describes the processes and measures that PLP will implement to restore temporary impacted areas on land (Owl Ridge 2019).

A Preliminary Jurisdictional Determination (PJD) report was prepared for the Project (HDR 2019). As part of the data collection and mapping inventory, WOUS, including wetlands, and uplands were classified by an Enhanced National Wetlands Inventory (ENWI) classification code. The classification codes are based on the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al. 1979) and NWI Mapping Conventions (USFWS (U.S. Fish and Wildlife Service) 1995).

Hydrogeomorphic (HGM) coding was also applied to the mapping and was based on Hydrogeomorphic Classification for Wetlands (Brinson 1993). Lacustrine waters and riverine channel waters are HGM map codes specific to the Project. While lacustrine fringe wetlands occur adjacent to lakes, the lakes themselves are classified as lacustrine waters, and small wetlands and flowing WOUS contained within an active channel are classified as riverine channel waters (HDR 2019).

A summary of permanent and temporary WOUS impacts grouped by HGM and Cowardin classifications for each project element is provided in Table 3-2. Cowardin classification were grouped by System, Subsystem (if defined) and Class. Most permanent discharges of fill for the mine site and transportation corridor will impact slope palustrine scrub-shrub, and slope-emergent WOUS (Table 3-2).

Riverine channel waters impacted by the project include approximately 8.8 miles of anadromous streams, including 8.5 miles of permanent impacts and 0.3 miles of temporary impacts (Table 3-3).

Table 3-1 Summary of permanent and temporary WOUS impacts (acres)

Facility	Permanent	Temporary	Total Acres	%
Mine Site	2,162.63	-	2,162.63	70.1%
Transportation Corridor	60.54	46.52	107.06	3.5%
Port and Ferry Terminals	2.33	5.02	7.35	0.2%
Natural Gas Pipeline	0.99	805.23	806.22	26.2%
Total	2,226.49	856.77	3,083.26	100.0%

Table 3-2 Summary of permanent and temporary WOUS impacts (acres) by project element

HGM and Cowardin Classification	Permanent Impacts					Temporary Impacts				
	Mine Site	Natural Gas Pipeline	Port	Transportation Corridor	Permanent Total	Natural Gas Pipeline	Port	Transportation Corridor	Temporary Total	Grand Total
DEPRESSIONAL WETLANDS	**50.33**	**-**	-	**0.87**	**51.19**	**1.75**	**-**	**1.03**	**2.78**	**53.97**
Palustrine Aquatic Bed	-	-	-	-	**-**	0.12	-	-	**0.12**	**0.12**
Palustrine Emergent	4.79	-	-	0.09	**4.87**	1.44	-	0.16	**1.60**	**6.47**
Palustrine Scrub-Shrub	6.91	-	-	0.31	**7.22**	0.02	-	0.27	**0.29**	**7.51**
Palustrine Unconsolidated Bottom	29.96	-	-	0.27	**30.23**	0.02	-	0.36	**0.38**	**30.61**
Palustrine Unconsolidated Shore	8.67	-	-	0.20	**8.87**	0.15	-	0.24	**0.39**	**9.27**
FLAT WETLANDS	**8.35**	**-**	-	**0.69**	**9.04**	**7.92**	-	**0.68**	**8.60**	**17.64**
Palustrine Emergent	2.67	-	-	0.33	**3.00**	1.64	-	0.30	**1.94**	**4.94**
Palustrine Scrub-Shrub	5.68	-	-	0.36	**6.04**	6.28	-	0.38	**6.66**	**12.69**
LACUSTRINE WATERS	-	**0.99**	-	**1.67**	**2.66**	**156.03**	-	**2.20**	**158.23**	**160.89**
Lacustrine Limnetic Unconsolidated Bottom	-	0.99	-	0.97	**1.96**	155.82	-	1.58	**157.40**	**159.36**
Lacustrine Littoral Unconsolidated Bottom	-	-	-	0.23	**0.23**	-	-	0.07	**0.07**	**0.30**
Lacustrine Littoral Unconsolidated Shore	-	-	-	0.47	**0.47**	0.21	-	0.55	**0.76**	**1.23**
LACUSTRINE FRINGE WETLANDS	**0.04**	-	-	-	**0.04**	**-**	-	-	**-**	**0.04**
Palustrine Emergent	0.04	-	-	-	**0.04**	-	-	-	**-**	**0.04**
MARINE WATERS	-	-	**2.33**	-	**2.33**	**627.12**	**5.02**	-	**632.14**	**634.47**
Marine Intertidal Unconsolidated Shore	-	-	0.07	-	**0.07**	0.90	0.78	-	**1.68**	**1.74**
Marine Subtidal Unconsolidated Bottom	-	-	2.26	-	**2.26**	626.22	4.24	-	**630.46**	**632.72**
RIVERINE WETLANDS	**125.15**	-	-	**1.72**	**126.87**	**1.51**	-	**1.45**	**2.96**	**129.83**
Palustrine Emergent	41.51	-	-	0.20	**41.71**	0.22	-	0.16	**0.38**	**42.09**
Palustrine Forested	-	-	-	0.09	**0.09**	0.42	-	0.28	**0.70**	**0.79**
Palustrine Scrub-Shrub	76.46	-	-	1.31	**77.77**	0.87	-	0.93	**1.80**	**79.57**
Palustrine Unconsolidated Bottom	7.18	-	-	0.11	**7.29**	-	-	0.09	**0.09**	**7.38**
RIVERINE CHANNEL WATERS	**49.67**	-	-	**1.76**	**51.44**	**0.32**	-	**1.57**	**1.89**	**53.32**
Riverine Intermittent Streambed	3.81	-	-	0.24	**4.05**	0.01	-	0.16	**0.17**	**4.22**
Riverine Lower Perennial Unconsolidated Bottom	-	-	-	-	**-**	-	-	0.04	**0.04**	**0.04**
Riverine Upper Perennial Unconsolidated Bottom	44.27	-	-	1.52	**45.78**	0.30	-	1.31	**1.61**	**47.40**
Riverine Upper Perennial Unconsolidated Shore	1.60	-	-	0.00	**1.60**	-	-	0.07	**0.07**	**1.67**
SLOPE WETLANDS	**1,929.09**	-	-	**53.83**	**1,982.92**	**10.59**	-	**39.59**	**50.18**	**2,033.11**
Palustrine Aquatic Bed	2.13	-	-	0.14	**2.27**	-	-	0.11	**0.11**	**2.38**
Palustrine Emergent	547.29	-	-	12.96	**560.26**	2.62	-	9.15	**11.77**	**572.03**
Palustrine Forested	-	-	-	1.88	**1.88**	-	-	1.32	**1.32**	**3.20**
Palustrine Scrub-Shrub	1,365.85	-	-	33.36	**1,399.21**	7.97	-	24.85	**32.83**	**1,432.03**
Palustrine Unconsolidated Bottom	11.63	-	-	5.41	**17.04**	-	-	4.09	**4.09**	**21.13**
Palustrine Unconsolidated Shore	2.19	-	-	0.08	**2.27**	-	-	0.06	**0.06**	**2.33**
Grand Total	**2,162.63**	**0.99**	**2.33**	**60.54**	**2,226.49**	**805.23**	**5.02**	**46.52**	**856.78**	**3,083.26**

Note: Minor discrepancies in totals are the result of rounding numbers.

Table 3-3 Miles of anadromous streams impacted by the Project

Impact in miles	Impact Duration					
	Permanent	Temporary				Grand Total
HUC10 Watershed	**Headwaters Koktuli River**	**Iliamna Lake**	**Newhalen River**	**Upper Talarik Creek**	**Amakdedori Creek-Frontal Kamishak Bay**	
Mine Site	8.5	--	--	--	--	8.5
Transportation Corridor	--	0.04	0.07	0.08	0.02	0.21
Natural Gas Pipeline	--	--	0.03	--	--	0.03
Grand Total	8.5	0.04	0.10	0.08	0.02	8.74

4. Compensatory Mitigation

PLP has avoided and minimized, to the extent practicable, discharges of fill into WOUS, including wetlands: avoidance and minimization measures are discussed in Block 23 of the DA Application. PLP is proposing compensatory mitigation for 2,227 acres of permanent unavoidable impacts to WOUS and aquatic resource functions in the watersheds. PLP is not proposing compensatory mitigation for 857 acres of temporary impacts (including 464 acres in OCS waters that are not subject to Section 404 of the CWA), as those WOUS and functions are expected to recover in the short term after restoration. The proposed permanent impacts are distributed among six Hydrologic Unit Code (HUC) 10 watersheds. A summary of permanent WOUS impacts grouped by HGM and Cowardin classification for each HUC 10 watershed is provided in Table 4-1. Most of the proposed WOUS impacts (97% or 2,158 acres) are in the Headwaters Koktuli River HUC 10 watershed. Impacts to 'open waters' such as streams, lakes and marine waters have been minimized to the extent practicable. Discharges of fill at the mine site would be placed in 125 acres of riverine wetland HGM with mostly palustrine scrub-shrub and emergent wetlands, and 50 acres of riverine channel water HGM, mainly palustrine upper perennial. Construction of the Amakdedori Port will discharge fill in 2.2 acres of marine water HGM, including 0.1 acre of marine intertidal WOUS and 2.1 acres of marine subtidal WOUS. Construction of the ferry terminals would require the discharge of fill into 0.04 acres of lacustrine fringe wetland HGM.

The Rule emphasizes the selection of compensatory mitigation sites using a watershed approach and established three types of compensatory mitigation mechanisms: (1) mitigation banks, (2) ILF programs, and (3) permittee-responsible mitigation plans. PLP consulted the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS) and confirmed the existence of The Conservation Fund ILF with a service area that includes the Project (USACE 2018). However, as of October 16, 2017 the fund is no longer authorized to sell credits (USACE 2017). The Project is not located in the service area of an approved bank or ILF with appropriate credits available. In the absence of mitigation banks or an ILF program in the watersheds, 33 Code of Federal Regulation [CFR] 332.3 (b)(4) states that "permittee-responsible mitigation is the only option." Three PRM options are identified in The Rule and 2018 MOU. PRM projects using a watershed approach are most favored. Such projects 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. 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.

Table 4-1 Summary of permanent WOUS impacts (acres) by HUC 10 watershed

HGM and Cowardin Classification	Headwaters Koktuli River	Newhalen River	Iliamna Lake	Gibraltar Lake	Upper Talarik Creek	Amakdedori Creek-Frontal Kamishak Bay	Cook Inlet	Total
MARINE WATERS						**2.18**	**0.15**	**2.33**
Marine Subtidal Unconsolidated Bottom						2.11	0.15	**2.26**
Marine Intertidal Unconsolidated Shore						0.07		**0.07**
LACUSTRINE WATERS			**2.36**	**0.00**		**0.30**		**2.66**
Lacustrine Limnetic Unconsolidated Bottom			1.95	0.00		0.00		**1.96**
Lacustrine Littoral Unconsolidated Bottom						0.23		**0.23**
Lacustrine Littoral Unconsolidated Shore			0.41			0.06		**0.47**
LACUSTRINE FRINGE WETLANDS	**0.04**							**0.04**
Palustrine Emergent	0.04							**0.04**
RIVERINE WETLANDS	**125.15**	**0.63**	**0.06**		**1.03**			**126.87**
Palustrine Emergent	41.51				0.20			**41.71**
Palustrine Forested		0.09						**0.09**
Palustrine Scrub-Shrub	76.46	0.53	0.06		0.72			**77.77**
Palustrine Unconsolidated Bottom	7.18				0.11			**7.29**
RIVERINE CHANNEL WATERS	**49.68**	**0.13**	**0.69**	**0.20**	**0.16**	**0.58**		**51.44**
Riverine Intermittent Streambed	3.81		0.03	0.02	0.01	0.18		**4.05**
Riverine Upper Perennial Unconsolidated Bottom	44.27	0.13	0.66	0.18	0.15	0.40		**45.78**
Riverine Upper Perennial Unconsolidated Shore	1.60				0.00	0.00		**1.60**
FLAT WETLANDS	**8.35**	**0.29**			**0.40**			**9.04**
Palustrine Emergent	2.67				0.33			**3.00**
Palustrine Scrub-Shrub	5.68	0.29			0.07			**6.04**

HGM and Cowardin Classification	Headwaters Koktuli River	Newhalen River	Iliamna Lake	Gibraltar Lake	Upper Talarik Creek	Amakdedori Creek-Frontal Kamishak Bay	Cook Inlet	Total
SLOPE WETLANDS	**1,925.27**	**3.33**	**19.29**	**8.28**	**12.61**	**14.15**		**1,982.92**
Palustrine Aquatic Bed	2.13		0.14					**2.27**
Palustrine Emergent	546.47		5.06	2.36	1.75	4.62		**560.26**
Palustrine Forested		0.30	1.58					**1.88**
Palustrine Scrub-Shrub	1,362.85	3.03	11.14	4.95	10.85	6.39		**1,399.21**
Palustrine Unconsolidated Bottom	11.63		1.29	0.97	0.01	3.15		**17.04**
Palustrine Unconsolidated Shore	2.19		0.07	0.01				**2.27**
DEPRESSIONAL WETLANDS	**49.90**		**0.55**		**0.74**	**0.01**		**51.19**
Palustrine Emergent	4.72				0.15			**4.87**
Palustrine Scrub-Shrub	6.91		0.31					**7.22**
Palustrine Unconsolidated Bottom	29.70		0.24		0.28	0.01		**30.23**
Palustrine Unconsolidated Shore	8.57				0.31			**8.87**
Grand Total	**2,158.38**	**4.38**	**22.94**	**8.48**	**14.93**	**17.22**	**0.15**	**2,226.49**

Note: Minor discrepancies in totals are the result of rounding numbers.

5. Affected Watersheds Analysis

A watershed approach is used to establish compensatory mitigation requirements to the extent appropriate and practicable (33 CFR 332.2). The watershed approach is an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It considers watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by DA permits. This section provides a summary of available data used to determine the watershed conditions.

The geographic area of the watershed analysis (Analysis Area) extends over three HUC 6 basins (Nushagak River, Kvichak-Port Heiden, and Western Cook Inlet) and includes 15 HUC 10 watersheds encompassing approximately 3,709,208 acres (Table 5-1, Figure 1 [figures are included in Attachment 1]). The Project footprint includes facilities on the Kenai Peninsula, in the Stariski Creek-Frontal Cook Inlet HUC 10 watershed, but there are no impacts to WOUS, and this watershed is excluded from the Analysis Area. Cook Inlet waters are also excluded from the Analysis Area as WOUS impacts will be minimal (approximately 0.1 acres) or temporary, and no compensatory mitigation is proposed for temporary impacts. Each watershed includes important physical features, ecological processes, and resource types for the sustainability of aquatic resource functions.

Table 5-1 HUC 10 watersheds included in the geographic area of the watershed analysis

HUC 10	Watershed	Project Element	Watershed Acres
Nushagak River (HUC 6)			
1903030211	Headwaters Koktuli River	Mine site	170,635
1903030213	Outlet Koktuli River	Transportation corridor; natural gas pipeline & fiber optic cable	120,176
1903030215	Pine Creek-Mulchatna River	Transportation corridor; natural gas pipeline & fiber optic cable	124,317
1903030217	Outlet Mulchatna River	Downstream of Mine site	232,422
1903030302	Tunravik Creek-Nushagak River	Downstream of Mine site	222,834
1903030307	Lower Klutuk Creek-Nushagak River	Downstream of Mine site	170,512
1903030309	Portage Creek-Nushagak River	Downstream of Mine site	216,422
1903030310	Scandinavian Slough-Nushagak River	Downstream of Mine site	196,184
1903030311	Little Muklung River-Nushagak River	Downstream of Mine site	204,360
1903030608	Nushagak Bay-Frontal Bristol Bay	Downstream of Mine site	329,352
Kvichak-Port Heiden (HUC 6)			
1903020514	Newhalen River	Transportation corridor	119,725
1903020609	Iliamna Lake	Transportation corridor; natural gas pipeline & fiber optic cable	1,201,978
1903020606	Gibraltar Lake	Transportation corridor; natural gas pipeline & fiber optic cable	81,594
1903020607	Upper Talarik Creek	Mine site; transportation corridor; natural gas pipeline & fiber optic cable	87,547
Western Cook Inlet (HUC 6)			
1902060212	Amakdedori Creek-Frontal Kamishak Bay	Transportation corridor; natural gas pipeline and fiber optic cable; Amakdedori Port	231,151
Total			**3,709,208**

Source: USGS Watershed Boundary Dataset, 2018

5.1 Land Cover

The National Land Cover Database (NLCD) (Jim, et al. 2011) provides a rapid estimate of land cover types for watersheds, including percent of developed areas and percent of vegetated cover.

The most abundant land cover in the Analysis Area is scrub-shrub at 39 percent (See Table 5-2). Open water is the second most abundant cover at 22 percent, most of which (90 percent) is Iliamna Lake. Dwarf shrub is the next most widely distributed vegetation types at 19 percent. Barren lands are unvegetated areas that generally occur at hill tops and shorelines and account for approximately one percent of cover types in the Analysis Area. Mixed forest, evergreen forest, and deciduous forest account for approximately 10 percent of cover types. Less than one percent is identified by the NLCD as developed areas, woody wetlands, perennial ice/snow, and moss areas (See Table 5-2). Wetlands mapped in the NLCD are generally undercounted because the data analysis process is not optimized for this purpose. Wetlands are discussed in section 5.2.

5.2 Wetlands and Other Waters

Using a consistent dataset for the calculation of wetlands is desired for equitable assessment of habitat types on a broad level. Three wetlands datasets provide varying coverage of the Analysis Area: Alaska Wetlands Mapping (AWM), National Wetlands Inventory (NWI), and PLP wetlands mapping. Only one available dataset, the AWM, covers the entire area with a uniform method of analysis and scale. The AWM is derived from L-band radar imagery acquired by Japanese Earth Resources Satellite (JERS-1) synthetic aperture radar (SAR) and is available with a resolution of 100-meter pixels. The U.S. Fish and Wildlife Service (USFWS) NWI dataset covers approximately 60 percent of the Analysis Area and would need to be supplemented by the AWM dataset. The Headwaters Koktuli River is the only watershed covered 100 percent by the NWI data. A third dataset available is the PLP wetlands mapping for the immediate vicinity of the Project footprint and includes 89 percent of the surface area in the Headwaters Koktuli River watershed. The PLP wetlands data outside the Headwaters Koktuli River watershed are generally limited to the transportation corridor and are of limited use in the evaluation of the Analysis Area.

Most of the proposed Project wetland impacts are in the Headwaters Koktuli River watershed. It is appropriate to provide and use the most accurate data for that portion of the Analysis Area. The PLP-generated data for the Headwaters Koktuli River is provided in Table 5-3. Since the PLP wetlands mapping only includes 89 percent of the surface area in the Headwaters Koktuli River watershed, NWI data were used to supplement the remaining 11 percent of the watershed (Table 5-4). The AWM dataset is the only consistent dataset for the entire Analysis Area and was used for the remainder of the watersheds and is provided in Table 5-5. The AWM provides only wetlands; therefore, other waters were calculated from the National Hydrography Dataset 1:63,360 scale mapping (USGS 2018).

The Headwaters Koktuli River watershed includes approximately 59,581 acres of wetlands, including 48,693 acres mapped by PLP and 10,888 acres mapped by the NWI. Slope palustrine scrub-shrub (42.65%), slope palustrine emergent (18.3%) and riverine palustrine scrub-shrub (12.01%) and emergent (4.44%) are the most abundant wetlands mapped by PLP in the watershed (Table 5-3). The NWI data are not grouped by HGM, but palustrine scrub-shrub (71.74%) and palustrine emergent (23.93%) are the most widely distributed wetlands (Table 5-4).

Table 5-2 NLCD Classification for the watershed Analysis Area

	Nushagak River										Kvichak-Port Heiden				Western Cook Inlet	
Land Cover Class	Headwaters Koktuli River (%)	Outlet Koktuli River (%)	Pine Creek-Mulchatna River (%)	Outlet Mulchatna River (%)	Tunravik Creek-Nushagak River (%)	Lower Klutuk Creek-Nushagak River (%)	Portage Creek-Nushagak River (%)	Scandinavian Slough-Nushagak River (%)	Little Muklung River-Nushagak River (%)	Nushagak Bay-Frontal Bristol Bay (%)	Newhalen River (%)	Iliamna Lake (%)	Gibraltar Lake (%)	Upper Talarik Creek (%)	Amakdedori Creek-Frontal Kamishak Bay (%)	Analysis Area Total (%)
Barren Land	2	<1	<1	<1	<1	<1	<1	0	<1	1	3	3	4	<1	9	1
Deciduous Forest	<1	3	3	1	3	3	2	2	3	<1	5	3	4	2	3	2
Developed, High Intensity	<1	0	0	0	0	0	0	0	0	0	<1	<1	<1	<1	<1	<1
Developed, Low Intensity	<1	0	0	0	0	0	0	0	<1	0	<1	<1	<1	<1	<1	<1
Developed, Medium Intensity	<1	0	0	0	0	0	0	0	0	0	<1	<1	<1	<1	<1	<1
Developed, Open Space	<1	0	0	0	0	0	0	0	0	0	<1	<1	<1	<1	<1	<1
Dwarf Shrub	42	22	22	19	22	17	22	23	23	6	13	12	38	47	13	19
Emergent Herbaceous Wetlands	<1	<1	<1	2	2	9	12	18	13	5	<1	<1	<1	<1	<1	6
Evergreen Forest	2	12	6	4	7	13	6	3	2	<1	11	4	<1	2	<1	5
Mixed Forest	<1	2	2	3	3	5	3	3	2	<1	11	5	1	<1	<1	3
Moss	<1	<1	0	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Open Water	2	1	4	5	6	7	7	6	17	74	9	57	6	2	3	22
Perennial Ice/Snow	<1	0	0	0	0	0	0	0	0	0	<1	<1	<1	<1	<1	<1
Sedge/Herbaceous	<1	<1	<1	4	4	7	9	3	<1	<1	<1	<1	<1	<1	<1	3
Shrub/Scrub	51	58	61	61	52	39	38	42	37	13	46	16	46	46	71	39
Woody Wetlands	<1	<1	<1	<1	<1	<1	1	<1	3	<1	1	<1	<1	<1	<1	<1
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: National Land Cover Database (Jim, et al. 2011). Differences in the acreage between the above and those shown in Table 5-1 are a result of the differences in data resolution and data types (vector versus raster data).

Table 5-3 Wetlands and other waters mapped by PLP in the Headwaters Koktuli River

HGM and Cowardin Classification	Acres	%
Lacustrine Waters	**975.0**	**2.00%**
Lacustrine Limnetic Unconsolidated Bottom	844.4	1.73%
Lacustrine Littoral Aquatic Bed	10.1	0.02%
Lacustrine Littoral Unconsolidated Bottom	33.0	0.07%
Lacustrine Littoral Unconsolidated Shore	33.8	0.07%
Palustrine Emergent	1.1	<0.01%
Palustrine Unconsolidated Bottom	51.0	0.10%
Palustrine Unconsolidated Shore	2.7	0.01%
Lacustrine Fringe Wetlands	**126.7**	**0.26%**
Lacustrine Littoral Emergent	0.3	0.00%
Lacustrine Littoral Unconsolidated Shore	9.4	0.02%
Palustrine Emergent	50.7	0.10%
Palustrine Moss-Lichen	0.2	<0.01%
Palustrine Scrub-Shrub	64.8	0.13%
Palustrine Unconsolidated Bottom	0.5	<0.01%
Palustrine Unconsolidated Shore	0.9	<0.01%
Riverine Wetlands	**8,345.6**	**17.14%**
Palustrine Aquatic Bed	1.8	<0.01%
Palustrine Emergent	2,163.4	4.44%
Palustrine Forested	38.5	0.08%
Palustrine Moss-Lichen	2.9	0.01%
Palustrine Scrub-Shrub	5,847.3	12.01%
Palustrine Unconsolidated Bottom	160.6	0.33%
Palustrine Unconsolidated Shore	67.6	0.14%
Riverine Intermittent Streambed	0.1	<0.01%
Riverine Lower Perennial Unconsolidated Bottom	41.5	0.09%
Riverine Lower Perennial Unconsolidated Shore	19.1	0.04%
Riverine Upper Perennial Aquatic Bed	<0.01	<0.01%
Riverine Upper Perennial Unconsolidated Bottom	2.2	<0.01%
Riverine Upper Perennial Unconsolidated Shore	0.5	<0.01%
Riverine Channel Waters	**1,070.0**	**2.20%**
Palustrine Aquatic Bed	1.0	<0.01%
Palustrine Emergent	0.3	<0.01%
Palustrine Unconsolidated Bottom	38.1	0.08%
Palustrine Unconsolidated Shore	6.0	0.01%
Riverine Intermittent Streambed	64.1	0.13%
Riverine Lower Perennial Aquatic Bed	19.1	0.04%
Riverine Lower Perennial Emergent	0.3	<0.01%
Riverine Lower Perennial Unconsolidated Bottom	166.6	0.34%
Riverine Lower Perennial Unconsolidated Shore	9.1	0.02%
Riverine Upper Perennial Emergent	0.1	<0.01%
Riverine Upper Perennial Unconsolidated Bottom	635.7	1.31%
Riverine Upper Perennial Unconsolidated Shore	129.6	0.27%
Flat Wetlands	**6,599.8**	**13.55%**
Palustrine Aquatic Bed	<0.1	<0.01%
Palustrine Emergent	1,623.7	3.33%
Palustrine Forested	0.2	<0.01%
Palustrine Moss-Lichen	33.7	0.07%
Palustrine Scrub-Shrub	4,917.6	10.10%

HGM and Cowardin Classification	Acres	%
Palustrine Unconsolidated Bottom	4.1	0.01%
Palustrine Unconsolidated Shore	20.3	0.04%
Riverine Intermittent	<0.1	<0.01%
Slope Wetlands	**29,813.9**	**61.23%**
Palustrine Aquatic Bed	6.1	0.01%
Palustrine Emergent	8,911.2	18.3%
Palustrine Forested	2.2	<0.01%
Palustrine Moss-Lichen	27.5	0.06%
Palustrine Scrub-Shrub	20,768.5	42.65%
Palustrine Unconsolidated Bottom	69.3	0.14%
Palustrine Unconsolidated Shore	28.3	0.06%
Riverine Upper Perennial Unconsolidated Bottom	0.3	<0.01%
Riverine Upper Perennial Unconsolidated Shore	0.5	<0.01%
Depressional Wetlands	**1,561.2**	**3.21%**
Lacustrine Littoral Unconsolidated Shore	<0.1	<0.01%
Palustrine Aquatic Bed	4.8	0.01%
Palustrine Emergent	155.3	0.32%
Palustrine Moss-Lichen	0.5	<0.01%
Palustrine Scrub-Shrub	172.7	0.35%
Palustrine Unconsolidated Bottom	913.1	1.88%
Palustrine Unconsolidated Shore	314.8	0.65%
N/A	**201.3**	**0.41%**
Palustrine Emergent	2.6	0.01%
Palustrine Scrub-Shrub	197.9	0.41%
Palustrine Unconsolidated Shore	0.9	<0.01%
Grand Total	**48,693.5**	**100%**

Source: PLP mapped wetlands. Minor discrepancies in totals are the result of rounding numbers.

Table 5-4 NWI wetlands and other waters in the Headwaters Koktuli River outside PLP mapped wetlands Analysis Area

Cowardin Classification	Acres	%
Palustrine Emergent	2,605.4	23.93%
Palustrine Scrub-Shrub	7,811.1	71.74%
Palustrine Unconsolidated Bottom	248.4	2.28%
Riverine Unknown Perennial Unconsolidated Bottom	222.8	2.05%
Grand Total	**10,887.7**	**100%**

Source: USFWS NWI mapped wetlands.

For the remaining Analysis Area watersheds, the percentage of wetlands and other waters ranges from 14 percent in the Amakdedori Creek-Frontal Kamishak Bay watershed, to 100 percent in the Lower Klutuk Creek-Nushagak River watershed (Table 5-5). The most abundant wetlands types are palustrine scrub-shrub and emergent. The Newhalen River, Iliamna Lake, Gibraltar Lake, and Upper Talarik Creek HUC 10 watersheds contain many rivers and streams that drain into Iliamna Lake. At 1,012 sq. mi, 77 miles long, up to 22 miles wide, and up to 984 feet deep, Iliamna Lake is the largest fresh-water waterbody in the Analysis Area. The Kvichak River drains from Iliamna Lake southwest into Bristol Bay.

Table 5-5 Wetlands and other waters of HUC 10 Watersheds, outside of the Headwaters Koktuli River watershed

	Nushagak River									Kvichak-Port Heiden				Western Cook Inlet	
Wetlands and Other Waters	Outlet Koktuli River	Pine Creek-Mulchatna River	Outlet Mulchatna River	Tunravik Creek-Nushagak River	Lower Klutuk Creek-Nushagak River	Portage Creek-Nushagak River	Scandinavian Slough-Nushagak River	Little Muklung River-Nushagak River	Nushagak Bay-Frontal Bristol Bay	Newhalen River	Iliamna Lake	Gibraltar Lake	Upper Talarik Creek	Amakdedori Creek-Frontal Kamishak Bay	Analysis Area Total
Estuarine															
Emergent (ac)	0	0	0	0	0	0	0	0	0	0	15	0	0	1,525	1,540
Forested (ac)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (ac)	0	0	0	0	0	0	0	0	0	0	15	0	0	1,525	1,540
Lacustrine															
Emergent (ac)	0	0	0	0	0	0	0	0	0	116	42	0	0	035	193
Total (ac)	0	0	0	0	0	0	0	0	0	116	42	0	0	35	193
Palustrine															
Emergent (ac)	13,658	15,113	2,622	1,147	7,561	33,055	145,011	86,460	77,379	30,908	133,446	7,594	13,200	5,666	572,820
Moss-lichen (ac)	0	10	2	74	0	0	0	0	121	0	0	0	0	0	207
Forested (ac)	0	0	2,370	9,820	15,059	502	0	30	0	59	682	0	44	62	28,628
Scrub-Shrub (ac)	52,233	81,859	206,689	189,532	139,812	164,152	27,231	63,489	52	25,610	136,444	13,964	22,111	20,240	1,143,418
Total	65,891	96,982	211,683	200,573	162,432	197,709	172,242	149,979	77,552	56,577	270,572	21,558	35,355	25,968	1,745,073
Other Waters															
Ice (Glacier) (ac)	0	0	0	0	0	0	0	0	0	0	0	38	0	0	38
Lakes (ac)	955	3,780	9,281	8,941	9,805	9,186	8,700	4,383	3,986	8,075	681,658	5,331	1,680	3,960	759,721
Total (ac)	955	3,780	9,281	8,941	9,805	9,186	8,700	4,383	3,986	8,075	681,658	5,369	1,680	3,960	759,759
Streams (mi)	306	393	851	505	355	502	303	388	112	250	881	91	250	684	5,871
Summary															
Watershed Size (ac)	120,176	124,317	232,422	222,834	170,512	216,422	196,184	204,360	329,352	119,725	1,201,978	81,594	87,547	231,151	3,538,574
Wetlands (ac)	65,891	96,982	211,683	200,573	162,432	197,709	172,242	149,979	77,552	56,693	270,629	21,558	35,355	27,528	1,746,806
Wetlands (%)	55	78	91	90	95	91	88	73	24	47	23	26	40	12	49
Other Waters (ac)	955	3,780	9,281	8,941	9,805	9,186	8,700	4,383	3,986	8,075	681,658	5,369	1,680	3,960	759,759
Other Waters (%)	1	3	4	4	6	4	4	2	1	7	57	7	2	2	21
Wetlands and Other Waters (ac)	66,846	100,762	220,964	209,514	172,237	206,895	180,942	154,362	81,538	64,768	952,287	26,927	39,315	31,488	2,506,565
Wetlands and Other Waters (%)	56	81	95	94	101	96	92	76	25	54	79	33	45	14	71
Streams (mi)	306	393	851	505	355	502	303	388	112	250	881	91	250	684	5,871

Source: Wetlands – Alaska Wetlands Map; Other Waters – National Hydrography Dataset

5.3 Fish and Wildlife

The wetlands and other WOUS in the watersheds provide habitat for mammals, fish, and bird animal species, many of which are of high importance to the ecosystems they inhabit and to the local economies and subsistence lifestyles. Representative indicator animal species in the Analysis Area include:

- Caribou. Caribou (*Rangifer tarandus granti*) in this area are referred to as the Mulchatna Caribou Herd. Caribou prefer tundra habitats. Their distribution in the watersheds include the Headwaters Koktuli River, Upper Talarik Creek, Newhalen River, and the western shores of Iliamna Lake. In the mid-1990s, the caribou population peaked at about 200,000 animals, and then the herd began simultaneously declining in numbers and expanding its range north and west. This current decade the population reached a low of approximately 18,000 caribou; although in 2015 it had shown an increase to over 30,000. During the late 1990s, reported annual harvests peaked at over 5,000 caribou but during the 2010s, the reported harvest has not exceeded 466 caribou per year (Van Lanen 2018).

- Lake Seals. Iliamna Lake provides habitat to a population of freshwater seals, which are believed to be harbor seals (*Phoca vitulina*), although the exact species identification remains uncertain. These seals are unique in that freshwater seal populations are very rare in the northern hemisphere. Over the 28 years of aerial surveys, counts have ranged from zero to more than 300 seals, with the largest numbers occurring during August. The seals spend most of their time in and around the island systems of the northeast portion of the lake and during salmon season feed near the mouths of the lake's tributary rivers and streams. Approximately 3-5 seals are harvested per community per year (Van Lanen 2018).

- Fish. The Bristol Bay watershed, of which these watersheds are a part, support important commercial and sport fisheries for Pacific salmon and other fishes. The watersheds provide spawning and rearing habitat for all species of anadromous Pacific salmon (Figure 2): sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), Chinook (*O. tshawytscha*), chum (*O. keta*), and pink (*O. gorbuscha*). The most abundant species in the watersheds is sockeye salmon. Waters in the watersheds provide habitat for other fish species, including rainbow trout (*O. mykiss*), Dolly Varden (*Salvelinus malma*), Arctic char (*S. alpinus*), lake trout (*S. namaycush*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), and humpback whitefish (*Coregonus pidschian*). These fishes occupy a variety of habitats in the watershed, from headwater streams to wetlands to large rivers and lakes. The Analysis Area includes approximately 1,120 miles of anadromous streams and 684,616 acres of anadromous waterbodies (Table 5-6).

Table 5-6 Anadromous fish habitat in the watershed Analysis Area

	Nushagak River										Kvichak-Port Heiden				Western Cook Inlet	Analysis Area
Anadromous Waters	Headwaters Koktuli River	Outlet Koktuli River	Pine Creek-Mulchatna River	Outlet Mulchatna River	Tunravik Creek-Nushagak River	Lower Klutuk Creek-Nushagak River	Portage Creek-Nushagak River	Scandinavian Slough-Nushagak River	Little Muklung River-Nushagak River	Nushagak Bay-Frontal Bristol Bay	Newhalen River	Iliamna Lake	Gibraltar Lake	Upper Talarik Creek	Amakdedori Creek-Frontal Kamishak Bay	Total
Streams (mi)	143	81	35	111	78	84	65	37	60	0	53	213	43	76	41	1,120
Lakes (acres)	428	0	0	0	0	0	0	0	0	0	5,749	656,304	3,206	35	428	666,134

Source: ADF&G Anadromous Waters Catalog *(ADF&G 2019).*

The Headwaters Koktuli River watershed includes approximately 143 stream miles and 428 lake acres of anadromous fish habitat for Arctic char, Chinook salmon, chum salmon, coho salmon, and sockeye salmon (ADF&G 2019). Sockeye and coho salmon have the greatest distribution of any anadromous fish in the Headwaters Koktuli River watershed (Table 5-7). Sockeye salmon spawning has been documented in approximately 164 lake acres and 59 stream miles and rearing in 152 lake acres and 53 stream miles. Coho salmon spawning has been documented in approximately 79 stream miles and rearing in 187 lake acres and 123 stream miles. Chinook spawning has been documented in 64 stream miles and rearing in 83 stream miles. Chum spawning includes approximately 49 stream miles and rearing 7 stream miles. Arctic char is present in 41 stream miles.

Table 5-7 Anadromous fish habitat in the Headwaters Koktuli Watershed

Fish Species	Present	Rearing	Spawning
Arctic char			
Stream (miles)	41	--	--
Chinook salmon			
Lake (acres)	164.3	--	--
Stream (miles)	11.9	83.3	63.8
Chum salmon			
Stream (miles)	3.5	6.7	49.5
Coho salmon			
Lake (acres)	219.1	187.1	
Stream (miles)	19.4	123.3	79.0
Sockeye salmon			
Lake (acres)	52.0	151.5	164.3
Stream (miles)	14.8	52.7	58.8

Source: ADF&G Anadromous Waters Catalog (ADF&G 2019).

- Pacific Salmon Barriers. Culverts that do not mimic the characteristics of the stream, including bankfull width, slope, and depth, can impede both upstream and downstream fish movement. The Alaska Department of Fish and Game (ADF&G) maintains the Fish Passage Inventory Database (FPID) (ADF&G 2001) that stores the results of over 2,500 culverts assessed for fish passage by ADF&G since 2001. This database includes detailed physical data for each culvert evaluated, and a determination regarding each culvert's adequacy to allow passage of juvenile fish. The FPID currently includes a total of 710 culverts that are 'inadequate passage' for fish; 350 as 'unlikely passage'; and 232 that are yet to be determined. Inadequate passage culverts affect hundreds of miles of anadromous and other fish-bearing streams through western and southcentral Alaska, including communities in the Lake and Peninsula Borough, the Kenai Peninsula Borough, the Matanuska-Susitna Borough, and the Municipality of Anchorage. This database includes five 'inadequate passage' and seven 'unlikely passage' culverts on tributary streams of the Nushagak River downstream of project impacts in the community of Dillingham, affecting at least 10.5 mi of anadromous streams.

- Protected Species. Protected species in the watershed include southcentral stock northern Sea Otters (*Enhydra lutris kenyoni*), which make use of the marine shorelines of Amakdedori Creek-Frontal Kamishak Bay.

- Other. The watersheds' wetlands and aquatic resources provide habitat for large carnivores, such as brown bears (*Ursus arctos*), bald eagles (*Haliaeetus leucocephalus*), gray wolves (*Canis lupus*), ungulates such as moose (*Alces alces gigas*), and numerous species of waterfowl and small mammals. Brown bears are abundant in the Nushagak River and Kvichak River watersheds. Moose are abundant, particularly in the Nushagak River watershed where felt-leaf willow, a preferred forage species, is plentiful.

5.4 Land Ownership

Generalized land status data to the section level (generally 1 square mile) including federal, State of Alaska, and native lands is produced by the Alaska Department of Natural Resources (ADNR 2018).

Approximately 85 percent of the 3,709,208-acre Analysis Area (3,165,848 acres) encompasses public lands, including State of Alaska (48%) and federally owned (18%) lands (Table 5-8). Overall, the State of Alaska is the largest surface landowner. Approximately 32 percent of land in the watershed are privately-owned lands (1,025,900 acres), including ANCSA lands (31%) and private or municipal lands (2%). Approximately 87,631 acres (~3%) are grouped in administrative management areas, including Katmai National Park and Preserve, Lake Clark National Park and Preserve, and the McNeil River State Game Refuge and Sanctuary (Figure 3).

5.5 Land Use

The watersheds are largely undeveloped, except for twelve rural communities—Nondalton, Iliamna, Newhalen, Pedro Bay, Pile Bay, Igiugig, Kokhanok, Dillingham, Portage Creek, Ekwok, New Stuyahok, and Koliganek. The region is remote with no road access to the State highway system. Limited roads connect Iliamna, Newhalen, and Nondalton and a 15-mile long road connects Williamsport to Pile Bay. Most communities have gravel and earth surfaced streets. Dillingham is the largest and most urbanized community in the Analysis Area. Surface access between most communities is by boat on Iliamna Lake and the Nushagak River in the summer and by snow machine along winter trails in the winter. A few small air carriers provide regular year-round, air charter, and cargo flights from regional hubs to the smaller communities (BBNA 2018).

The communities rely primarily on diesel electric generators for power. However, some communities have implemented alternative energy sources as a means to lower fuel cost (BBNA 2018) and to alleviate spill risk concerns associated with fuel transport (HDR 1998). Iliamna, Newhalen, and Nondalton have implemented hydroelectric options at Tazimina Falls about 9 miles upstream of the confluence of the Tazimina River and the Newhalen River (HDR 1998). Igiugig is experimenting with a river power system (Caldwell 2014).

The communities operate as both subsistence and cash economies. Most cash opportunities result from government development projects, commercial fishing, sport fishing, and sport hunting ventures. Iliamna Lake and the Nushagak River are noted for sport fishing; primarily rainbow trout, Pacific salmon, and Arctic grayling.

Table 5-8 Land ownership for the watershed Analysis Area

	Nushagak River										Kvichak-Port Heiden				Western Cook Inlet	Analysis Area	
Land Ownership	Headwaters Koktuli River (acres)	Outlet Koktuli River (acres)	Pine Creek-Mulchatna River (acres)	Outlet Mulchatna River (acres)	Tunravik Creek-Nushagak River (acres)	Lower Klutuk Creek-Nushagak River (acres)	Portage Creek-Nushagak River (acres)	Scandinavian Slough-Nushagak River (acres)	Little Muklung River-Nushagak River (acres)	Nushagak Bay-Frontal Bristol Bay (acres)	Newhalen River (acres)	Iliamna Lake (acres)	Gibraltar Lake (acres)	Upper Talarik Creek (acres)	Amakdedori Creek-Frontal Kamishak Bay (acres)	Areal Extent (acres)	Portion (%)
Type																	
ANCSA	0	0	0	26,760	80,511	33,174	61,874	154,046	93,794	63,263	53,583	356,724	31,866	19,037	0	974,632	31
Private or Municipal	0	0	0	0	1,589	372	0	0	13,340	9,913	4,344	21,710	0	0	0	51,268	2
State	170,632	120,176	124,317	203,787	16,494	82,692	88,415	37,304	81,476	20,875	40,630	283,807	41,864	64,664	148,642	1,525,775	48
State and ANCSA	0	0	0	1,384	4,467	6,255	3,172	2,560	0	1,868	5,516	8,117	0	0	0	33,339	1
Federal	0	0	0	0	0	0	0	0	640	17,685	15,635	531,496	7,850	3,837	3,691	580,834	18
Total	170,632	120,176	124,317	231,931	103,061	122,493	153,461	193,910	189,250	113,604	119,708	1,201,854	81,580	87,538	152,333	3,165,848	100
Administrative Boundary																	
Katmai National Park & Preserve	0	0	0	0	0	0	0	0	0	0	0	336	1,067	0	25,620	27,023	31
Lake Clark National Park & Preserve	0	0	0	0	0	0	0	0	0	0	25,192	1,913	0	0	0	27,105	31
McNeil River State Game Refuge	0	0	0	0	0	0	0	0	0	0	0	1,124	1,962	0	11,789	14,875	17
McNeil River State Game Sanctuary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18,628	18,628	21
Total	0	0	0	0	0	0	0	0	0	0	25,192	3,373	3,029	0	56,037	87,631	100

Source: Alaska Department of Natural Resources General Land Status, 2018, section level data (ADNR 2018). In some cases, the land ownership was split between State of Alaska and ANCSA owned land. In those cases, the data were not segregated and counted as "State and ANCSA". Discrepancies in the total acreage for the watershed in this table and those shown in Table 5-1 are a result of the differences in data boundaries between the Generalized Land Status and the HUC; in coastal areas, the Generalized Land Status data, and HUC 10 boundary limits do not match.

Almost all State of Alaska lands within the Analysis Area are managed for multiple use and are open to mining. The watersheds include a history of mineral exploration, but to date, no mines have been developed. The most significant placer mining districts in proximity to the Analysis Area are the Nyac (gold) 175 miles northwest of the mine site and Goodnews Bay (platinum) 235 miles west of the mine site. The Alaska Resource Data File maintained by the U.S. Geological Survey (USGS) provides a record of mines, prospects and mineral occurrences (USGS 2018). The watersheds within the Nushagak River, Kvichak-Port Heiden, and Western Cook Inlet basins include six mineral occurrences and 26 prospects for gold, copper, iron, silver, and molybdenum.

The State of Alaska closed many streams to mineral entry in the Nushagak-Mulchatna River drainage as well as streams around Iliamna Lake (Mineral Closing Order 393). This closure is aimed at protecting Pacific salmon streams, including the North Fork Koktuli River, South Fork Koktuli River, and Upper Talarik Creek.

The Analysis Area has large quantities of sand, gravel, and rock materials. There has been little use for these materials except near communities that require them for airport and road construction or upgrades.

5.6 Water Quality Contaminants

Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem. Potential sources of contaminants in the Analysis Area include spills of chemicals or petroleum lubricants and fuels, stormwater runoff and erosion, community sanitation facilities including landfills and sewage management systems, and marine debris. PLP has reviewed available databases to locate known potential sources of contamination in the Analysis Area. All known identified sites are listed, however remediation of sites that are the legal responsibility of a known entity may not qualify for compensatory mitigation.

- Alaska Department of Environmental Conservation (ADEC) contaminated sites. The ADEC maintains a database of contaminated sites in Alaska. The database includes 12 contaminated sites in the Analysis Area where cleanup actions have been completed, and six sites where cleanup actions are ongoing. Contaminants at these sites included oil and lubricants. There are no identified sites in the Analysis Area where clean up actions are not completed or in progress.
- ADEC Solid Waste Sites. The ADEC maintains a database of solid waste sites in Alaska. The database includes 11 solid waste sites in the Analysis Area, each located near a village. Six solid waste sites are active, one inactive, and four retired.
- ADEC Waste Erosion Assessment and Review (WEAR). The ADEC conducted the WEAR program to inventory sites that have the potential to release hazardous substances and garbage from Alaska's landfills, contaminated sites, tank farms, and other sites of environmental concern into state waters, jeopardizing water quality, fish, and wildlife (ADEC 2018). Pertinent site information from this program is included in Table 5-9.
- Environmental Protection Agency Brownfields Sites. The EPA maintains a list of brownfield sites. There are three brownfield sites located in Newhalen that resulted from large historic fuel spills on land, all near waters. Cleanup has been completed at one spill site abutting Iliamna Lake. The two remaining sites are 0.3 miles from the Newhalen River and cleanup actions are under way. Contamination at these sites resulted from a ~13,630-gallon Jet-A spill, and a ~35,000-gallon diesel spill.

Table 5-9 Selected sites of concern from WEAR 2012-2014

Site Name and Location	Description
Igiugig	
Tank Farm, 59.327258/-155.897948 (Active)	The site was constructed in 2004 for the Native Village of Igiugig and contains nine tanks with a total capacity of 111,000 gallons. The nearest source of erosion, the Kvichak River, is only 20 feet away. Erosion symptoms such as root exposure, undercutting, and slides were observed on the closest bank of the river.
Community Landfill, 59.325198/-155.905045 (Retired)	This is the location of a historical military landfill that was started in the 1950s. After the military left, the community used it as their landfill until 2001 when the new landfill was constructed. The field is 500 feet from the closest source of erosion, the Kvichak River.
Iliamna	
Landfill, 59.783836/-154.901292 (Active)	The landfill is a permitted, self-haul facility. The landfill has been in operation since at least 1986 and most waste is burned in a Summit burn unit. The landfill employs a landfill operator but would benefit from improved management of burning and special wastes. The landfill is located approximately 3.3 miles from Iliamna Lake.
Airport Crowley Tank Farm, 59.754428/-154.906141 (Active)	The Crowley tank farm is located across the street from the Iliamna Airport and is an active Contaminated Site (File ID 2560.38.012). A spill of 1,507 gallons of aviation gas occurred at the site in late 2009. 65 cubic yards of contaminated soil was excavated and landfarmed to remediate the soil beginning in 2011. After remediation, the soil was transported to and disposed of at the Newhalen Landfill in June 2013. This site is still being monitored by the Contaminated Sites Program as not all contaminated soil was excavated. The tank farm is about 0.15 acres in size and holds six tanks with a total capacity of 258,000 gallons in a fenced and locked area.
Federal Aviation Administration (FAA) Living Quarters Landfarm, 59.761161/-154.828806 (Active)	This site is part of an active Contaminated Site (File ID 2560.38.001). The landfarm is remediating contaminated soil linked to above-ground fuel tanks that used to exist in the area. The landfarm is within Iliamna Airport Tract II, near the Old FAA landfill and covers an area of approximately 0.08 acres. The site is 170 feet south of Lake Superior.
Former U.S. Post Office, 59.751424/-154.815653 (Active)	The former Iliamna U.S. Post Office was located on Iliaska Drive at this site. In November of 1999, it was reported that drums of used oil were shot and subsequently leaked. This caused the site to become an active Contaminated Site (File ID 2560.38.007). During inspection, the area appeared to be well vegetated aside from a cut in the bushes to provide access to the lake from the road. The site is no longer owned by the U.S. Postal Service and is located right on the shoreline of Roadhouse Bay.
Abandoned Fuel Tanks, 59.749782/-154.812959 (Abandoned)	These tanks, with unknown size and contents, reside in the Iliaska Subdivision in front of Lots 30 and 31. The tanks were completely surrounded by dense vegetation and are 245 feet from Iliamna Lake.
Newhalen	
Landfill, 59.731888/-154.892355 (Active)	This unpermitted landfill has been operating since its construction in 1983. Necessary equipment for the removal of chlorofluorocarbons (CFCs) from white goods was unavailable, and batteries and used oil were poorly stored. The 5.5-acre landfill is located half a mile north of Newhalen and 2,000 feet east of erosion reported along the banks of the Newhalen River.
Crowley Contaminated Soil, 59.719562/-154.891769 (Active)	This site is an active landfarm to remediate contaminated soil under the Contaminated Sites Program. The site consists of two listings Crowley Jet A Fuel Tank 471 Newhalen Tank Farm (File ID 2619.38.002) and Newhalen Bulk Fuel Storage (File ID 2619.38.001). The site is associated with numerous historic spills and a former tank farm. The site dates back to a 1983 spill reported in relation to Newhalen's old utility tank farm. There are several data gaps in the history of this site that don't allow for identification of all spills; however, additional free product was discovered near the 1983 spill during sewer cleaning operations in August 1999. Later, on October 30, 2008, there was a jet fuel spill totaling approximately 13,630 gallons from Crowley Jet A Fuel Tank 471. The majority of the spill was recovered from secondary containment, but 2,777 gallons were suspected to have breached the containment. The tank farm has since been decommissioned with the site consisting mostly of the 2.9-acre landfarm at the time of inspection. Soil staining, 55-gallon drums, piles of dirty rags, and metal debris were identified along the perimeter of the landfarm. The site is located adjacent to the current Newhalen Tank Farm, on its lakeward side, and is 1,000 feet from Iliamna Lake.
Nondalton	
Drum Cache, 59.970533/-154.851000 (Abandoned)	This site is associated with the construction of generators and a new tank for the water plant. The site is about 0.02 acres in size and is located in the middle of town. It consists of a slightly depressed region covered in black textiles with heavy staining on top of the textile. Vegetation surrounding the perimeter of the site was noted as distressed during the inspection. Several 55-gallon drums were strewn about the site with contents unknown. The site is believed to have originated around 2005 and is 250 feet from Sixmile Lake.
Airport Tanks, 59.978880/-154.836069 (Abandoned)	These empty tanks are located at the airport. There are 10 tanks in total with the labeling "Out of Service, Do Not Fill, 10-1-02" and a total capacity of 80,500 gallons. The tanks were constructed by the City of Nondalton sometime in the early 1990s with the intent that they become storage for heating fuel and gasoline to be sold to local residences and businesses. However, the project was never completed. The site is unfenced and eight of the vertical tanks rest on a geotextile liner; two of the tanks are located outside of the containment. Roughly two inches of water were seen pooling within the containment at the time of inspection. Stacked alongside one of the tanks were several 55-gallon drums and miscellaneous buckets with contents unknown. The site is 0.15 acres in size and is located 1,230 feet from Sixmile Lake.

Site Name and Location	Description
Kokhanok	
Landfill, 59.433225/-154.750637 (Active)	This unpermitted landfill is found a half mile due south of the school on a hill. It was constructed in 1992 by the U.S. Public Health Service. The landfill operates as a trench and fill with a working Tok burn unit. Metals, drums, and white goods (household appliances) are separated at the site. The inactive areas of the landfill have been covered and are revegetated. It lies 1,600 feet from Piva Lake.
Old Tank Farm, 59.441288/-154.751535 (Abandoned)	This tank farm is no longer in use since the 2003 construction of the new tank farm. It is located approximately 540 feet northwest of the school. There were 2 vertical tanks and 5 horizontal tanks, which could hold a total of 52,500 gallons of diesel. The horizontal tanks were within a lined, earthen berm, and the vertical tanks were on wooden platforms with no visible berm or liner. There was evidence of staining on the ground, and ponded water around the tanks had a visible sheen. It is located approximately 400 feet from Iliamna Lake.
Slop Bucket Lake Dump, 59.441696/-154.759466 (Abandoned)	This lake can be found 1,000 feet east of Big Lake. It was reportedly used as a dump site for many years by the community with sporadic dumping still occurring. There was visible trash on the shores and lake bottom, which ranged from bags of trash to rusted barrels and tires. It is 350 feet from Iliamna Lake.
Pedro Bay	
Landfill, 59.791717/-154.102628 (Active)	This unpermitted landfill is located on the northeast side of town 1,000 feet from the Village Council building. This one-acre site has been in operation since around 1985. An incinerator is on site but has never been used due to operational costs. A baler is also available but has not been used. Municipal waste is burned in a small pit and then mixed with dirt into a large pile that will eventually be pushed back into a trench. Batteries and other recyclables are separated out. There is a separate area for hide goods and other metals. A fence surrounds part of the landfill, but it is falling down in places. The landfill lies 2,100 feet from Iliamna Lake.

Source: ADEC Waste Erosion Assessment and Review (2018)

- EPA Superfund Sites. The EPA maintains a database of superfund cleanup sites. There are no listed superfund cleanup sites in the Analysis Area.
- Rural Sanitation. Most villages and private houses are equipped with septic tanks or a centralized sewage system. Community sanitation systems are in constant need of improvement in the Analysis Area. The Indian Health Service (IHS) through the Alaska Native Tribal Health Consortium (ANTHC) maintains a comprehensive database of sanitation and water supply improvement projects (Sanitation Tracking and Reporting System) in Alaska that are prioritized for funding. As of November 2019, approximately $1.4 billion in eligible projects are identified in the database, including multiple projects in the Analysis Area. At current funding rates even the existing list of projects will not be completed for many years. A review of EPA's Enforcement and Compliance History Online (ECHO) identified multiple wastewater discharge and reporting violations in the Analysis Area and provides evidence of ongoing water quality impacts associated with malfunctioning or underperforming sewage handling systems.
- Barge Landings. Barge and boat landings can be a source of shoreline erosion and sedimentation in Iliamna Lake. In 2009-2010 the Denali Commission funded the design of barge and boat landings for Iliamna, Kokhanok, Pedro Bay, Pile Bay, and Igiugig. Construction of these projects is pending (Denali Commision 2018).
- Marine debris. The National Oceanic Atmospheric Administration (NOAA) maintains a marine debris tracking system (NOAA 2019) that records locations of marine debris and amounts from citizen's reports and other sources. There are no mapped marine debris sites within Cook Inlet. The nearest mapped marine debris sites are nine reports along the coastlines of Shelikof Strait in the Alaska Peninsula and Kodiak. In 2015, approximately 11,169 lbs. of marine debris was removed from 17.8 mi of beaches in Katmai National Park and Preserve (NPS 2019). PLP personnel and contractors have documented large amounts of marine debris between the northern most extent of Amakdedori Beach and Amakdedulia Cove. Marine debris observations include buoys of a variety of materials (e.g. plastic, metal, or polystyrene foam), insulation materials (e.g. polystyrene foam sheets

and fragments), barrels, buckets, plastic bottles, propane canisters, fish nets and seines, rope, pallets, lumber, coolers, fish totes, pressurized cannisters of paint and lubricant, containers of waste oil, other lubricants, and anti-freeze, tarps and fabric.

5.7 Invasive Species

Invasive species pose a threat to ecosystems, including wetlands and other WOUS, by altering the functional compositions of communities and from the loss of locally abundant species (Diaz, et al. 2006). While most invasive plants have been recorded along Alaska's road network, remote communities off the road system may be increasingly and disproportionately vulnerable to harm from exposure to invasive species.

Bristol Bay residents have expressed concern about the potential impacts of invasive plants on local natural resources, including subsistence foods (Spellman and Swenson 2012). Survey data from Bristol Bay indicate relatively small populations of several high-risk invasive species exist in the area. The species include reed canarygrass (*Phalaris arundinacea*), yellow toadflax (*Linaria vulgaris Mill.*), white sweetclover (*Melilotus officinalis (L.) Lam*), bird vetch (*Vicia cracca L.*), orange hawkweed (*Hieracium aurantiacum L.*) and oxeye daisy (*Leucanthemum vulgare Lam.*) (Spellman and Swenson 2012).

Fall dandelion (*Leontodon autumnalis L.*), oxeye daisy (*Leucanthemun vulgare Lam.*), pineapple weed (*Matricaria discoidea DC.*), Kentucky bluegrass (*Poa pratensis L. ssp. irrigata*), creeping buttercup (*Ranunculus repens L.*), common sheep sorrel (*Rumex acetosella L.*) and common chickweed (*Stellaria media*) were found in Igiugig in 2010 (AKEPIC 2018). It does not appear that surveys have been conducted in most of the communities in the Analysis Area.

Reed canarygrass, which grows very well in wetlands, has a high potential for impacting important subsistence foods resources. Reed canarygrass can invade active stream channels, accelerating siltation of gravel and sand bars, reducing the active-channel area, and altering fluvial dynamics (Galatowitsch, Anderson and Ascher 1999) (Wisconsin Reed Canary Grass Management Working Group (WRCGMWG) 2009), which could affect Pacific salmon and other fishes habitat. The results of a reed canarygrass vulnerability model for the Bristol Bay region completed in 2012 projected 24 miles of salmon stream could be vulnerable in the next 30 years. From 2039 to 2069, the length of salmon streams vulnerable to reed canarygrass invasion would grow to 275 miles. The model projected that by 2099, the length of salmon streams vulnerable to potential adverse effects from reed canarygrass could total 668 miles. Modeling indicates the Iliamna area had the second greatest number of vulnerable streams for the same period (Spellman and Swenson 2012).

Reed canarygrass surveys conducted in 2006 along most primary and secondary roads in the Kenai Peninsula highlight spread and management issues. The surveys located 260 sites populated by reed canarygrass. Of this total, 51sites were in wetlands, with 14 of those adjacent to coho salmon habitats (B. Spellman 2018). Authorities have determined that reed canarygrass on the Kenai Peninsula is beyond eradication efforts, because early detection and eradication opportunities were missed. Consequently, they decided to focus reed canarygrass management efforts in sensitive areas.

During additional surveys from 2007-2009 extensive reed canarygrass infestations were documented in four streams had: Kenai River, Bishop Creek, North Fork Anchor River, and Beaver Creek. In an approximately 20 mile-reach of the North Fork Anchor River, reed canary grass was found in 256 sites, including sites directly along the active channel. Eradication efforts have had mixed results, in part because of the extensive distribution of the reed canarygrass (B. Spellman 2018). Although prevention of invasive species is the best management practice, early detection and eradication are crucial to fighting invasive species once established in an ecosystem.

5.8 Summary of Watershed Conditions

This watershed analysis has characterized conditions within the Analysis Area. The following is a summary of these conditions and provides general watershed improvement opportunities that could benefit aquatic functions in the watersheds.

The majority of the Analysis Area is undeveloped and wetlands and aquatic resources have little to no degradation. The principal sources of land development in the 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 the villages. Development accounts for less than 1 percent of land use in the Analysis Area.

Wetlands and other waters are widely distributed in the Analysis Area. The Headwaters Koktuli River watershed includes more than 59,581 acres of wetlands and other waters. The other watersheds encompass a combined total of 1,136,689 acres of wetlands and other waters. Dominant wetlands include palustrine scrub-shrub and emergent, whereas estuarine and lacustrine emergent wetlands are rare.

Generalized land ownership in the Analysis Area is split between the State of Alaska (48%), federal government (18%), native owned lands (31%), and private and municipal lands (2%). Roughly 3 percent of the Analysis Area includes the Katmai and Lake Clark national parks and is permanently protected from development. Although State of Alaska lands are open to multiple uses, including mining, the Alaska Department of Natural Resources has closed many streams to mineral entry in the Nushagak-Mulchatna River drainage, as well as streams around Iliamna Lake, to protect Pacific salmon fish habitat. Regardless of land ownership and the occurrence of minerals in the watershed, the potential for development, other than the proposed Project, is low.

Aquatic habitats, though plentiful, do face potential threats from fish barriers and pollution associated with community growth, marine debris, or invasive species. Known fish barriers in the Analysis Area include five 'inadequate passage' and seven 'unlikely passage' culverts in the community of Dillingham, impacting more than 10.5 miles of Pacific salmon streams. Most of the communities have documented contamination from fuel and lubricant spills and under-performing village sanitation systems, such as landfills and wastewater treatment and collection systems, and these are a continuing source of water quality impacts. Large amounts of marine debris have been reported in Kamishak Bay. Invasive species are a threat to aquatic resources in the Analysis Area, but much of the area remains un-surveyed.

6. Project Effects on Aquatic Resources

The discharge of fill proposed by the project will permanently impact 2,227 acres of WOUS. Most of these impacts (2,158 acres) would occur in the Headwaters Koktuli River watershed (Table 6-1). The remaining permanent impacts to wetlands and other aquatic resources (68 acres) are divided among the Newhalen River, Iliamna Lake, Gibraltar River, Upper Talarik Creek, Amakdedori Creek-Frontal Kamishak Bay watersheds, and Cook Inlet watersheds (Table 6-2), and the Cook Inlet watershed (<1 acre [0.15 acre]).

The greatest impact would be to slope wetland HGM aquatic resources which would be reduced by 6.46 percent. Slope palustrine unconsolidated bottom would be reduced by 16.78 percent, slope palustrine scrub-shrub would be reduced by 6.56 percent, slope palustrine emergent would be reduced by 6.13 percent and palustrine aquatic bed and unconsolidated shore would be reduced 34.95 and 7.73 percent respectively. Riverine wetland and riverine channel water HGM aquatic resources will experience a 1.50 percent and 4.64 percent loss respectively. Most impacts to the riverine channel waters are to upper perennial streams unconsolidated bottom with a 6.96 percent reduction. Riverine channel intermittent streambed would experience a 5.94 percent reduction. Slope wetland HGM palustrine scrub-shrub and emergent wetlands are the most widely distributed aquatic resource in the watershed with approximately 20,769 acres and 8,911 acres respectively. These wetlands are broadly used by ungulates such as moose and caribou.

Construction of the mine facilities within Headwaters Koktuli River would permanently remove 8.5 miles of anadromous streams in the North Fork Koktuli (NFK) River, a tributary of the Koktuli River (Owl Ridge 2019). These are narrow, steep, and higher gradient headwater streams. This loss equates to approximately 17 acres of low Pacific salmon use habitat (R2 Resource Consultants 2019). The loss would be permanent, but the impacts in the context of Pacific salmon species use by life stage and density is low and localized when compared to the higher quantity and higher use Pacific salmon habitat immediately downstream in the NFK River (Owl Ridge 2019). The larger, downstream reaches more heavily used by Pacific salmon for spawning and rearing would not be directly impacted. Indirect effects, such as alterations to water flow and nutrient transport, could have further indirect impacts in downstream reaches of NFK River and South Fork Koktuli River in designated aquatic habitat for Chinook salmon, coho salmon, sockeye salmon, and chum salmon (Owl Ridge 2019). Low numbers of rearing Chinook salmon and coho salmon and spawning and developing embryonic coho salmon would be permanently removed in areas with low salmon densities and lower habitat value characteristics (Owl Ridge 2019).

Table 6-1 Summary of aquatic resources (acres) in the HUC 10 Headwaters Koktuli River

	Baseline		Impacts to WOUS	Reduction
HGM and Cowardin Classification	**Acres**	**%**	**Acres**	**%**
LACUSTRINE WATERS	**975.00**	**1.64%**	**--**	**--**
Lacustrine Limnetic Unconsolidated Bottom [1]	844.40	1.42%	--	--
Lacustrine Littoral Aquatic Bed [1]	10.10	0.02%	--	--
Lacustrine Littoral Unconsolidated Bottom [1]	33.00	0.06%	--	--
Lacustrine Littoral Unconsolidated Shore [1]	32.80	0.06%	--	--
Palustrine Emergent [1]	1.10	<0.01%	--	--
Palustrine Unconsolidated Bottom [1]	51.00	0.09%	--	--
Palustrine Unconsolidated Shore [1]	2.70	<0.01%	--	--
LACUSTRINE FRINGE WETLANDS	**126.70**	**0.21%**	**0.04**	**0.03%**
Lacustrine Littoral Emergent [1]	0.30	<0.01%	--	--
Lacustrine Littoral Unconsolidated Shore [1]	9.40	0.02%	--	--

HGM and Cowardin Classification	Baseline		Impacts to WOUS	Reduction
	Acres	%	Acres	%
Palustrine Emergent [1]	50.70	0.09%	0.04	0.07%
Palustrine Moss-Lichen [1]	0.20	<0.01%	--	--
Palustrine Scrub-Shrub [1]	64.80	0.11%	--	--
Palustrine Unconsolidated Bottom [1]	0.50	<0.01%	--	--
Palustrine Unconsolidated Shore [1]	0.90	<0.01%	--	--
RIVERINE WETLANDS	**8,345.60**	**14.01%**	**125.15**	**1.50%**
Palustrine Aquatic Bed [1]	1.80	<0.01%	--	--
Palustrine Emergent [1]	2,163.40	3.63%	41.51	1.92%
Palustrine Forested [1]	38.50	0.06%	--	--
Palustrine Moss-Lichen [1]	2.90	<0.01%	--	--
Palustrine Scrub-Shrub [1]	5,847.30	9.81%	76.46	1.31%
Palustrine Unconsolidated Bottom [1]	160.60	0.27%	7.18	4.47%
Palustrine Unconsolidated Shore [1]	67.60	0.11%	--	--
Riverine Intermittent Streambed [1]	0.10	<0.01%	--	--
Riverine Lower Perennial Unconsolidated Bottom [1]	41.50	0.07%	--	--
Riverine Lower Perennial Unconsolidated Shore [1]	19.10	0.03%	--	--
Riverine Upper Perennial Aquatic Bed [1]	<0.1	<0.01%	--	--
Riverine Upper Perennial Unconsolidated Bottom [1]	2.20	<0.01%	--	--
Riverine Upper Perennial Unconsolidated Shore [1]	0.50	<0.01%	--	--
RIVERINE CHANNEL WATERS	**1,070.00**	**1.80%**	**49.68**	**4.64%**
Palustrine Aquatic Bed [1]	1.00	<0.01%	--	--
Palustrine Emergent [1]	0.30	<0.01%	--	--
Palustrine Unconsolidated Bottom [1]	38.10	0.06%	--	--
Palustrine Unconsolidated Shore [1]	6.00	0.01%	--	--
Riverine Intermittent Streambed [1]	64.10	0.11%	3.81	5.94%
Riverine Lower Perennial Aquatic Bed [1]	19.10	0.03%	--	--
Riverine Lower Perennial Emergent [1]	0.30	<0.01%	--	--
Riverine Lower Perennial Unconsolidated Bottom [1]	166.60	0.28%	--	--
Riverine Lower Perennial Unconsolidated Shore [1]	9.10	0.02%	--	--
Riverine Upper Perennial Emergent [1]	0.10	<0.01%	--	--
Riverine Upper Perennial Unconsolidated Bottom [1]	635.70	1.07%	44.27	6.96%
Riverine Upper Perennial Unconsolidated Shore [1]	129.60	0.22%	<0.00	<0.00%
FLAT WETLANDS	**6,599.80**	**11.08%**	**8.35**	**0.13%**
Palustrine Aquatic Bed [1]	<0.1	<0.01%	--	--
Palustrine Emergent [1]	1,623.70	2.73%	2.67	0.16%
Palustrine Forested [1]	0.20	<0.01%	--	--
Palustrine Moss-Lichen [1]	33.70	0.06%	--	--
Palustrine Scrub-Shrub [1]	4,917.60	8.25%	5.68	0.12%
Palustrine Unconsolidated Bottom [1]	4.10	0.01%	--	--
Palustrine Unconsolidated Shore [1]	20.30	0.03%	--	--
Riverine Intermittent Streambed [1]	<0.1	<0.01%	--	--
SLOPE WETLANDS	**29,813.90**	**50.04%**	**1925.27**	**6.46%**
Palustrine Aquatic Bed [1]	6.10	0.01%	2.13	34.95%
Palustrine Emergent [1]	8,911.20	14.96%	546.47	6.13%
Palustrine Forested [1]	2.20	<0.01%	--	--
Palustrine Moss-Lichen [1]	27.50	0.05%	--	--
Palustrine Scrub-Shrub [1]	20,768.50	34.86%	1362.85	6.56%
Palustrine Unconsolidated Bottom [1]	69.30	0.12%	11.63	16.78%
Palustrine Unconsolidated Shore [1]	28.30	0.05%	2.19	7.73%
Riverine Upper Perennial Unconsolidated Bottom [1]	0.30	<0.01%	--	--
Riverine Upper Perennial Unconsolidated Shore [1]	0.50	<0.01%	--	--
DEPRESSIONAL WETLANDS	**1,561.20**	**2.62%**	**49.90**	**3.20%**
Lacustrine Littoral Unconsolidated Shore [1]	<0.1	<0.01%	--	--
Palustrine Aquatic Bed [1]	4.80	0.01%	--	--

HGM and Cowardin Classification	Baseline		Impacts to WOUS	Reduction
	Acres	%	Acres	%
Palustrine Emergent [1]	155.30	0.26%	4.72	3.04%
Palustrine Moss-Lichen [1]	0.50	<0.01%	--	--
Palustrine Scrub-Shrub [1]	172.70	0.29%	6.91	4.00%
Palustrine Unconsolidated Bottom [1]	913.10	1.53%	29.70	3.25%
Palustrine Unconsolidated Shore [1]	314.80	0.53%	8.57	2.72%
N/A	**11,089.00**	**18.61%**	**--**	**--**
Palustrine Emergent [1, 2]	2,608.00	4.38%	--	--
Palustrine Scrub-Shrub [1, 2]	8,009.00	13.44%	--	--
Palustrine Unconsolidated Shore [1]	0.90	<0.01%	--	--
Palustrine Unconsolidated Bottom [2]	248.40	0.42%	--	--
Riverine Unknown Perennial Unconsolidated Bottom [2]	222.80	0.37%	--	--
Grand Total	**59,581.20**	**100%**	**2,158.38**	**3.62%**

Source: (1) PLP mapped wetlands, (2) NWI mapped wetlands.

Project impacts from fill discharges to aquatic resources in the Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, and Amakdedori Creek-Frontal Kamishak Bay Watersheds would be small relative to the abundance of wetlands and other waters in each watershed and the footprint of project impacts (Table 6-2). The largest reduction in aquatic resources (<0.05%) outside of the Headwaters Koktuli watershed would take place in the Amakdedori Creek-Frontal Kamishak Bay watershed. Within the Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, and Amakdedori Creek-Frontal Kamishak Bay watersheds the aquatic resources most impacted include palustrine, lacustrine, and marine subtidal habitats, all of which are abundant. Fills will impact riverine aquatic resources that provide habitat to Pacific salmon and other fishes in the watersheds, but this will be minimized by including bridges and culverts designed to allow for fish passage.

Table 6-2 Summary of aquatic resources (acres) in the HUC 10 Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, and Amakdedori Creek-Frontal Kamishak Bay watersheds

	Kvichak-Port Heiden				Western Cook Inlet	
	Newhalen River	Iliamna Lake	Gibraltar Lake	Upper Talarik Creek	Amakdedori Creek-Frontal Kamishak Bay	Total
Baseline Aquatic Resources						
Estuarine (ac.)	--	15	--	--	1,525	1,540
Lacustrine (ac.)	116	42	<0.01	<0.01	35	193
Palustrine (ac.)	56,577	270,572	21,558	35,355	25,968	431,995
Ice (Glacier) (ac.)	--	--	38	--	--	99
Lakes (ac.)	8,075	681,658	5,331	1,680	3,960	702,863
Streams (mi.)	250	881	91	250	684	2,713
Total Aquatic Resources (ac.)	**64,768**	**952,287**	**26,926**	**37,036**	**31,487**	**1,112,504**
Impacts to Aquatic Resources						
Lacustrine (ac.)	0.00	2.36	0.00	0.00	0.30	**2.66**
Palustrine (ac.)	4.25	19.90	8.28	14.77	14.16	**61.36**
Riverine (ac.)	0.13	0.69	0.20	0.16	0.58	**1.76**
Marine (ac.)	0.00	0.00	0.00	0.00	2.18	**2.18**
Total Impact to Aquatic Resources (ac.)	**4.38**	**22.94**	**8.48**	**14.93**	**17.22**	**67.96**
Reduction of Aquatic Resources (%)	**<0.01%**	**<0.00%**	**<0.03%**	**<0.04%**	**<0.05%**	**<0.01%**

7. Mitigation Opportunities Evaluated

When the results of each of the watershed analysis sections are considered and synthesized it becomes apparent that: 1) wetlands and other waters in the 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 will result in the loss of 8.4 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,

Consequently, PLPs approach to compensate for the permanent loss of wetlands and aquatic habitat in the Analysis Area resulting from the Project will prioritize on opportunities that benefit anadromous fish habitat, including improvements to water quality. The following factors will be used to evaluate compensatory mitigation options:

- Location. On-site opportunities will be given preference versus off-site opportunities. If needed, mitigation sites will be ranked according to their location using the following preference order:

  1) HUC 10 watersheds that intersect with the Project wetlands impacts;
  2) HUC 10 watersheds downstream of Project wetlands impacts;
  3) HUC 8 watersheds that intersect with the Project wetlands impacts;
  4) HUC 6 watersheds that intersect with the Project wetlands impacts; and
  5) HUC 4 watersheds that intersect with the Project wetlands impacts.

- Watershed health impacts. Sites within watersheds that are experiencing or may experience water quality or other impacts due to development and human activity.
- Environmental significance. Selected sites will be ranked according to the aquatic resources that are impacted or threatened and can be returned to health or protected by mitigation projects. Sites with wetlands, streams, and other waters that provide regionally significant support to fish will be given higher priority consistent with the results of the watershed analysis.
- Practicability. Practicability will be evaluated in consideration of engineering feasibility, authorization for the construction work, and construction costs.

Compensatory mitigation may be performed using methods of restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances, preservation of wetlands and other waters. Restoration as re-establishment opportunities for aquatic resources in the Analysis Area are unavailable because development in the Analysis Area is limited, and all existing developments are in use or needed. However restoration as rehabilitation, may be possible in the affected watersheds through repair, enhancement, or replacement of underperforming sanitation systems that would result in water quality improvements to WOUS and, through removal of marine debris, would restore coastal marine wetlands and marine habitat by removing wildlife hazards. Establishment of wetlands is not highly desirable as wetlands are already abundant in the Analysis Area. Lastly, preservation opportunities are limited due to the land status and unjustifiable due to the lack of foreseeable development threat to existing wetlands and aquatic resources in the Analysis Area.

PLP has evaluated multiple wetland mitigation leads or opportunities (Attachment 2) and determined that opportunities with community wastewater projects, Pacific salmon fish passage improvement projects, and marine debris removal opportunities were practicable as mitigation for the project and were further developed into permittee-responsible mitigation (PRM) plans.

7.1 Water Quality Improvement Projects

The goal of the water-quality-improvement PRM plan (Attachment 3) is to enhance water quality in the affected watersheds by improving the quality of discharges from wastewater treatment systems in drainages with identified needs. Discharges from properly designed wastewater management systems have little or no adverse effect on water quality and the biota that thrives in the aquatic system. Furthermore, discharges from properly designed systems could improve the quality of water in poorly functioning drainages downstream of the discharges. Consequently, improving under-performing treatment systems would improve overall water quality in the region.

PLP is proposing to perform wastewater management improvement projects in three communities adjacent to the project, namely Kokhanok, Newhalen, and Nondalton. The objectives of the improvements include:

- Increase treatment and storage capacity of the sewage lagoon in Kokhanok.
- Increase treatment and storage capacity of the sewage lagoon in Newhalen.
- Reduce wastewater treatment volume by reducing sewage collection system infiltration and improving operational reliability of the lift station unit.

The projects were identified and prioritized based on information provided in the IHS/ANTHC database and in discussions with the Lake and Peninsula Borough and with the affected communities. PLP would perform the required mitigation in coordination with the affected communities and would retain responsibility for ensuring that required compensatory mitigation activities are completed and successful.

7.2 Removal of Pacific Salmon Passage Barriers

PLP's PRM Plan for the Removal of Pacific salmon Passage Barriers (Attachment 4) proposes to rehabilitate up to 8.5 miles of Pacific salmon habitat. During planning, PLP consulted with ADF&G personnel to better align the plan's objectives with those of ADF&G's Fish Passage Improvement Program. The Fish Passage Improvement Program is one of the resources identified by the EPA as a potential source of Compensatory Mitigation projects (EPA 2019).

The removal of fish passage barriers satisfies PLP's compensatory mitigation approach of seeking opportunities that enhance or restore fish habitat. PLP has proposed fill placement in riverine channel waters that are considered regionally important in the watershed based on their connection to important fish and wildlife species (AECOM 2019). PLP's proposed discharge of fill material will result in the permanent removal of approximately 8.5 miles of Pacific salmon habitat within the headwater streams of the Koktuli

River, a tributary to the Nushagak River. The proposed PRM Plan will compensate the riverine channel waters losses by rehabilitating 8.5 miles of streams containing Pacific Salmon habitat through replacement of undersized or damaged culverts.

Approximately 6 miles of Pacific salmon habitat in stream tributaries to the Nushagak River near the community of Dillingham, located downstream of the project impacts, have already been degraded by undersized culverts associated with local road infrastructure. PLP expects that all fish passage improvement projects will take place outside (off-site) of the Analysis Area. PLP's proposed plan prioritizes culverts based on their location (e.g., watersheds downstream of project impacts and in proximity to the project) and potential for Pacific salmon habitat gains.

7.3 Marine Debris Removal at Kamishak Bay

PLP's PRM Plan for Marine Debris Removal at Kamishak Bay (Attachment 5) proposes to rehabilitate 7.4 miles of coastal habitat in Kamishak Bay by removing marine debris currently accumulated in large amounts at local beaches. Marine debris has several documented impacts to habitats and natural resources. It can cause physical damage to shoreline, marshes, and the benthos. Marine debris can also cause injury to wildlife from entanglement and ingestion. The removal of debris will result in ecosystem service benefits to beach habitats in Kamishak Bay and adjacent marine habitat that are currently used by marine wildlife, including protected species under the ESA.

8. Conclusion

Construction of the Project will require the dredge or discharge of fill material into 3,083 acres of WOUS. This includes 2,227 acres of permanent impacts and 857 acres of temporary impacts to WOUS. PLP plans to restore the 857 acres of temporarily impacted wetlands post-construction. The proposed impacts will take place in HUC-10 watersheds with large expanses of wetlands that are at low risk of being cumulatively degraded.

33 CFR Part 320.4 (r)(2) states that all compensatory mitigation will be for significant resource losses of importance to the human or aquatic environment. The majority of the proposed WOUS impacts would occur within the HUC-10 Headwaters Koktuli Watershed and would affect headwater streams and wetlands. Headwater WOUS are important ecosystem components because they deliver water, sediments, and organic material to downstream waters and contribute to the nutrient cycling and water quality. When natural flow regimes of headwater streams are altered, downstream water quality is often impaired (Colvin, et al. 2019). Direct impacts to anadromous streams are estimated at approximately 8.5 miles. Therefore, PLP believes compensatory mitigation should focus on opportunities that benefit anadromous streams and water quality in the watershed.

Consideration of compensatory mitigation options over a larger watershed scale beyond the HUC-10 Analysis Area is necessary given that compensatory mitigation options are limited at the smaller, local watershed scale. There are no Mitigation Banks or In-Lieu Fee program opportunities within the impacted watersheds, and PRM compensatory mitigation opportunities are similarly unavailable due to the remoteness and lack of disturbance in the watersheds.

PLP has identified three approaches to mitigate for the project's WOUS impacts. The first is off-site, out-of-kind water quality restoration opportunities that will enhance water quality in the Bristol Bay region by improving wastewater collection and treatment systems in drainages with identified needs. Discharges from properly designed wastewater management systems have little or no adverse effect on water quality and the biota that thrives in the aquatic system. Discharges from properly designed systems could improve the quality of water in poorly functioning drainages downstream of the discharges. Consequently, improving under-performing treatment systems would improve overall water quality in the region. The PRM plan is included as Attachment 3. PLP believes this to be a practical approach, capable of meeting the compensatory mitigation requirements stated in 33 CFR Part 332.

The second approach is removing Pacific salmon fish passage barriers associated with undersized or damaged culverts. This approach is promising because of the large amount of Pacific salmon habitat that can be restored through a single fish passage improvement. The proposed PRM Plan will compensate the Project's riverine wetlands losses by rehabilitating up to 8.5 mi of streams containing Pacific Salmon habitat through replacement of undersized or damaged culverts. The removal of these fish passage barriers also satisfies PLP's compensatory mitigation approach of seeking opportunities that enhance or restore fish habitat. The PRM plan is included as Attachment 4.

The third approach is removing and properly disposing of marine debris accumulated on beaches in Kamishak Bay. Marine debris pose hazards to wildlife through entanglement and ingestion and can damage habitat. This PRM (Attachment 5) will result in the rehabilitation of 7.4 mi of coastal marine wetlands and marine habitat in Kamishak Bay.

PLP believes this combination of PRM plans including, wastewater facility improvement projects in Kokhanok, Newhalen, and Nondalton, the restoration of 8.5 mi of fish habitat from repair of fish passage barriers, and cleanup of marine debris in 7.4 mi of coastal habitats in Kamishak, are a practical approach, capable of meeting the compensatory mitigation requirements stated in 33 CFR Part 332.

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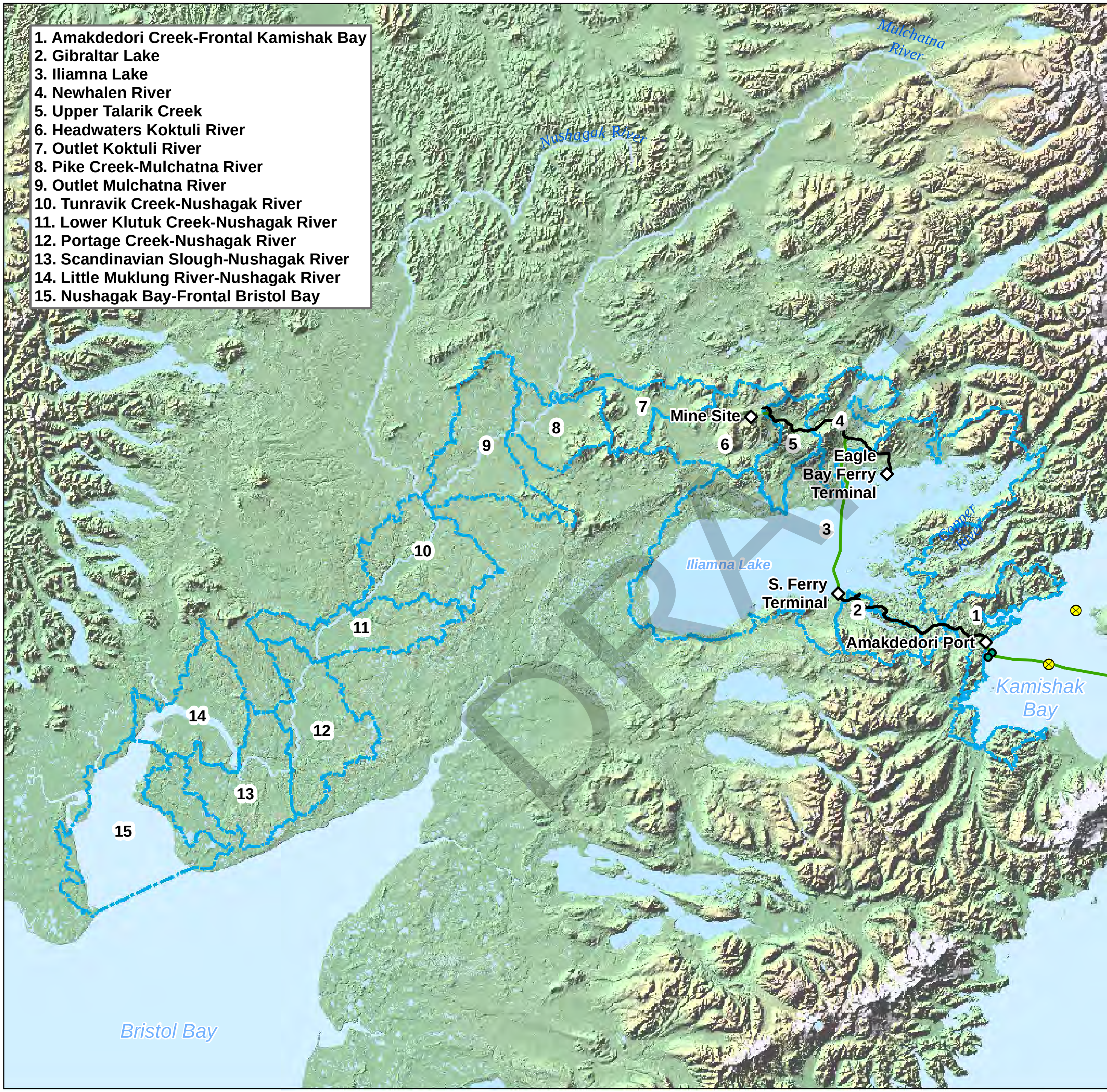
Attachments

Attachment 1 – Figures



Area (Geographic Area of Watershed Analysis)
Project Feature
Lighted Navigation Buoy
Lightering Location
Proposed Natural Gas Pipeline
Proposed Project Transportation Corridor

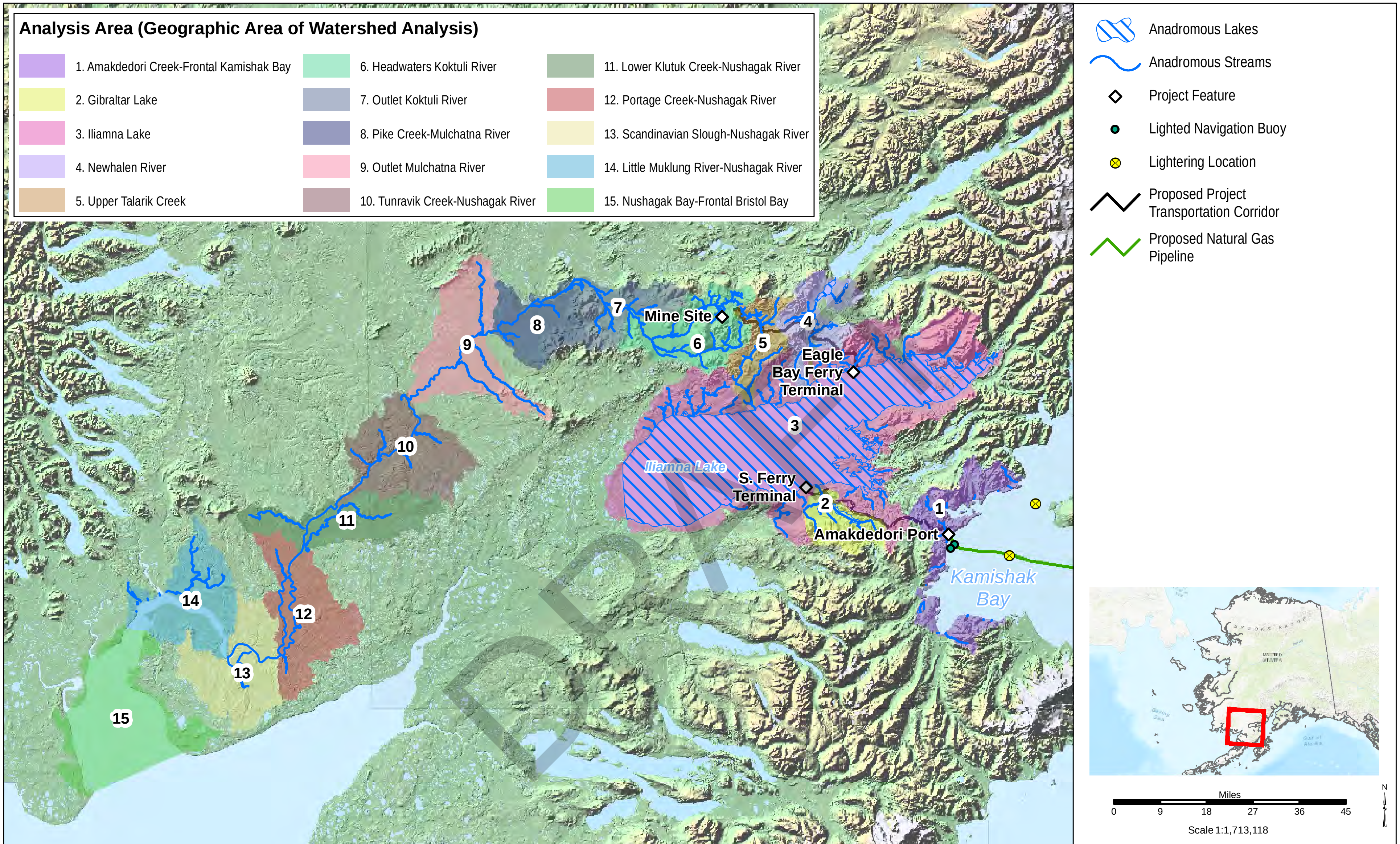
Miles
0 9 18 27 36 45
Scale 1:1,713,118

NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian	Figure: **1**

Geographic Extent of the Watershed Analysis

Compensatory Mitigation Plan
Pebble Project

File: PLP105	Date: 11/12/2019
Revision: 08	Author: ORNRC



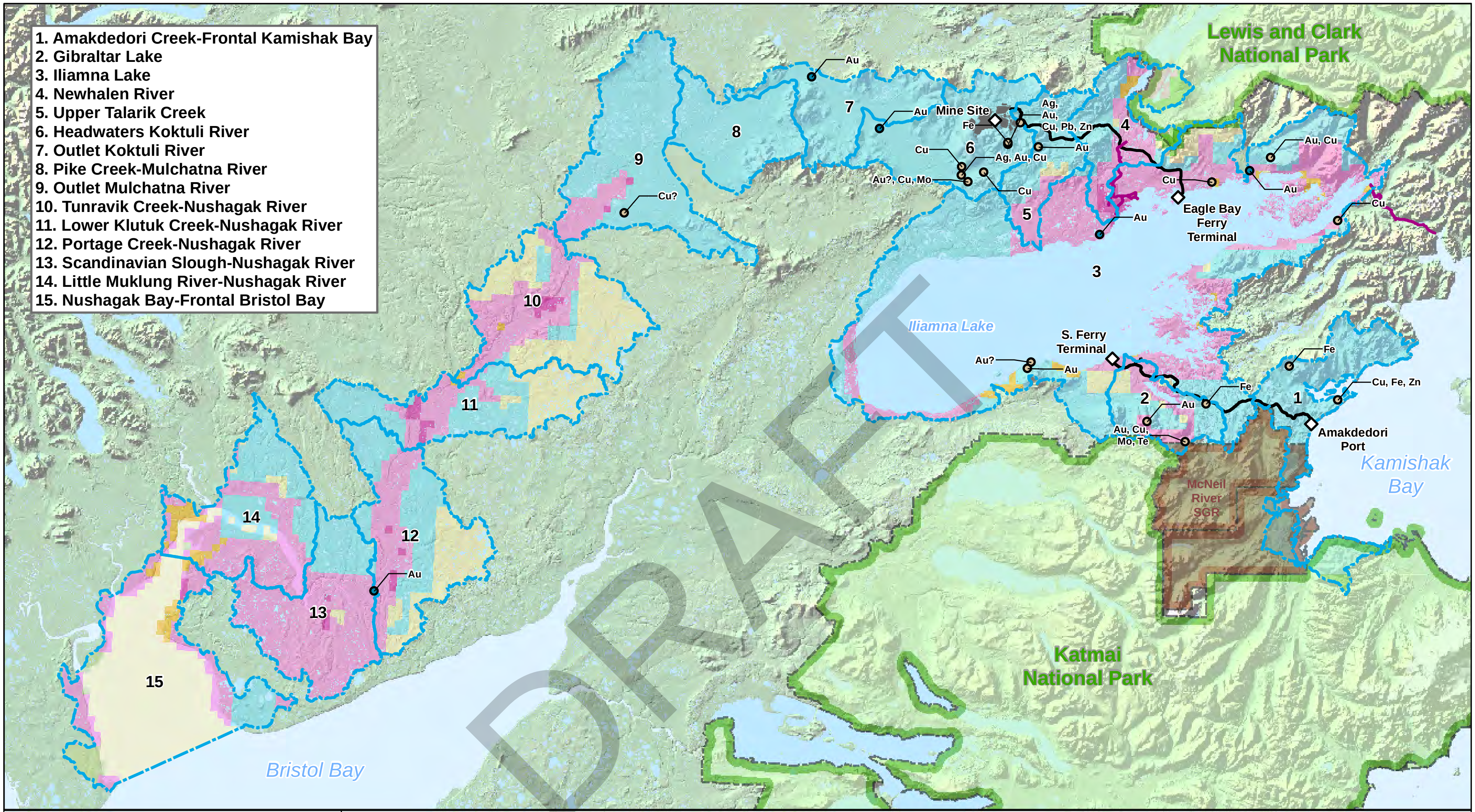
NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian

Figure: **2**

Area of Anadromous Waters

Compensatory Mitigation Plan
Pebble Project

File: PLP107	Date: 11/12/2019
Revision: 07	Author: ORNRC



Miles
0 7 14 21 28 35
Scale 1:1,291,103

NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian

Figure: 3

Land Ownership and Land Use

Compensatory Mitigation Plan
Pebble Project

File: PLP106	Date: 11/12/2019
Revision: 07	Author: ORNRC

- Analysis Area (Geographic Area of Watershed Analysis)
- Project Feature
- Resource Occurrence
- Prospect
- Existing Road
- Proposed Project Transportation Corridor

Section Level Land Status
- BLM
- National Park Service
- State
- State and ANCSA
- ANCSA
- Private or Municipal

Administrative Boundaries
- National Park
- State Game Sanctuary and Refuge

Attachment 2 – Potential Compensatory Mitigation Projects Evaluated

Potential Mitigation Project	Watershed health impacts	Environmental significance	Practicability	Location
Existing Mitigation Banks and In-Lieu Fee Programs			Not practical - There are no active permitted Mitigation Banks or In-Lieu Fee programs within the HUC-10 watersheds that would be impacted by the project. Mitigation banks would be available at a HUC4 or HUC 2 level.	
Removal of Pacific salmon Passage Barriers (e.g. culvert barrier removal)	Hundreds of miles of anadromous fish habitat have been degraded throughout Alaska by undersized or damaged culverts that limit the passage of Pacific salmon. Healthy anadromous fish habitat is of high importance to residents who rely on Pacific salmon for subsistence. Approximately 6 miles of anadromous stream are impacted in the Analysis area.	Anadromous habitat can be returned to health by simply upgrading the undersized or damaged culvert. Benefits could extend for many miles upstream of the replaced culvert and have regional significance.	Practical - Generally, most sites will practicable as long and the land or right-of-way owner authorizes the construction activity, and cost are reasonable. There are virtually hundreds of miles of degraded streams that could be candidates for restoration.	There are no opportunities in the HUC-10 affected watershed, and few opportunities downstream of project impacts. There are abundant opportunities in waters connected to Upper Cook Inlet.
Restoration of Abandoned Fish Canneries	Wetlands or river shoreline on the Kvichak has been lost or are degraded by construction of the canneries. It is likely that canneries may include contaminants such as lead-based paint, asbestos, and oil-and lubricants contaminations.	Removal of the canneries and potential contamination could restore wetlands and improve water quality near the sites.	Not practical - the sites' lack of site assessment data on recognized environmental conditions, complex title history and mixed land ownership, historic values, and remoteness made it unfeasible to determine a practical approach to mitigation. Potential would be for a few acres of wetlands.	Outside the HUC-10 watersheds affected by the project.
ADEC Contaminated Sites	Reviewed spills are in improved locations (developed) sites. Clean up spills is unlikely to result in wildlife habitat gains, or habitat may continue to be degraded even after restoration is complete.	Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem.	Not practical - All contaminated sites (fuel spills) within the affected watersheds appear to have clean up actions in progress and are the legal responsibility of known entities. Contaminated sites are generally small and would result in few acres of benefit, and even fewer wetlands.	The database includes 12 contaminated sites in the Analysis Area where cleanup actions have been complete, and six sites where cleanup actions are undergoing.
ADEC Solid Waste Sites	Abandoned solid was sites are capped and expect to be generally upland locations. Further improvement are unlikely to result in wetland habitat gains.	Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem.	Not practical - Retired solid waste sites appear to be properly closed and operating solid waste sites appear to generally employee measures protective of the environment, with minor enhancements needed. There is little room for improvements that would result in either habitat or wildlife benefits. Solid waste sites are generally small and would result in few acres of benefit, and even fewer wetlands.	The database includes 11 solid waste sites in the Analysis Area located in the proximity of villages. Six solid waste sites are active, one inactive, and four retired.
ADEC Waste Erosion Assessment and Review (WEAR)	The ADEC conducted the WEAR program to inventory sites that have the potential to release hazardous substances and garbage from Alaska's landfills, contaminated sites, tank farms, and other sites of environmental concern into state waters, jeopardizing water quality, fish and wildlife.	Reviewed WEAR sites are in improved locations (developed) sites. Restoration is unlikely to result in wildlife habitat gains, or habitat may continue to be degraded even after restoration is complete due.	Not practical. There is much overlap between the ADEC WEAR program and other ADEC lists including the contaminated sites and solid waste sites databases. Similar practicability limitations discussed for ADEC contaminated sites and solid waste sites applies. WEAR sites are generally small and would result in few acres of benefit, and even fewer wetlands.	WEAR sites are present within the Analysis Area.
Environmental Protection Agency (EPA) Brownfields Sites	Potential source of water pollutants. There are 5 contaminated Brownfield sites in the Analysis Area.	Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem.	Not practical due to lack of opportunities. Cleanup has been completed at one spill site abutting Iliamna Lake. The two remaining sites are 0.3 miles the Newhalen River and cleanup actions are underway. Currently, not potential to generate any compensatory mitigation due to the lack of sites.	There are three brownfield sites located in Newhalen that resulted from large historic fuel spills on land, all near waters.
EPA Superfund Sites	Potential source of water pollutants, however there are no listed superfund cleanup sites in the Analysis Area.	Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem.	Not practicable due the lack of opportunities.	There are no listed superfund cleanup sites in the Analysis Area.
Rural Sanitation	Wastewater collection and treatment systems in the region need upgrades or improvements. Some systems are underperforming introducing pollutants into aquatic habitats.	Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem. Improvement in sanitation systems may result in water quality improvement.	Practical. Community sanitation systems are in constant need of improvement in the Analysis Area. The Alaska Native Tribal Health Consortium (ANTHC) is working on building a sludge disposal site for the sludge that is pumped from the individual septic tanks at Iliamna, but funding to complete the project is insufficient. Kokhanok, Nondalton, and Newhalen recently received approval for their water and wastewater feasibility study (ADEC 2018). Would not result in area increases, but functions would be improved	In Analysis Area
Barge Landings	Barge and boat landings can be a source of shoreline erosion and sedimentation in Iliamna Lake.	Barge landing improvements may result in localized lake habitat improvement by reducing suspended sediment in the water from boat activity. However, necessary improvements would likely result in additional habitat loss.	Not practicable as improvement projects are already under way: In 2009-2010 the Denali Commission funded the design of barge and boat landings for Iliamna, Kokhanok, Pedro Bay, Pile Bay, and Igiugig. Construction of these projects is pending (Denali Commision 2018).	In Analysis Area

Attachment 3 – Permittee-Responsible Mitigation Plan for Water Quality Improvement Projects

DRAFT REPORT

Pebble Project
Permittee-Responsible Mitigation Plan for Water Quality Improvement Projects

January 2020

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CONTENTS

ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ANTHC	Alaska Native Tribal Health Consortium
AWC	Anadromous Waters Catalog
BOD	Biological Oxygen Demand
CMP	Compensatory Mitigation Plan
DA	Department of the Army
EPA	Environmental Protection Agency
ER	Environmental Report
HUC	Hydrologic Unit Code
IHS	Indian Health Service
NMFS	National Marine Fisheries Service
O&M	Operation and Maintenance
PER	Preliminary Engineering Report
PLP	Pebble Limited Partnership
PRM	Permittee-responsible Mitigation
STARS	Sanitation Tracking and Reporting System
SWTR	Surface Water Treatment Rule
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VSW	Village Safe Water
WOUS	Waters of the U.S., including wetlands

1. Objectives

The Pebble Limited Partnership (PLP) is proposing this permittee-responsible mitigation (PRM) plan for water quality improvement projects as compensation for the unavoidable losses to aquatics resources that would result from the Pebble Project's proposed discharges of dredge or fill material into waters of the U.S. (WOUS), including wetlands. Wetlands improve water quality by intercepting surface runoff and removing or retaining inorganic nutrients, processing organic wastes, and reducing suspended sediments before they reach open water. The removal of wetlands can reduce the watershed's ability to perform these functions and improve water quality.

Current sources of water pollutants in the project's watersheds include community wastewater treatment systems. Poorly performing wastewater collection and treatment systems can introduce large volumes of pollutants (excrement, detergents, chlorine, and other chemicals) into the environment (NMFS 2017), degrading water quality and aquatic habitats. Discharges from properly designed and managed wastewater management systems have little or no adverse effect on water quality and the biota that thrives in the aquatic system.

The goal of this PRM plan is to rehabilitate water quality in the project watersheds by reducing pollutants in discharges from wastewater collection and treatment systems. PLP is proposing to conduct wastewater improvement projects located within project watersheds that will address deficiencies and result in the rehabilitation of water quality in the communities of Kokhanok, Newhalen, and Nondalton.

Objectives of this PRM include:

- Increase treatment and storage capacity of the sewage lagoon in Kokhanok.
- Increase treatment and storage capacity of the sewage lagoon in Newhalen
- Reduce wastewater treatment volume by reducing sewage collection system infiltration and improving operation reliability of the lift station unit in Nondalton.

PLP would be responsible for implementing this PRM, including ensuring that required compensatory mitigation activities are completed and successful. This type of mitigation project is not unique in Alaska. The U.S. Army Corps of Engineers (USACE) has previously accepted wastewater treatment facility improvements as compensatory mitigation for unavoidable losses resulting from discharges to WOUS (USACE 2019).

2. Site Selection

PLP's site selection process considered current wastewater collection and treatment needs within the project watersheds. Most wastewater collection and treatment systems serving communities in the project watersheds typically consist of a combination of piped gravity systems, sewage lagoons, individual septic tanks, and privies.

Treated wastewater that meets federal and state requirements is vital for preventing disease and protecting the environment. Individual privies and septic tanks can seep into the underground water tables and pollute water. Failing septic systems are a consequence of urban development. EPA estimates that 10 to 25 percent of all individual septic systems are failing at any one time, introducing contaminants into the environment

(NMFS 2017). Sewage may contain significant amounts of organic matter that exert a biochemical oxygen demand (BOD) and cause immune suppression in fish (Arkoosh, et al. 2001). Piped gravity systems that store, treat, and discharge wastewater provide better protection for the environment in rural communities. However, successful operation of these facilities is often hampered by inadequate training and a lack of funding for preventive maintenance (U.S. Congress 1994).

Federal and state agencies have programs to provide essential capital funds for repairing existing facilities and building new ones. The funding for proper operation and maintenance (O&M) of sanitation facilities is not traditionally part of any federal or state plan. Recognizing this deficiency, Congress amended the Indian Health Care Improvement Act of 1976 by passing the Indian Health Amendments of 1992, authorizing the Indian Health Service (IHS) to provide, for the first time, up to 80 percent of the O&M funding needed by economically deprived Native communities.

The IHS Division of Sanitation Facilities Construction maintains the Sanitation Tracking and Reporting System (STARS) database to track sanitation facilities' projects (Indian Health Services 2019). Similarly, the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) Program maintains a multi-year project list to identify where funding is needed for the next several years. Projects are added to the list when communities submit applications that receive high overall ADEC review scores. Scoring is based primarily on critical health-related needs and local capacity to operate and maintain existing facilities. Sanitation projects are also funded and supported by the Alaska Native Tribal Health Consortium (ANTHC). Wastewater sanitation projects in rural areas often require the joint participation of IHS, ADEC's VSW Program, and ANTHC. Table 1 identifies rural sanitation projects for communities in the project affected watersheds listed in the STARS database as of November 11, 2019.

IHS and VSW projects are initiated and completed based on their priority and the availability of funds. The project list is constantly evolving as new projects are added and projects are completed. Federal and state funds need to be stretched to complete as many projects as possible across Alaska. Table 1 includes ANTHC identified projects in the project watersheds that were considered by PLP.

In 2019, the Lake and Peninsula Borough (LPB) manager approached PLP to explore potential financing opportunities for community wastewater improvement projects within the framework of PLP's compensatory mitigation plans. The LPB and PLP engaged in planning discussions and collaborated in the selection of potential wastewater projects from those listed in Table 1 that would meet the water quality goal of reducing pollutants in wastewater discharges, offsetting unavoidable losses to aquatic resources. Projects were selected based on their location within the potentially affected watershed, environmental significance, and practicability. Wastewater improvement project opportunities in the communities of Kokhanok, Newhalen and Nondalton are in proximity to the proposed discharges of fill material into WOUS and in the same watershed as the proposed mine facilities and transportation infrastructure.

PLP reviewed the wastewater treatment systems' deficiencies identified by IHS, ADEC and LPB for the communities of Kokhanok, Newhalen, and Nondalton. In general, these deficiencies affect wastewater treatment storage and capacity, and result in discharges of wastewater that have undergone little removal of contaminants or have the potential to bypass treatment entirely. Key deficiencies identified include:

- *Kokhanok wastewater treatment system*. The wastewater treatment demands exceed the system's design capacity and the sewage treatment and storage lagoon is at risk of overtopping the berms. The percolation cell is undersized and has been damaged due to the excess demand. The wastewater system does not meet EPA's Surface Water Treatment Rule for turbidity requirements. The wastewater system is adjacent to Big Lake, which discharges into Iliamna Lake.

- *Newhalen wastewater treatment system*. The wastewater treatment plant is undersized to handle the current wastewater volume and has reached the limit of its useful life. The plant is equipped with two septic tanks that are at a high risk of imminent failure (collapse). Raw sewage passes through these tanks substantially untreated. Removal of the septic tanks will require expansion of the sewage lagoon. This wastewater system is proximity 750 feet from Iliamna Lake.

- *Nondalton wastewater treatment system*. The wastewater treatment plant is undersized to handle the current wastewater volume which has increased as a result of significant stormwater infiltrations (hydraulic overloading) and debris intrusion in the sewage collection system. The lift station operates almost continuously (up to 80,000 gallons of wastewater per day) in order to meet the community's wastewater demand and discharges to a lagoon designed to receive 12,300 gallons per day. The infiltration is a consequence of manholes that have experienced separation from their concrete bases due to frost jacking. Compounding the hydraulic overloading, the lift station components are severely deteriorated, causing the unit to be frequently offline. The increased flow and lift station conditions have caused back-ups to occur at lower elevation manholes, which could spill into adjacent Sixmile Lake waters. There are 17 manholes located within approximately 300 feet of Sixmile Lake, including the three closest to the lift station which are within 150 feet of Sixmile Lake. The lift station is located approximately 100 feet from Sixmile Lake.

In December 2019 PLP contactors conducted in-depth reviews and site visits of wastewater facilities in Kokhanok, Newhalen, and Nondalton to confirm facility and site conditions and to initiate the development of conceptual wastewater improvement designs. The Concept Design Memorandums for each project are included in Exhibit A. Based on the review of site conditions and construction cost estimates, PLP has determined these conceptual plans to be practical, and capable of meeting the water quality rehabilitation goals of this PRM.

Table 1. Potential sewer, water treatment, and solid waste projects at specific communities[1]

Community **Project Name (IHS #)**	**Existing Deficiencies**	**Proposed Facilities**[2]
Iliamna Lake and Sixmile Lake Communities		
Igiugig Sewage Lagoon Improvements (AK15429-2001)	The Igiugig sewage lagoon was constructed over 25 years ago and consists of two lagoon cells. Cell one and cell two were designed with berm heights of 10 feet and 4 feet. Deficiencies include: • The lagoon berms were constructed with native silt material and have settled approximately 2-3 feet. • The wire perimeter mesh fencing surrounding the lagoons is in disrepair. • The cell one liner has degraded due to ultraviolet (UV) light exposure.	This project would: • Repair lagoon dike settlement and reshape the lagoon berms. • Replace the wire mesh fencing with chain-link fencing and fence posts. • Patch the lagoon liner.
Kokhanok Water Treatment Plant (AK15455-1002)	The facility is over 20 years old and has severely degraded in the extreme weather that comes off Iliamna Lake. The existing surface water treatment plant is not capable of meeting EPA's Surface Water Treatment Rule (SWTR). Deficiencies include: • The existing facility is too small to be retrofitted to meet the SWTR. • Existing filtration does not meet SWTR turbidity requirements. • The solo-valve on the pressure sand filter, has frozen in the past and the internal orifices within the valve have broken, creating an internal cross-connection problem in the filter piping. • During heavy snow conditions, snow drifts bury the facility.	Construct a new surface water treatment plant that complies with the current SWTR, including: • Dual multimedia filters for direct filtration and polymer injection. • Dual boilers for adding heat to cold lake water being pumped to the water storage tank and water distribution system. • A small laboratory, bathroom, office, storage, and O&M workspace. • A concrete foundation, 2x6 insulated wall, metal siding and metal roof structure.
Kokhanok Sewage Lagoon Expansion (AK15455-2003)	The existing sewage lagoon was constructed in 1995 and is undersized. • Limited capacity in cell one causes sewage overflows into cell two, the percolation cell. • The undersized percolation cell has been damaged due to overloaded demand. The percolation rate in cell two has slowly decreased over time and during certain times of the year, the incoming flow rates are greater than cells one and two can treat. • A 2016 sanitation survey reported local source water streams close to the lagoon were at risk of contamination due to the overflow.	This project would construct an additional 14,000 square-foot percolation cell for expansion of the sewage lagoon.

Community Project Name (IHS #)	Existing Deficiencies	Proposed Facilities[2]
Kokhanok Individual Wastewater System Replacement (AK15455-2004)	The Kokhanok wastewater system was installed in the early 1990s and has exceeded its design life. Wastewater flows to the community's lagoon by either a conventional gravity sewer main with individual sewer services or a sewer force main working in conjunction with Residential Effluent Pump (REP) units. The 10 to 15-year design life of REP units has been exceeded. • Many of the existing pumps and controls have failed causing some residents to manually turn on their pumps for wastewater discharge. Others have resorted to using honey buckets for their wastewater needs. • The failed systems have led to sewage regularly backing up into residential toilets, tubs, and sinks, exposing homeowners to raw sewage and creating a health hazard. • Steel septic tanks and pump vaults have rusted through causing wastewater to surface on residential property. The Kokhanok Tribe and homeowners have attempted to replace the pumps and control panels throughout the system, however due to the age of the system, replacing only these components does not solve the deficiency.	This project would replace the individual REPS and sewer service lines for 15 homes.
Newhalen Water Treatment Plant (AK15400-1001)	The existing groundwater treatment plant is over 34 years old and at the end of its useful life. Although still capable of meeting current water quality standards, the plant deficiencies include: • Extremely deteriorated, which precludes safe and normal operation and maintenance on the piping and components. • O&M costs are high due to significant structure energy deficiencies and it needs to be replaced.	Construct a new groundwater treatment plant.
Newhalen Sewage Lagoon Expansion (AK15440-2003)	The existing sewage lagoon is only approved as an effluent lagoon and is not permitted for or capable of handling raw sewage. During the development of the current sewage lift station project, it was assumed that the lagoon would be able to handle raw sewage, thereby eliminating the two failing septic tanks and failing wet well/dry well lift station. ADEC reviewed the proposed expansion plans and are requiring that in order to connect to the new sewage lift station and accept raw sewage the existing sewage lagoon must be expanded. The existing failing septic tanks would be left in place until the lagoon is expanded.	This proposed project would upgrade an existing sanitation component that cannot meet capacity requirements and if unresolved, would jeopardize the health benefits of the system. Improvements include: • Expand and permit the existing sewage lagoon to connect to a new sewage lift station and permit and accept raw sewage. • Retain existing failing septic tanks in place until the lagoon is

Community Project Name (IHS #)	Existing Deficiencies	Proposed Facilities[2]
		expanded and permitted to accept raw sewage.
Nondalton Lift Station Replacement (AK15442-2001)	The lift station has deteriorated over time and no longer functions as designed. Deficiencies include: • Broken pump rails that make it impossible to provide operation and maintenance or replacement of the lift station pumps. • Malfunctioning electrical controls, including those for the ventilation fans • Electrical controls are housed in the same room as the wet well and are not explosion proof as required by National Electrical Manufacturers Association. • The lift station operates almost continuously (up to 80,000 gallons of wastewater per day) in order to meet the community's wastewater demand and discharges to a lagoon designed to receive 12,300 gallons per day. • The lift station is located less than 100 ft from the high-water level of Sixmile Lake, a violation of the State of Alaska's separation distance requirements.	Remove the existing lift station structure, pumps, wet well, and electrical, and replace the lift station with a new structure, wet well, submersible pumps, and new electrical. Replace the failed 20+ year old lift station.
Nondalton Sewage Lagoon (AK15442-2105)	• The sewage lagoon is undersized for the flow it receives and discharges without a discharge permit more than 10% of the time. • Effluent is discharged to a lined primary cell; an overflow structure on the south side of the primary cell connects to an unlined percolation cell. The percolation cell has an overflow pipe that discharges into woods east of the lagoon. Wastewater flows from this overflow discharge pipe to a lowland area and eventually to Sixmile Lake, the community's drinking water source.	• Construct an additional 3 acres of lagoon cell(s) at the existing sewage lagoon site. • Upgrade components that intermittently compromise or are likely to compromise the health benefits of the system.
Nondalton Sewer Collection (AK15442-4006)	• The sewer system's polyvinyl chloride (PVC) mains and service lines have become brittle over the years, causing breaks, specifically at connection points where the main meets a service line or manhole. • Existing corrugated metal manholes have experienced separation from their concrete bases due to frost jacking. • Sediment and debris have built up in the manhole inverts and many of the manholes and covers are below grade making access for maintenance difficult. • Infiltration caused by the system's deficiencies has led to a significant increase in the system's wastewater flow causing the community lift station to work overtime.	The project would replace existing system components where structural integrity has been compromised and currently jeopardizes the health benefits of the system. • Replace the existing PVC arctic gravity sewer collection mains with 8-inch high density polyethylene (HDPE) insulated arctic pipe. • Replace the existing arctic manholes with 4-foot diameter concrete manholes.

Community Project Name (IHS #)	Existing Deficiencies	Proposed Facilities[2]
		• Replace arctic boxes and service lines at each home.
Koliganek Onsite Water and Sewer for Two Homes (AK15433-2003)	Water: Two homes have no interior or exterior water facilities. Homeowners haul water for residential use. Sewer: Two homes have no interior or exterior sewer facilities.	Water: This project would provide two un-served homes with in-home plumbing and onsite wells. Sewer: This project would provide two un-served homes with in-home plumbing and onsite wastewater facilities.
Ekwok Sewage Lagoon Improvements (AK15428-2003)	• Fencing is in disrepair. • Lagoon seepage estimated at over 10 times the current applicable standard. The first cell was designed as a percolating cell, and a second cell was subsequently added. The first cell is undersized and is functioning as a cesspool, with uncontrolled sewage flow into the ground and overland to the second cell. • The lagoon receives periodic deliveries of septage; most homes use on-site systems.	The project would rehabilitate the lagoon by expanding and lining the first cell, rehabilitating the second cell and, as necessary, replacing/repairing fencing.

1 Source: Indian Health Services, Sanitation Tracking and Reporting System (STARS), https://wstars.ihs.gov/index.cfm?fuseaction=Reports.selectCommunityForPublicSdsSummary, November 6, 2019, unless otherwise noted.
2 The project as summarized in STARS.

Abbreviations: Preliminary Engineering Report (PER); Environmental Report (ER); Alaska Native Tribal Health Consortium (ANTHC), Indian Health Service (IHS)

3. Determination of Credits

PLP's proposal to fund village wastewater collection and treatment projects at Kokhanok, Newhalen, and Nondalton would improve local wastewater management systems in project watersheds; the resulting outcomes would be the rehabilitation of receiving WOUS water quality or prevention of further degradation. This rehabilitation would not result in a gain of aquatic resources area for purposes of tracking "no net loss" of wetlands; however, it can still be used to compensate for a loss in resource area.

4. Mitigation Work Plan

PLP has prepared conceptual plans, including concept design requirements and preliminary engineering drawings, for the proposed wastewater improvements at Kokhanok, Newhalen, and Nondalton (Exhibit A). Proposed wastewater improvements include:

- Kokhanok wastewater system improvements.
  - Construct a new groundwater treatment plant with a three-cell lagoon having a total surface area of approximately 4 acres to meet required wastewater storage and adequate percolation.
- Newhalen wastewater system improvements.
  - Construct a new groundwater treatment plant with a three-cell lagoon having a total surface area of approximately 2.1 acres to meet required wastewater storage and adequate percolation.
- Nondalton wastewater system improvements.
  - Remove the existing lift station structure, pumps, wet well, and electrical, and replace the lift station with a new structure, wet well, submersible pumps, and new electrical.
  - Replace the existing 21 arctic manholes with 4-foot diameter concrete manholes.

The work plan to complete the proposed wastewater improvements includes:

- Complete final coordination with village administration and operations and maintenance (O&M) personnel to ensure planned upgrades and repairs address identified problems and are compatible with O&M capabilities.
- Coordinate with ADEC and ANTHC to ensure plans are compatible with existing systems and current standards for village community sewage systems.
- Complete comprehensive assessment of the existing wastewater infrastructure.
- Confirm current wastewater volumes and calculate projected volumes through project design life.
- Prepare system upgrade engineering plans for review by agencies and villages.
- ADEC plan review and final approval obtained.

- Prepare final project plans and specifications and release for bid.
- Construct wastewater system upgrades and commission systems.
- ADEC issues final approval to operate (FATO).
- Villages accept upgrades and assume maintenance and operations responsibility.
- Prepare a report of wastewater improvements completed and provide copies of the ADEC issued final approval to operate certificates to the USACE for review; document achievement of performance goals.

5. Maintenance Plan

Wastewater collection and treatment systems would be operated and maintained by the community or tribal entity served by the system and would be subject to state and federal regulatory oversight and reporting requirements. PLP is not proposing maintenance of the facilities or systems other than as necessary to correct potential system construction or design deficiencies for a period of five years after performance standards are achieved. The local wastewater treatment operators would continue to be responsible for maintaining their facilities. Therefore, no specific maintenance plan has been developed.

6. Performance Standards

The performance standard for wastewater projects is:

- Wastewater system improvements will receive the required "final approval to operate (FATO)" from the ADEC.

7. Monitoring Requirements

The proposed wastewater treatment systems will be subject to state and federal regulatory oversight, monitoring, and reporting requirements. The community or tribal entity would continue to be responsible for their facilities. PLP will conduct annual post-construction inspections to document integrity of improvements for a period of five years.

8. Long-term Management Plan

Long-term management of the wastewater treatment system by PLP is not warranted because PLP would not be the owner or operator of the system.

9. Adaptive Management Plan

This PRM proposes wastewater improvement projects for the communities of Kokhanok, Newhalen, and Nondalton. The timing to start construction of these projects is dependent on the USACE's approval of PLP's Department of the Army permit application, and PLP's decision to proceed with construction of the overall Pebble Project. The proposed improvements are critically needed by the communities to resolve existing deficiencies and have already been identified by ADEC, IHS, and ANTHC. It is possible that if funding becomes available from ANTHC or another party, the proposed wastewater improvements could be completed without PLP's involvement prior to execution of this plan. If the proposed wastewater improvements become impractical for any reason, PLP will research and propose similar scope project(s) within the potentially affected watershed, or outside if required. Such a change would require the revision of the PRM objectives and performance standards, which would be submitted to the USACE for review and approval.

Project design changes, necessary to meet regulatory requirements and the plan objectives and performance standards, will be completed by PLP without approval from USACE.

10. Financial Assurances

PLP will establish a performance bond to ensure the PRM projects are satisfactorily constructed and all performance criteria are met. PLP is responsible for:

- All permit acquisition and compliance.
- Project design, set-up, management, planning, support, and execution of the PRM plan.
- Site inventory, data collection, and monitoring.
- Reporting to USACE.

The bond will be closed once all PRM objectives and performance standards are met, and a final sign-off on the PRM plan has been provided by the USACE.

11. Other Information

No other information is provided.

12. References

Arkoosh, M. R., E. Cassillas, E. Clemons, P. Huffman, A. N. Kagley, T. Collier, and J. E. Stein. 2001. "Increased susceptibility of juvenile chinook salmon (Oncorhynchus tshawytscha) to vibriosis after exposure to chlorinated and aromatic compounds found in contaminated urban estuaries." *Journal of Aquatic Animal Health* 13:257-268.

EPA. 2019. *Enforcement and Compliance History Online.* Accessed August 29, 2019. https://echo.epa.gov.

Indian Health Services. 2019. *Sanitation Tracking and Reporting System (STARS).* Accessed November 6, 2019. https://wstars.ihs.gov/index.cfm?fuseaction=Reports.selectCommunityForPublicSdsSummary.

NMFS. 2017. *Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska, Appendix G Non-fishing Impacts to Essenstial Fish Habitat and Recommended Conservation Measure.* Environmental Impact Statement, National Marine Fisheries Service.

U.S. Congress. 1994. *An Alaskan Challenge: Native Village Sanitation.* Office of Technology Assessment, U.S. Congress, Washington, DC: U.S. Goverment Printing Office. doi:OTA-ENV-591.

USACE. 2019. "Department of the Army Permit POA-2015-00025." May 21.

Exhibit A

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Concept Design Memorandum

TO: Alaska Peninsula Corporation

SUBJECT: Kokhanok Sewage Lagoon Improvements

DATE: 1/23/2020

BY: Steven Hebnes, PE, Civil Engineer

CRW Engineering Group, LLC (CRW) is providing subcontract services with the Alaska Peninsula Corporation (APC) to assess various sanitation needs in the community of Kokhanok as a component of the mitigation planning for the Pebble Project. As a part of the evaluation effort, CRW has reviewed current Sanitation Deficiency System (SDS) documentation provided by Alaska Native Tribal Health Consortium (ANTHC), performed a site assessment, interviewed community members familiar with the system operation, and reviewed record documents for past specific projects, including previous design reports, field assessments, and related correspondence. The community of Kokhanok is served by ANTHC for addressing public sanitation needs. ANTHC has summarized various sanitation needs in Kokhanok for seeking Indian Health Service (IHS) funding through the SDS program. The Kokhanok wastewater lagoon project has been summarized in SDS reporting, but does not rank high enough for securing IHS funding.

Existing Conditions

The community of Kokhanok wastewater system includes a piped sewer collection system with a community percolation sewage lagoon used for wastewater treatment and disposal. The existing sewage lagoon in the community of Kokhanok was constructed in 1995 and has been found to be significantly undersized for current wastewater hydraulic and BOD loading rates. The sewage lagoon currently features a two-cell system: a primary cell and a smaller percolation cell. Both the primary and percolation cells are undersized. The percolation rate of the underlying soils have apparently diminished due to biochemical oxygen demand (BOD) overloading and solids overloading. BOD represents the amount of oxygen needed by aerobic organisms to break down organic material and reduce/remove organic solids. It has been noted by ANTHC and the community that percolation rates appear to be slower during the wetter and colder seasons of the year, and as a result, incoming flow rates often exceed the treatment rate of the lagoon. Lagoon overflows have been associated with these conditions. During CRW's October 2019 site visit, the regional State of Alaska Remote Maintenance Worker (RMW) was on-site and indicated that portions of the liner in Cell #1 occasionally float up above the water surface, possibly reducing the water capacity in Cell 1. Visible liners are typically a sign of off-gassing from decaying organics below the liner, or that the liner is compromised. High groundwater may also exacerbate this condition.

As part of this evaluation, CRW traveled to Kokhanok in early December 2019 and dug 3 test pits in the vicinity of the existing wastewater lagoon to identify the potential for percolation cell expansion, and also identify a potential site for a new wastewater lagoon. During the inspection, groundwater was found approximately 2 to 3 feet below the ground surface near the existing lagoon. The testing information and the geotechnical memo from this effort is attached.

Having a high potential for future overtopping and with a compromised liner, it is evident that the lagoon is failing and is in need of system improvements. Upgrades to the lagoon are necessary to meet current and future treatment capacity requirements.

Risk to the Environment from the Current Wastewater System Deficiencies

The existing sewage lagoon is at risk of overtopping. If the sewage lagoon continues to operate with the current deficiencies, it is expected that raw sewage will continue to be conveyed into the undersized primary treatment and percolation cells, and will continue to overtop the lagoon berms when incoming flow rates are greater than the diminishing treatment capacity of the existing lagoon. The result of a wastewater lagoon breach could create a substantial release of wastewater into the adjacent wetlands and waterbodies, as much as the daily volume of 18,750 gallons per day. Untreated releases of wastewater into the surrounding environment can impose threats to community health and damage aquatic habitats from high BOD, pathogens and other contaminants.

Recommended Improvement

The recommended improvement for the community of Kokhanok is to increase the treatment capacity of the sewage lagoon to meet ADEC standards for treating raw sewage. Further, the improvements should also provide adequate percolation and hydraulic storage capacity. This recommendation is consistent with ANTHC's findings from reviewing the lagoon's deficiencies.

With these improvements, the treatment of domestic wastewater would be performed in a three-cell lagoon having a total surface area of approximately 173,000 SF (4.0 acres). The lagoon would be bounded by berms constructed from local granular fill. The berms would be built in one-foot lifts to create 3:1 interior and exterior slopes. A vegetative cover on the exterior slopes would be graded at a 4:1 slope. The new berm height would be 8 feet above the existing grade. The primary treatment cells berm height provide a 3-foot freeboard height above the liquid volume, and a 1.0-foot depth for sludge storage (220,000 gallons), in accordance with the ADEC design criteria. Improvements for existing Cells #1 and #2 would be limited to regrading existing berm slopes and adding fill as required. Two feet of additional fill is anticipated. Secondary treatment and percolation would be performed in Cell #3, and would be constructed similar to Cell's #1 and #2, but to a lower berm height of 6 feet. The new percolation cell would be located in an undisturbed area, and would require full grading and berm development. With this geometry, the berm construction would require approximately 12,000 CY of granular fill. Approximately 1 foot of organic material would cap the exterior slopes, to be vegetated for erosion control and bank stability.

Conceptual Design Requirements

- Lagoon Design Criteria:
  - 18,750 GPD [1]
  - Percolation Rate: 0.25 gal/SF/day (ADEC reduced rate due to high groundwater).
  - Maximum Organic Loading: 20-30 lb/acre [2]
  - Minimum Primary Treatment Wetted Surface Area: 1.42 acres.
  - Total Effective Volume: 4,410,000 Gallons
- Upgrade existing Primary Cell #1 and Percolation Cell #2 berms to meet ADEC primary treatment surface area requirements based on the calculated organic loading [3]:
  - Repair the failed liner from Cell #1.
  - Upgrades to the existing cells:
    - Cell #1 would provide an effective operating volume of 2,390,000 gallons and a wetted surface area of 1.15 acres.
    - Cell #2 would provide an effective operating volume of 767,000 gallons and a wetted surface area of 0.45 acres.
- Design of a new percolation Cell #3 based on design percolation rate with a minimum winter volume storage capacity of 120 days:

[1] GV Jones and Associates, *Kokhanok Wastewater Feasibility Study, 2011,* ANTHC.
[2] Heath Research, Inc., Health Education Services Division, *Recommended Standards for Wastewater Facilities, 2004,* Member States and Province.
[3] Heath Research, Inc., Health Education Services Division, *Recommended Standards for Wastewater Facilities, 2004,* Member States and Province.

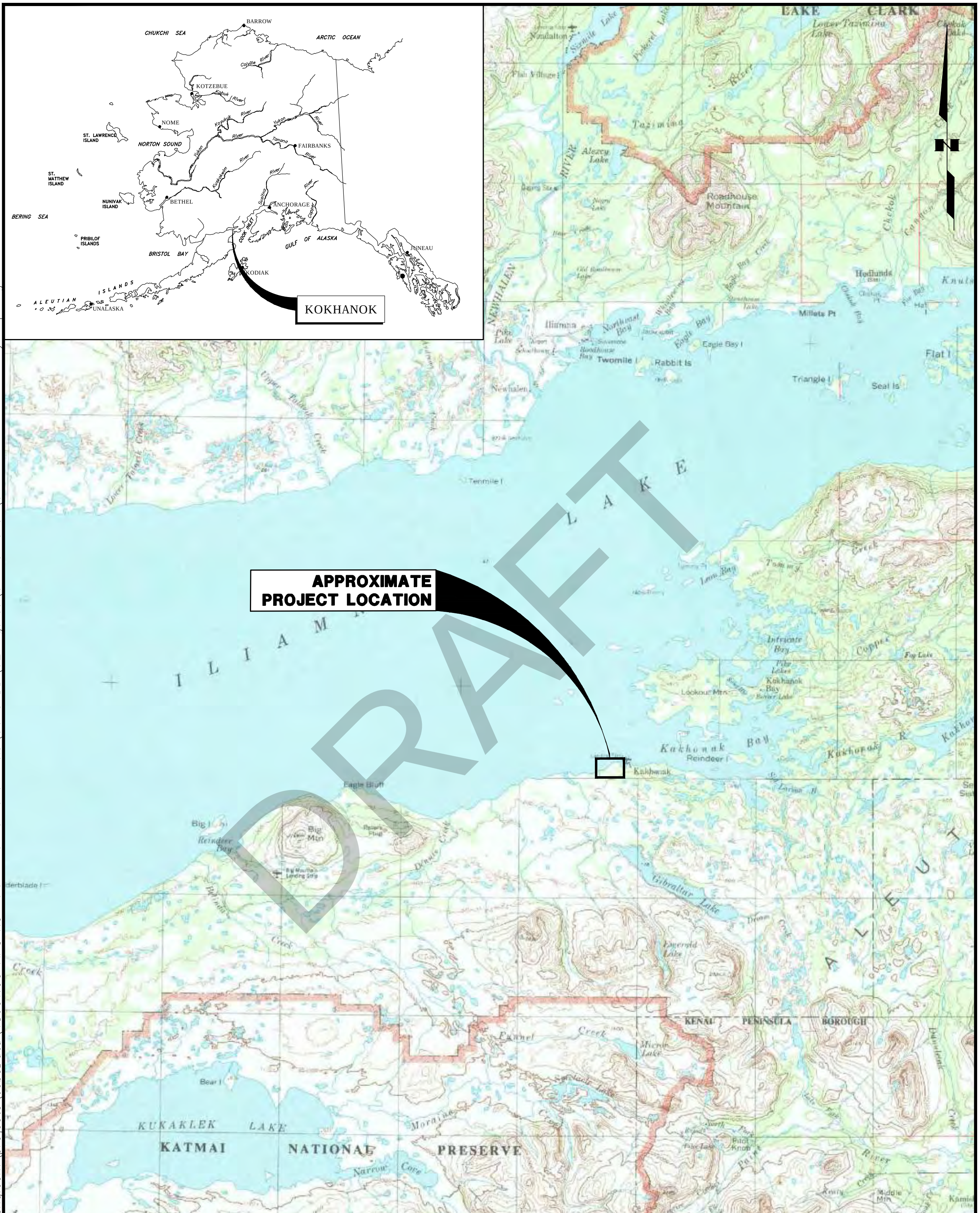
- The new percolation Cell #3 will provide an effective winter storage capacity of 2,350,000 gallons, percolation surface area of 84,000 square feet and a wetted surface area of 2.04 acres (area not included for Organic Loading requirements).

The proposed action would result in the construction of a fully-permitted community sewage treatment system, would will protect the environment and public health from the hazards identified.

Conceptual Construction Drawings

Kokhanok Sewage Lagoon Photos – October 2019

Geotechnical Report: Kokhanok W&S Scoping Assessment – January 2020



FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\07 Kokhanok\01 - KOKHANOK Vicinity Map.dwg

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#AECL882-AK

FINAL

KOKHANOK, ALASKA

VICINITY MAP

Project No:	48601.00
Drawn By:	MCH
Scale:	NTS
Date:	1/18/20
Figure:	1

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0 350 700

KOKHANOK, ALASKA

COMMUNITY OVERVIEW

LAGOON IMPROVEMENT PLAN

Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	2

FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\07 Kokhanok\02 - KOKHANOK Community Overview.dwg

NOTES:

1. BOTTOM OF LAGOON FILLED WITH 2 FT. OF GRAVEL FOR STRUCTURAL SUPPORT.
2. THE PROTECTIVE MATERIAL BETWEEN THE GRAVEL AND THE IMPERMEABLE LINER IS A NON-WOVEN GEOTEXTILE #801 MADE BY SYNTHETIC INDUSTRIES.
3. THE LAGOON LINER IS A COATED POLYESTER MEMBRANE #ORLTA8228, MADE BY SEAMANS.

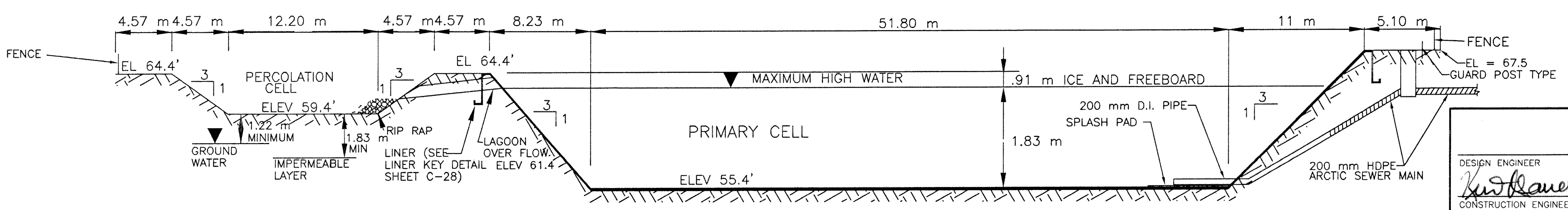
SEWAGE LAGOON PLAN

N.T.S.

DESIGN CRITERIA

POPULATION	= 152
DESIGN POPULATION	= 152 (120%) = 182
WASTEWATER FLOW	= 170 LPCD
PRIMARY CELL CAPACITY	= 6 MONTH RETENTION + 20 YEAR SLUDGE VOLUME
BOD LOADING	= 22 kg/Ha/DAY
PRIMARY CELL AREA REQUIRED	= 2683 m^2 = 51.8 X 51.8 m
PERCOLATION CELL	= 724 m^2 = 59.4 m X 12.2 m
ESTIMATED PERCOLATION CELL HYDRAULIC CONDUCTIVITY	= 204 LPD/m^2

NOTE:
ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED



SECTION A – A

N.T.S.

RECORD DRAWINGS

STATE OF ALASKA 49TH DANIEL D. REITZ No. 7928 REGISTERED PROFESSIONAL ENGINEER

THESE DRAWINGS REFLECT RECORDED INFORMATION OBTAINED DURING CONSTRUCTION.

INFORMATION PROVIDED HEREIN IS ACCURATE TO THE BEST OF MY KNOWLEDGE.

NAME ______ DATE 2-1-01

DESIGN ENGINEER

CONSTRUCTION ENGINEER

O&M CONSULTANT

STATE OF ALASKA 49TH STEPHEN R. BOLAN CE-8993 REGISTERED PROFESSIONAL ENGINEER

DATE	REVISIONS	INITIALS
01-01	FINAL AS-BUILT	BJH

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
PUBLIC HEALTH SERVICE
INDIAN HEALTH SERVICE

KOKHANOK, ALASKA
SEWAGE LAGOON PLAN AND PROFILE DETAILS

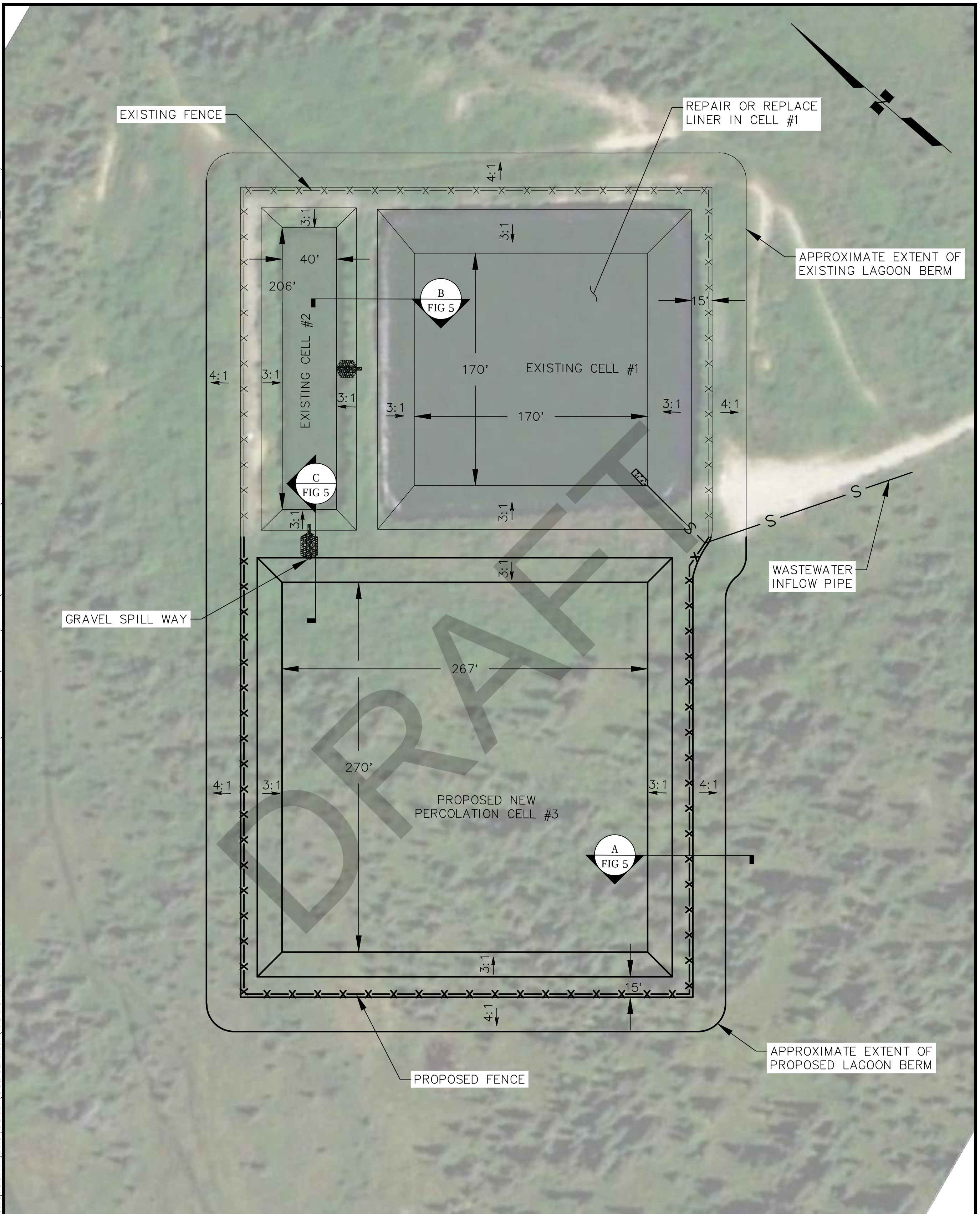
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-92-682

SHEET NO. C-42 OF 47 TOTAL SHEETS

DRAWN BY: JAQ
DATE: 5-94
FILE NAME: 682-C42AB
PLOT SCALE: FIT

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH AND ENGINEERING
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

FIG 3



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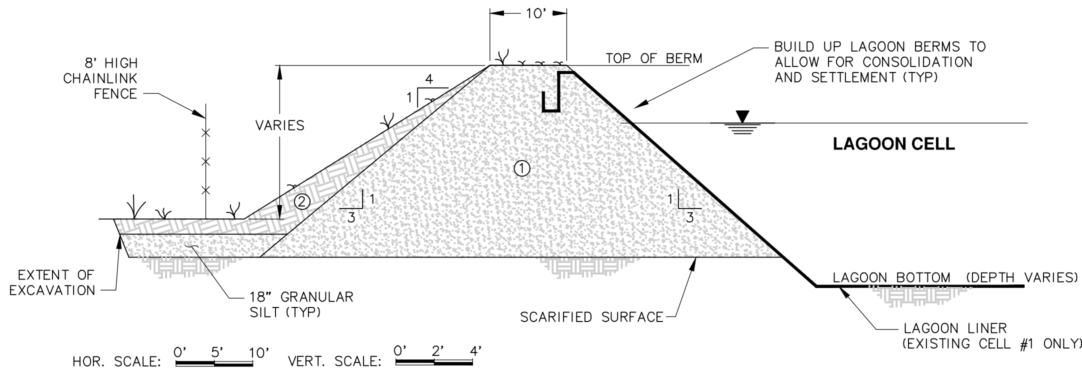
KOKHANOK, ALASKA

PROPOSED SEWAGE LAGOON

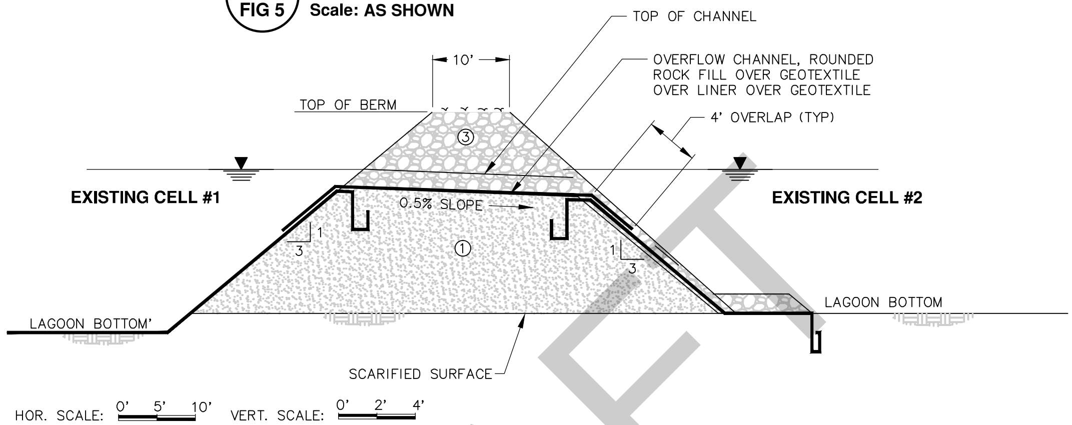
LAGOON IMPROVEMENT PLAN

Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	4



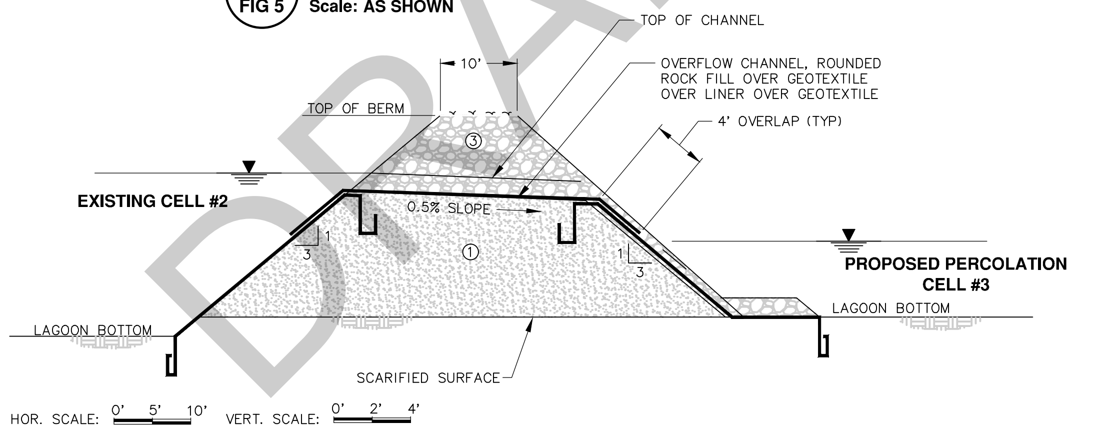
A / FIG 5 TYPICAL BERM SECTION A

Scale: AS SHOWN



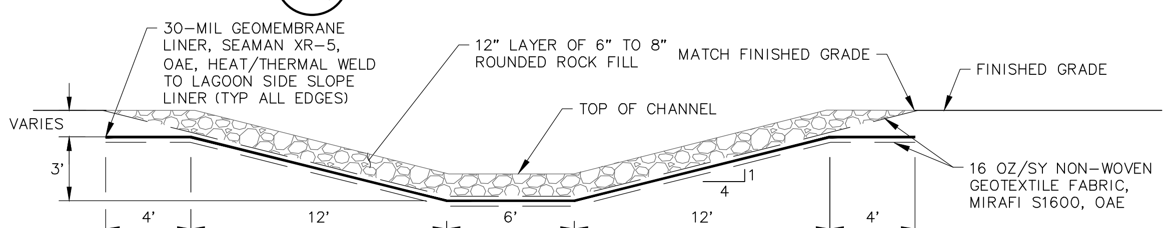
B / FIG 5 TYPICAL BERM SECTION B

Scale: AS SHOWN



C / FIG 5 TYPICAL BERM SECTION C

Scale: AS SHOWN



- / FIG 5 OVERFLOW CHANNEL DETAIL

Scale: NOT TO SCALE

FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\07 Kokhanok\04 - KOKHANOK Lagoon Sections.dwg

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KOKHANOK, ALASKA

LAGOON SECTIONS

LAGOON IMPROVEMENT PLAN

Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	5

<table>
<tr><th colspan="2">Kokhanok Lagoon
Site Investigation Photos</th></tr>
<tr><th>Photo</th><th>Description</th></tr>
<tr><td></td><td>Lagoon Cell #1 with liner visible. – October 29, 2019</td></tr>
<tr><td></td><td>Lagoon Cell #1, view two. – October 29, 2019</td></tr>
</table>

<table>
<tr><th colspan="2">Kokhanok Lagoon
Site Investigation Photos</th></tr>
<tr><th>Photo</th><th>Description</th></tr>
<tr><td></td><td>Lagoon Cell #2 – October 29, 2019</td></tr>
<tr><td></td><td>Berm between Cell #1 (right) and Cell #2 (left) – October 29, 2019</td></tr>
</table>

Geotechnical Report

Kokhanok W&S Scoping Assessment

January 2020

CRW ENGINEERING GROUP, LLC

Contact
Steven Halcomb, PE, GE
shalcomb@crweng.com

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Geotechnical Report

Kokhanok Water and Sewer Scoping Assessment

Submitted To:

Mr. David McAlister
Alaska Peninsula Corporation
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[DRAFT – NO SIGNATURES]

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Senior Geotechnical Engineer

January 2020
CRW Project Number 48601.00

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1. Introduction and Project Description

CRW Engineering Group, LLC (CRW) is pleased to present this geotechnical report to support the design and construction of a new lagoon in Kokhanok, Alaska (see Figure 1). This report summarizes our geotechnical investigation and existing subsurface conditions.

The project consists of the expansion of the existing lagoon for the Village of Kokhanok. The locations evaluated for the new lagoon were to the east and south of the existing lagoon and a new site approximately 0.43 miles north-northeast of the existing lagoon (see Figure 2).

Our scope of work included:

- Performing a geotechnical investigation which included excavating four test pits.
- Percolation testing.
- Overseeing laboratory testing of recovered soil samples including moisture content, grain size distribution, and Atterberg Limits.
- Analysis of field observations and testing results.
- Preparing the geotechnical data report.

2. Site Description

The project site is located in Kokhanok, Alaska, which is on the southern shoreline of Lake Iliamna, 22 miles south of the City of Iliamna, and 88 miles northeast of the City of King Salmon. The topography of the area is generally flat with some rolling hills, and benches with mountains to the southeast. Peat bogs occur in some of the lowland areas and consist of organic and silty soils with surface water or shallow groundwater present.

3. Subsurface Investigation

A geotechnical investigation was completed on December 16th and 17th of 2019 to assess existing subsurface conditions. The investigation included four test pit (TP-01 thru 03 and HDTP-01).

Test pit locations were determined by CRW and field-adjusted as needed. Final test pit location are shown on Figure 2.

Excavation services were provided by the Native Village of Kokhanok, using a Case 580 rubber-tired backhoe. Backhoe-completed test pits were excavated to depths ranging from 5 to 8 feet below the ground surface (BGS). One hand-dug test pit (HDTP-01) was completed to a depth of 2 feet BGS using a square-nosed shovel and gardening spade. Test pit logs are presented in Appendix A.

Field operations were supervised by a CRW geotechnical engineer, who logged the recovered soils, collected samples, and directed the excavation operation. Photos from the exploration are presented in Appendix C.

3.1 Test Pit Sample Collecting

Representative samples were collected from the backhoe bucket as the test pits were excavated or as grab samples from the excavation. Recovered samples were visually classified in the field before being individually sealed in double plastic bags. Visual classification was performed following the Unified Soils Classification System (USCS) according to ASTM D2487/D2488. Samples will be retained for up to 6 months for future testing if requested.

3.1.1 Test Pit Completion

Upon completion, the test pits were filled and compacted with the backhoe bucket or shovel to closely match original grade.

3.2 Percolation Test

One in-situ falling head percolation test was performed (PERC-01) in TP-03. The groundwater table was observed to be too shallow in TP-01, TP-02, and HDTP-01 to perform percolation testing. Results from the percolation tests are presented on the test pit log and shown in Table 1 below. The tests were performed in accordance with the Onsite Wastewater Treatment and Disposal System Design Manual (EPA, 1980). The percolation test location is shown in Figure 2.

Table 1 – Percolation Rates

Percolation Pit	PERC-01
Percolation Rate (minutes per inch)	0.98

4. Laboratory Testing and Results

Soil laboratory tests to evaluate index properties of representative samples were performed by Alaska Testlab at their Anchorage facility. The laboratory tests were performed in accordance with the test methods of ASTM International. In total, 8 samples were submitted for testing. The laboratory testing consisted of soil index tests to determine: water content, grain-size distribution, organic content, and Atterberg Limits.

All samples were tested for their water content per ASTM D2216. Water contents varied from 8 to 33 percent.

Five samples were selected for grain-size distribution testing in accordance with ASTM D6913 and/or D422. Four samples were classified as poorly graded sand and gravel with varying fines content, with one sample being silty sand with gravel.

Two samples were washed through the No. 200 mesh sieve in accordance with ASTM D1140. The coarse fraction of the remaining soil was then dried and sieved through the No. 4 sieve to determine the sand and gravel content. This method is termed the Limited Mechanical Analysis (LMA). The LMA is a means to determine the percentage of coarse and fine soil in a sample without having to perform full gradations. These two samples were classified as silty sand and silty gravel.

One sample was tested for its Atterberg Limits in accordance with ASTM D4318. The result of this test determined the plasticity to be non-plastic.

One sample was tested for its organic content in accordance with ASTM D2974. The organic and ash content was determined to be 5.3 and 94.7 percent, respectively.

Results of the laboratory testing are presented in Appendix B.

5. Site Conditions

5.1 Soil Lithology

Kokhanok is primarily underlain by beach deposits of estuarine and lacustrine origin, potential glacial drift, and bedrock (Detterman and Reed, 1973).

A thin organic mat approximately 3 inches thick was observed in the test pits. The organic mat was brown, moist, and had up to 1 inch fibrous roots.

The subsurface conditions around the existing lagoon generally consisted of poorly graded sand to silty sand. The sand was brown to dark gray in color and moist to wet with water contents ranging from 11 to 33 percent. The fines content of the sand ranged from 1 to 24 percent and was noted to be non-plastic. The sand content ranged from 41 to 99 percent, with a size range of coarse-to-fine. The gravel content ranged from 0 to 35 percent with a size range of coarse-to-fine and maximum particle size of 3 inches.

Significant organic content was observed in TP-01, in addition to variation in color of the sand compared to TP-02 and HDTP-01. It is most likely that the material encountered in TP-01 was from the construction of the existing lagoon and not necessarily reflective of the native in-situ soils.

The subsurface condition at TP-03 was observed to be 1 foot of brown, moist organic silt underlying the organic mat. Below the organic silt was a brown, moist, clean poorly graded gravel to a depth of 7 feet BGS. The moisture content of the gravel varied from 7.6 to 9.2 percent. The gravel content was noted to decrease with depth during the excavation. Below the poorly graded gravel was a silty gravel with sand until 8 feet BGS at which point the excavator bucket encountered refusal.

Cobbles were observed in the test pits and ranged from 8 to 11 inches in diameter though less than 5 percent of the soil matrix by volume.

5.2 Groundwater

Groundwater was observed in the test pits from 2 to 7 feet BGS. A summary of the depth of groundwater is presented in Table 2 below.

Table 2 – Groundwater Depths

Test Pit	Depth, feet
TP-01	3
TP-02	1
TP-03	7
HDTP-01	2

5.3 Permafrost

The project area is located in a region known to have isolated to absent permafrost (INE, 2008). Recovered samples were all observed to be in a thawed state. We therefore conclude that no permafrost is present at the site.

5.4 Bedrock

Local bedrock is of volcanic origin, found near the surface and in visible outcrops consisting of volcanic flows and tuffs including Mesozoic porphyry and Tertiary basalts (Martin, G.C., and Katz, F.P., 1912). The bedrock is not metamorphosed and is generally overlain at the lower altitudes by terrace gravels and small amounts of glacial till. The area has been heavily glaciated with glacial deposits prevalent throughout (Detterman and Reed, 1973).

6. Limitations and Closure

The information submitted in this report is based on our interpretation of data from the field geotechnical investigation performed for this project. The conclusions contained in this report are based on site conditions as they were observed on the dates indicated. It is presumed that the exploratory test pits are representative of the subsurface conditions throughout the site. Effort was made to obtain information representative of existing conditions at the site. If, however, subsurface conditions are found to differ, we should be notified immediately to review these recommendations in light of additional information.

If there is substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated soil conditions are commonly encountered and cannot fully be determined by collecting discrete samples or performing test pits. The client and contractor should be aware of this risk and account for contingency accordingly.

This report was prepared by CRW Engineering Group, LLC for use on this project and is not intended for use on other projects. CRW is not responsible for conclusions, opinions, or recommendations made by others based on data presented in this report.

7. References

Detterman, R.L. and Reed, B.L., 1973. Surficial Deposits of the Iliamna Quadrangle, Alaska. U.S. Geological Survey Bulletin 1368-A, p. A1-A64.

Institute of Northern Engineering (INE), 2008. Permafrost Characteristics of Alaska Map. University of Alaska Fairbanks, December 2008.

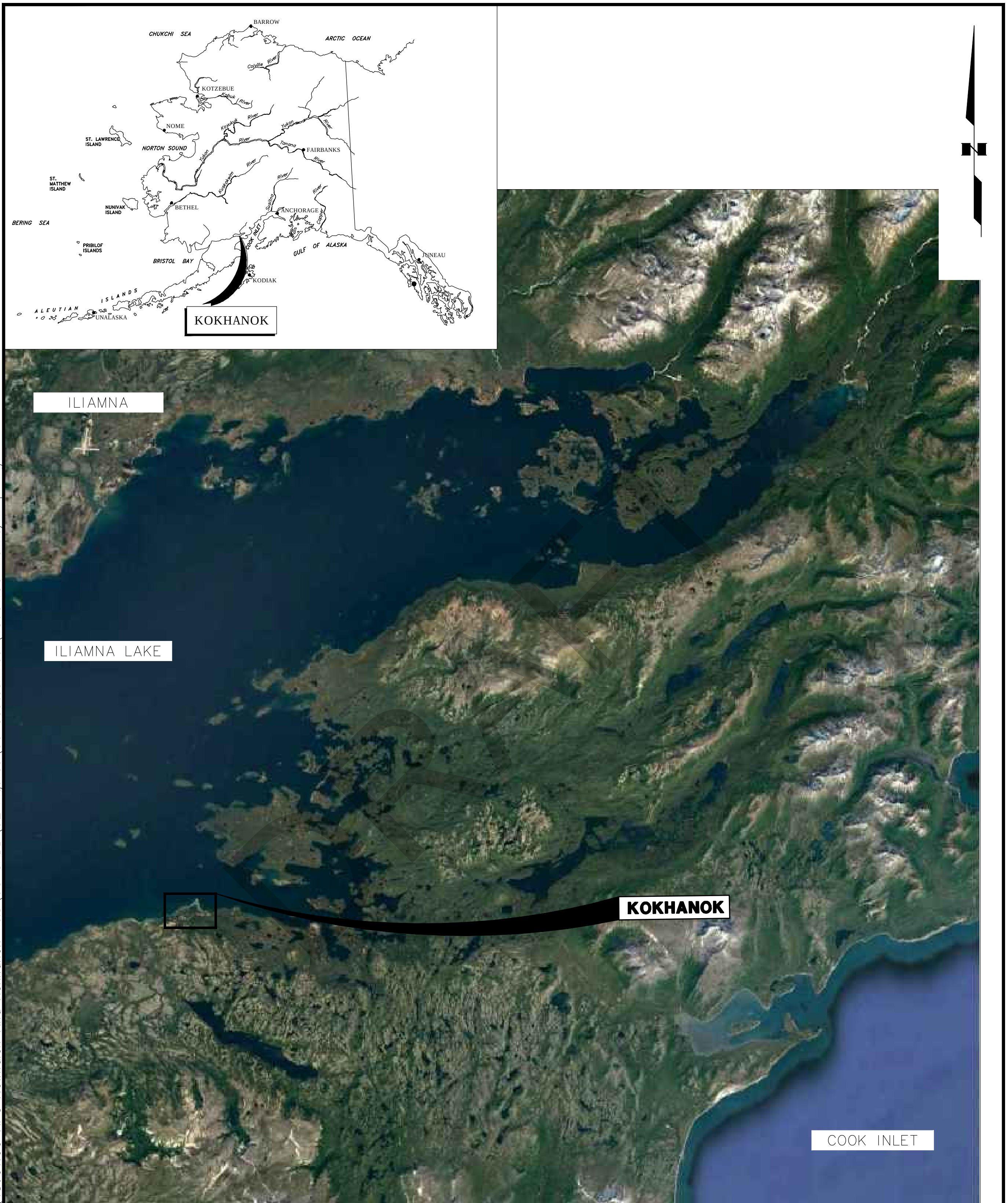
Martin, G.C. and Katz, F.J., 1912. A Geologic Reconnaissance of the Iliamna Region, Alaska. U.S. Geological Survey Bulletin 485, p.144.

Otis, R., W. Boyle, E. Clements, AND C. Schmidt. Design Manual: Onsite Wastewater Treatment and Disposal Systems. U.S. Environmental Protection Agency, Washington, D.C., EPA/625/1-80/012 (NTIS PB83219907), 1980.

Figures

Included in this section:

1) Vicinity Map
2) Test Pit Locations



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APC KOKHANOK W&S SCOPING ASSESSMENT
GEOTECHNICAL INVESTIGATION

VICINITY MAP

Project No:	48601.00
Drawn By:	SMH
Scale:	NTS
Date:	1/6/2020
Figure:	1

FILE NAME: J:\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\05 Geotechnical\48601.00 Vicinity Map.dwg

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APC KOKHANOK W&S SCOPING ASSESSMENT
GEOTECHNICAL INVESTIGATION

TESTPIT LOCATIONS

Project No:	48601.00
Drawn By:	SMH
Scale:	NTS
Date:	1/6/2020
Figure:	2

FILE NAME: J:\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\05 Geotechnical\48601.00 Vicinity Map.dwg

Appendix A

Test Pit Logs

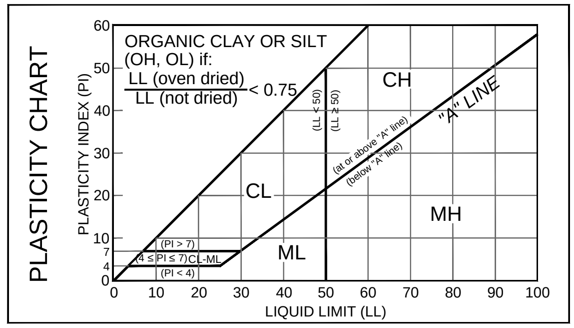
Included in this section:

1) Test Pit Log Legend
2) Test Pit Logs (TP-01 thru 03 and HDTP-01)

UNIFIED SOIL CLASSIFICATION (ASTM D 2487)

GROUP SYMBOL	SOIL GROUP NAMES & LEGEND	
GW	WELL-GRADED GRAVEL	if soil contains ≥ 15% sand, add "with sand"
GP	POORLY GRADED GRAVEL	
GM	SILTY GRAVEL	
GC	CLAYEY GRAVEL	
SW	WELL-GRADED SAND	if soil contains ≥ 15% gravel, add "with gravel"
SP	POORLY GRADED SAND	
SM	SILTY SAND	
SC	CLAYEY SAND	
CL	LEAN CLAY	if soil contains coarse-grained soil from 15% to 29%, add "with sand" or "with gravel" for whichever type is prominent, or for ≥ 30%, add "sandy" or "gravelly"
ML	SILT	
OL	ORGANIC CLAY OR SILT	
GW	FAT CLAY	
MH	ELASTIC SILT	
OH	ORGANIC CLAY OR SILT	
PT	PEAT	

Gravels or sands with 5% to 12 % fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM.
Optional Abbreviations: Lower case "s" after USCS group symbol denotes either "sandy or "with sand" and "g" denotes either "gravelly" or "with gravel."



COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 IN.
COBBLES	3 IN. TO 12 IN.
GRAVEL	3 IN. TO NO. 4 (4.76 mm)
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 (4.76 mm)
SAND	NO. 4 (4.76 mm) TO NO. 200 (0.074 mm)
COARSE SAND	NO. 4 (4.76 mm) TO NO. 10 (2.0 mm)
MEDIUM SAND	NO 10 (2.0 mm) TO NO. 40 (0.42 mm)
FINE SAND	NO. 40 (0.42 mm) TO NO. 200 (0.074 mm)
SILT AND CLAY	SMALLER THAN NO. 200 (0.074 mm)
SILT	0.074 mm TO 0.005 mm
CLAY	LESS THAN 0.005 mm

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D 2488)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES (FROM TERZAGHI & PECK 1996)

COHESIONLESS SOILS[a]		COHESIVE SOILS[b]		
RELATIVE DENSITY	N_{60} (BLOWS/FOOT)[c]	CONSISTENCY	N_{60} (BLOWS/FOOT)[c]	UNCONFINED COMPRESSIVE STRENGTH (TSF)[d]
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MED DENSE	10 - 30	MEDIUM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

(a) Soils consisting of gravel, sand and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
(b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
(c) Refer to ASTM D 1586-99 for a definition of N.
(d) Undrained shear strength, s_u = 1/2 unconfined compression strength, U_c. Note that Torvane measures s_u and Pocket Penetrometer measures U_c.

CRITERIA FOR DESCRIBING MOISTURE CONDITION (ASTM D 2488)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

SAMPLER ABBREVIATIONS

SS	SPT Sampler (2 in. OD, 140 lb hammer)	C	Core (Rock)
SSO	Oversize Spit Spoon (2.5 in. OD, 140 lb typ.)	TW	Thin Wall (Shelby Tube)
HD	Heavy Duty Split Spoon (3 in. OD, 300/340 lb typ.)	MS	Modified Shelby
BD	Bulk Drive (4 in. OD, 300/340 lb hammer typ.)	GP	Geoprobe
CA	Continuous Core (Soil in Hollow-Stem Auger)	AR	Air Rotary Cuttings
G	Grab Sample from surface / testpit	AG	Auger Cuttings

LABORATORY TEST ABBREVIATIONS

AL	Atterberg Limit	PI	Plastic Index	TS	Thaw Consolidation
Consol	Consolidation	PID	Photoionization Detector	TV	Torvane
LMA	Limited Mechanical Analysis	Proc	Proctor	TXCD	Consolidated Drained Triaxial
MA	Sieve and Hydrometer Analysis	PP	Pocket Penetrometer	TXCU	Consolidated Undrained Triaxial
MC	Moisture Content	P200	Percent Fines (Silt & Clay)	TXUU	Unconsolidated Undrained Triaxial
NP	Non-plastic	SA	Sieve Analysis	VS	Vane Shear
OLI	Organic Loss	SpG	Specific Gravity	Ω	Soil Resistivity

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FIELD AND LABORATORY TEST ABBREVIATIONS

FIGURE A-1

FROZEN SOIL CLASSIFICATION (ASTM D 4083)

1. DESCRIBE SOIL INDEPENDENT OF FROZEN STATE	CLASSIFY SOIL BY THE UNIFIED SOIL CLASSIFICATION SYSTEM			
	MAJOR GROUP		SUBGROUP	
	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION
2. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF FROZEN SOIL	Segregated ice not visible by eye	N	Poorly bonded of friable	N_f
			Well bonded: No excess ice	Nbn
			Well bonded: Excess ice	Nbe
	Segregated ice visible by eye (ice less than 25 mm thick)	V	Individual ice crystals or inclusions	V_x
			Ice coatings on particles	V_c
			Random or irregularly oriented ice formations	V_r
			Stratified or distinctly oriented ice formations	V_s
			Uniformly distributed ice	V_u
3. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF SUBSTANTIAL ICE STRATA	Ice greater than 25 mm thick	ICE	Ice with soil inclusions	ICE+soil type
			Ice without soil inclusions	ICE

FROST DESIGN SOIL CLASSIFICATION[1]

FROST GROUP[2]	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS[3]	(a) Gravels Crushed stone Crushed rock	0 - 1.5	GW, GP
	(b) Sands	0 - 3	SW, SP
PFS[4] [MOA NFS]	(a) Gravels Crushed stone Crushed rock	1.5 - 3	GW, GP
[MOA F2]	(b) Sands	3 - 10	SW, SP
S1 [MOA F1]	Gravelly soils	3 - 6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S1 [MOA F2]	Sandy soils	3 - 6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1[5]	Gravelly soils	6 - 10	GM, GC, GM-GC, GW-GM, GP-GM, GW-GC, GP-GC
F2[5]	(a) Gravelly soils	10 - 20	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6 - 15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3[5]	(a) Gravelly soils	10 -20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	6 - 15	SM, SC, SM-SC
	(c) Clays, PI>12	--	CL, CH
F4[5]	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI<12	--	CL, ML-CL
	(d) Varved clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) From the U.S. Army Corps of Engineers (USACE), EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions", April 1984
(2) USACE frost groups directly correspond to frost groups in Municipality of Anchorage (MOA) Design Criteria Manual (DCM).
(3) Non-frost susceptible
(4) Possibly frost susceptible, requires lab test for void ratio to determine frost design classification.
(5) Consistent with MOA Definition.

ICE BONDING SYMBOLS

No ice-bonded soil observed

Poorly bonded or friable

Well bonded

DEFINITIONS

Candled Ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

Clear Ice is transparent and contains only a moderate number of air bubbles.

Cloudy Ice is translucent, but essentially sound and non-pervious.

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

Ice Coatings on particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins and masses in soils, commonly but not always oriented normal to direction of heat loss.

Massive Ice is a large mass of ice, typically nearly pure and relatively homogeneous.

Poorly-Bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Porous Ice contains numerous void, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

Well-Bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

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FROZEN SOIL CLASSIFICATION / LEGEND

FIGURE A-2

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BOREHOLE HDTP-01

CLIENT Alaska Peninsula Corporation
PROJECT NAME Kokhanok W&S Scoping Assessment
PROJECT NUMBER 48601.00
PROJECT LOCATION Kokhanok, AK
DATE STARTED 12/17/19 **COMPLETED** 12/17/19
GROUND ELEVATION
DRILLING CONTRACTOR None
GROUND WATER LEVELS:
DRILLING METHOD Handdug
AT TIME OF DRILLING 2.00 ft
LOGGED BY SMH **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40
0.0	PT		ORGANIC MAT, (PT) brown, moist, organic odor, fiberous								
	SM		SILTY SAND, (SM) 26% gravel, 60% sand, 14% fines, brown, fine to medium grained, moist	G 1						SA	

Bottom of borehole at 2.0 feet.

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CRW MOA LOG - CRW_DATATEMPLATE_20190115.GDT - 1/23/20 15:26 - 48601 KOKHANOK W&S.GPJ

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TEST PIT TP-01

CLIENT Alaska Peninsula Corporation
PROJECT NAME Kokhanok W&S Scoping Assessment
PROJECT NUMBER 48601.00
PROJECT LOCATION Kokhanok, AK
DATE STARTED 12/17/19 **COMPLETED** 12/17/19
GROUND ELEVATION
EXCAVATION CONTRACTOR Village of Kokhanok
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580N
AT TIME OF EXCAVATION 3.00 ft
LOGGED BY SMH **CHECKED BY** SMH
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40
0.0	PT		ORGANIC MAT, (PT) brown, moist, 1 inch fiberous roots								
	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 38% gravel, 54% sand, 8% fines, brown to dark gray, moist, organic odor, fiber/roots to 1 foot depth, cobbles up to 10 inches approximately 5% by volume, organic content = 5.3%, ash content = 94.7%	G 1	100					OLI	
2.5											
		∇		G 2	100					SA	
5.0			Fiberous roots up to 2 inch in diameter								
	SM		SILTY SAND, (SM) 35% gravel, 41% sand, 24% fines, gray, wet, non plastic	G 3	100					AL, LMA	

Bottom of test pit at 7.0 feet.

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TEST PIT TP-02

CLIENT Alaska Peninsula Corporation
PROJECT NAME Kokhanok W&S Scoping Assessment
PROJECT NUMBER 48601.00
PROJECT LOCATION Kokhanok, AK
DATE STARTED 12/16/19 **COMPLETED** 12/17/19
GROUND ELEVATION
EXCAVATION CONTRACTOR Village of Kokhanok
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580N
AT TIME OF EXCAVATION 1.00 ft
LOGGED BY SMH **CHECKED BY** SMH
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID	OTHER TESTS	SPT N VALUE (10 20 30 40) / PL MC LL (10 20 30 40)
0.0	PT		ORGANIC MAT, (PT) brown, moist, 1 inch fiberous roots								
	SP		POORLY GRADED SAND, (SP) 0% gravel, 99% sand, 1% fines, brown, wet, cobbles up to 11 inches approximately 5% by volume								
				G 1	100					SA	MC ≈ 20
2.5											
			Test pit sloughing at 4.5 feet. Went an additional 6 inches then test pit collapsed								
5.0			Gray layer observed at 5 feet but no sample due to caving of test pit								

Bottom of test pit at 5.0 feet.

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TEST PIT TP-03 (Perc-01)

CLIENT Alaska Peninsula Corporation
PROJECT NAME Kokhanok W&S Scoping Assessment
PROJECT NUMBER 48601.00
PROJECT LOCATION Kokhanok, AK
DATE STARTED 12/16/19 **COMPLETED** 12/16/19
GROUND ELEVATION
EXCAVATION CONTRACTOR Village of Kokhanok
GROUND WATER LEVELS:
EXCAVATION METHOD Case 580N
AT TIME OF EXCAVATION 7.00 ft
LOGGED BY SMH **CHECKED BY** SMH
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID	OTHER TESTS	SPT N VALUE (10 20 30 40) / PL MC LL (10 20 30 40)	WELL DIAGRAM
0.0	PT		ORGANIC MAT, (PT) brown, moist, 1 inch fiberous roots									
	OL		ORGANIC SOIL, (OL) brown, moist									
	GP		POORLY GRADED GRAVEL, (GP) 82% gravel, 14% sand, 4% fines, brown, moist, cobbles up to 8 inches approximately 5% by volume	G 1	100					SA		Percolation Test Excavation
2.5												Percolation Rate = 0.98 minutes per inch (12/16/19)
5.0	GP		POORLY GRADED GRAVEL, (GP) 57% gravel, 41% sand, 2% fines, brown, moist, cobbles up to 8 inches approximately 5% by volume	G 2	100					SA		
7.5	GM		SILTY GRAVEL WITH SAND, (GM) 47% gravel, 36% sand, 17% fines, gray, wet Excavator bucket refusal at 8 feet	G 3	100					LMA		

Bottom of test pit at 8.0 feet.

DRAFT

Appendix B

Laboratory Results

Included in this section:

1) Laboratory Results from Alaska TestLab

Testing Report Summary

Alaska Testlab

Date Sample Recv'd	12/20/2019
Client	CRW Engineering Group
W.O. #	753
Project	APC Kokhanok W&S
Lab #	1483
Location	TP-01 through TP-03

Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Test Performed
Moisture Content, ASTM D2216

Sample ID	Results (%)	Sample ID	Results (%)	Sample ID	Results (%)
TP-01, Sample 1	22	TP-02, Sample 1	25.3	TP-03, Sample 1	9.2
TP-01, Sample 2	19.7			TP-03, Sample 2	7.6
TP-01, Sample 3	10.7			TP-03, Sample 3	8.4
HDTP-01, Sample 1	33.4				

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar

Oscar Lage
Laboratory Supervisor

DRAFT

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: Kokhanok W&S
Work Order: 753

Particle Size Distribution

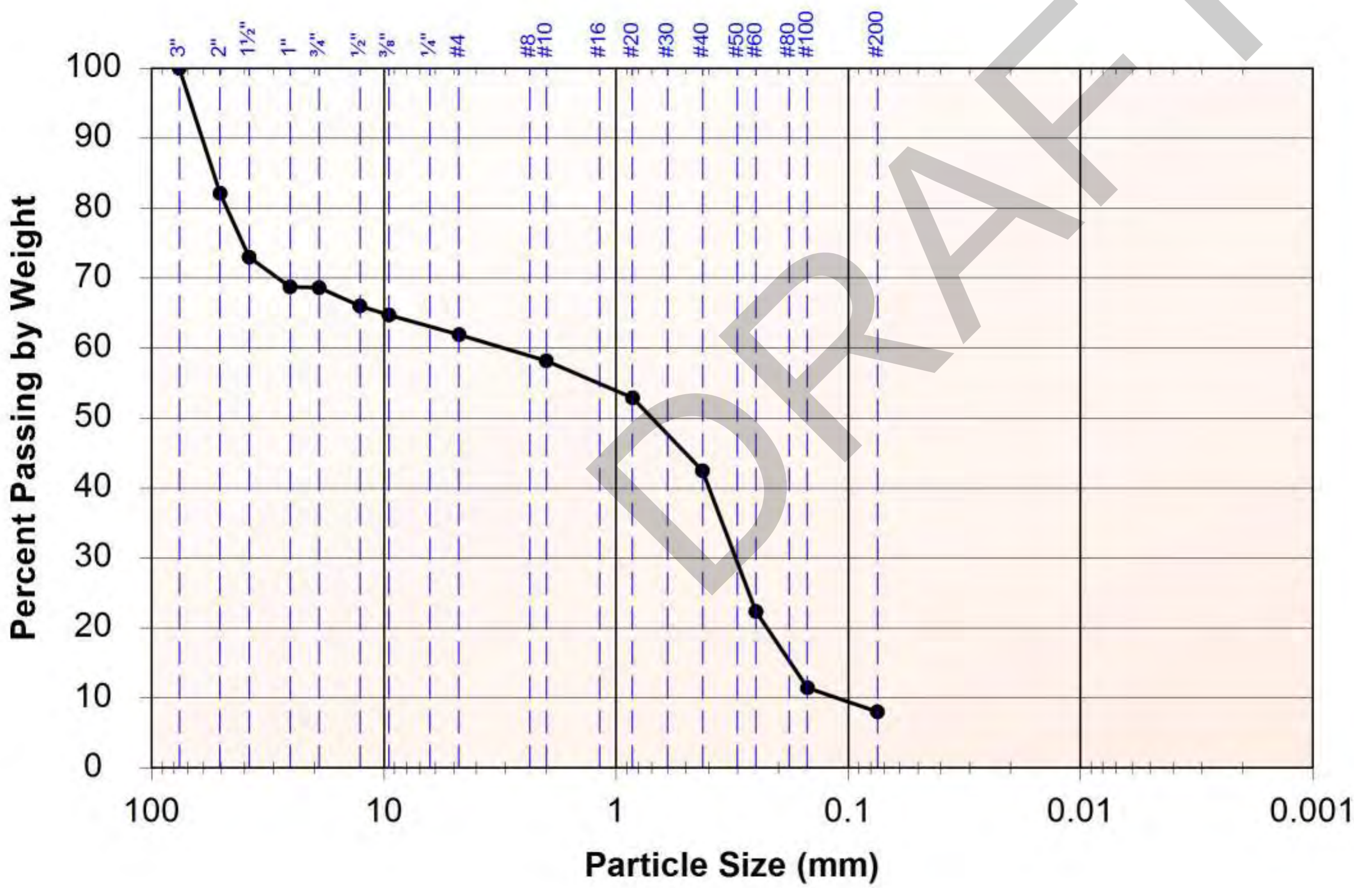
ASTM D422

Location: TP-01, Sample 2

Lab Number	2019-1485
Received	12/20/2019
Reported	12/31/2019

Engineering Classification: **Poorly Graded Sand with Silt and Gravel, SP-SM**

Frost Classification: **Not Measured**



Size	Passing	Specification
3"	100%	
2"	82%	
1½"	73%	
1"	69%	
¾"	69%	
½"	66%	
⅜"	65%	
#4	62%	
Total Weight of Sample 2288.9g		
#10	58%	
#20	53%	
#40	42%	
#60	22%	
#100	11%	
#200	8.0%	
Total Weight of Fine Fraction 413g		

ATL Alaska Testlab

Client: CRW Engineering Group, LLC
Project: Kokhanok W&S
Work Order: 753

Particle Size Distribution

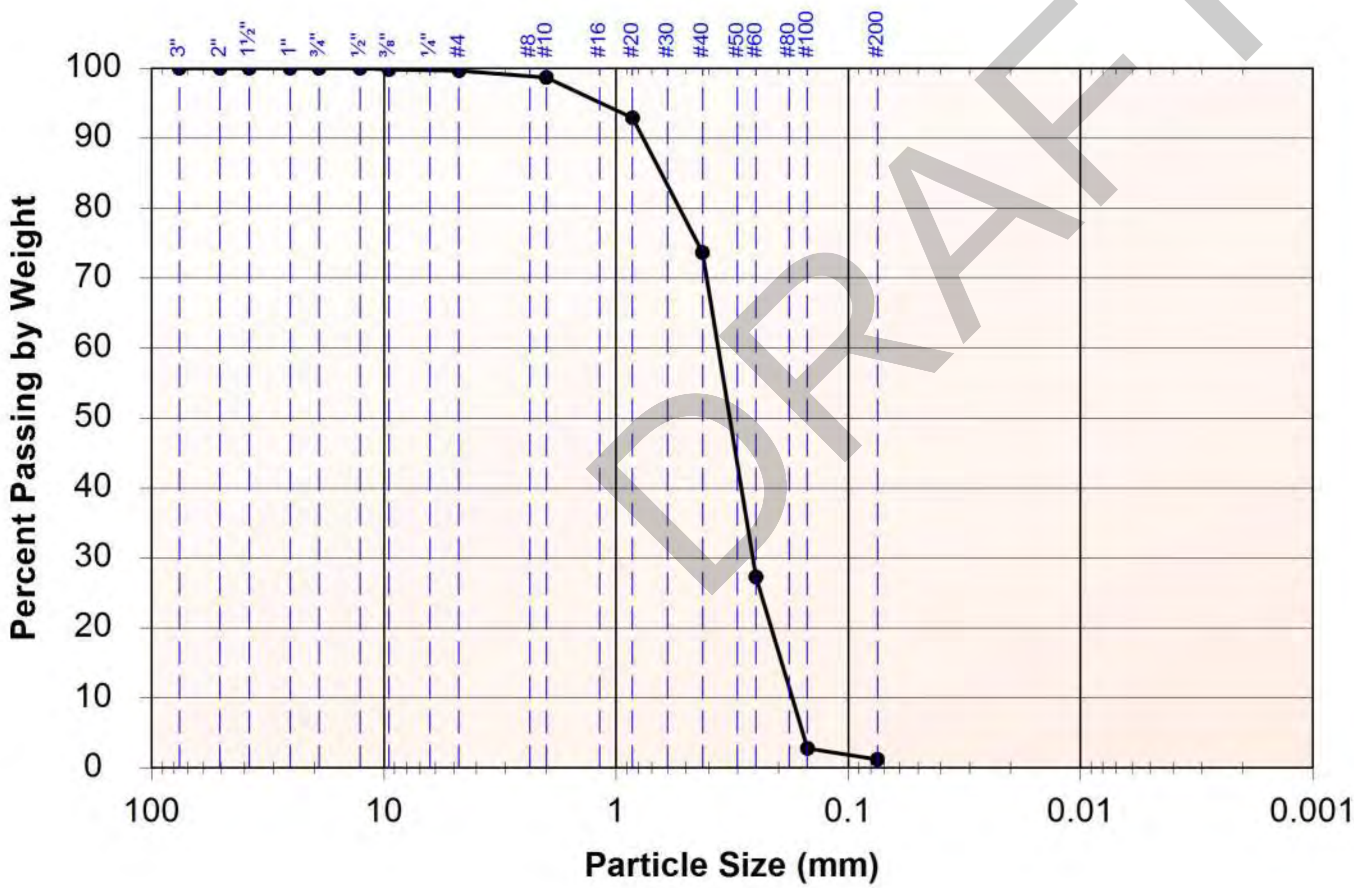
ASTM D422

Lab Number	2019-1487
Received	12/20/2019
Reported	12/31/2019

Location: TP-02, Sample 1

Engineering Classification: Poorly Graded Sand, SP

Frost Classification: NFS



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	100%	
Total Weight of Sample 1428.5g		
#10	99%	
#20	93%	
#40	74%	
#60	27%	
#100	3%	
#200	1.2%	
Total Weight of Fine Fraction 317.6g		

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Alaska Testlab

Client: CRW Engineering Group, LLC
Project: Kokhanok W&S
Work Order: 753

Particle Size Distribution

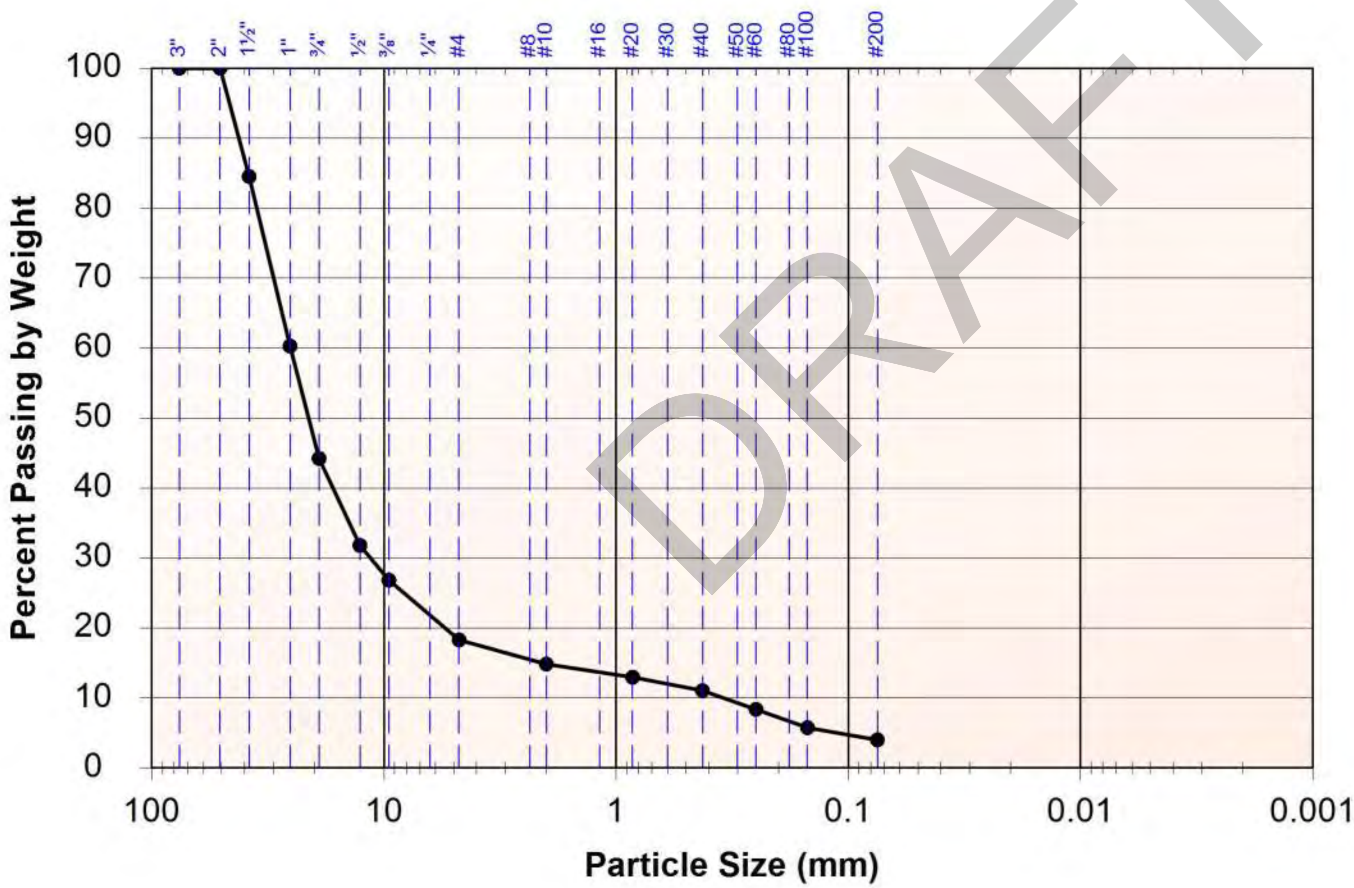
ASTM D422

Lab Number	2019-1488
Received	12/20/2019
Reported	12/31/2019

Location: TP-03, Sample 1

Engineering Classification: Poorly Graded Gravel, GP

Frost Classification: Not Measured



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	85%	
1"	60%	
¾"	44%	
½"	32%	
⅜"	27%	
#4	18%	
Total Weight of Sample 2679.3g		
#10	15%	
#20	13%	
#40	11%	
#60	8%	
#100	6%	
#200	4.0%	
Total Weight of Fine Fraction 489.3g		

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Alaska Testlab

Client: CRW Engineering Group, LLC
Project: Kokhanok W&S
Work Order: 753

Particle Size Distribution

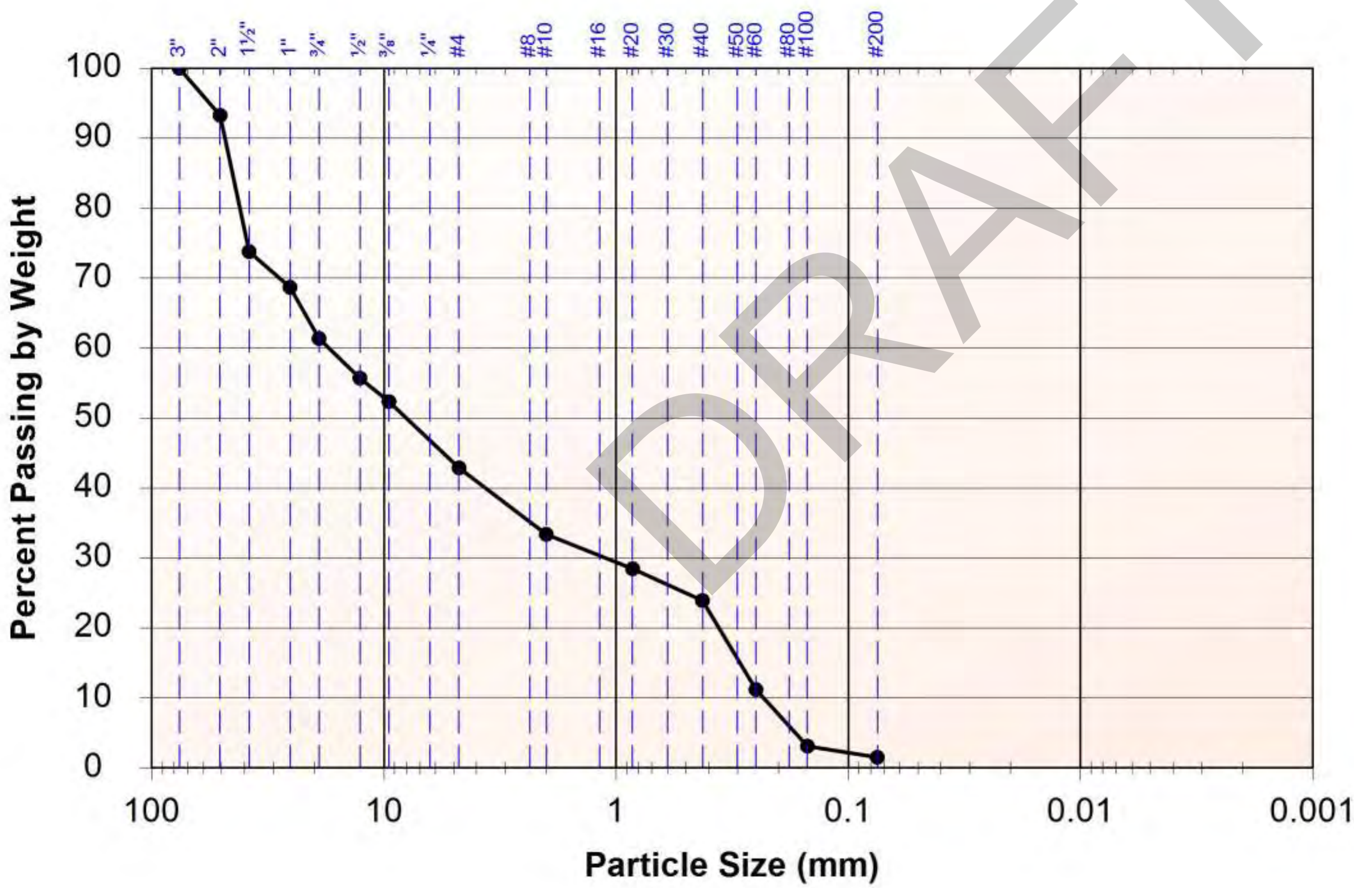
ASTM D422

Lab Number	2019-1489
Received	12/20/2019
Reported	12/31/2019

Location: TP-03, Sample 2

Engineering Classification: **Poorly Graded Gravel with Sand, GP**

Frost Classification: **NFS**



Size	Passing	Specification
3"	100%	
2"	93%	
1½"	74%	
1"	69%	
¾"	61%	
½"	56%	
⅜"	52%	
#4	43%	
Total Weight of Sample 3121.8g		
#10	33%	
#20	28%	
#40	24%	
#60	11%	
#100	3%	
#200	1.5%	
Total Weight of Fine Fraction 313.1g		

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Alaska Testlab

Client: CRW Engineering Group, LLC
Project: Kokhanok W&S
Work Order: 753

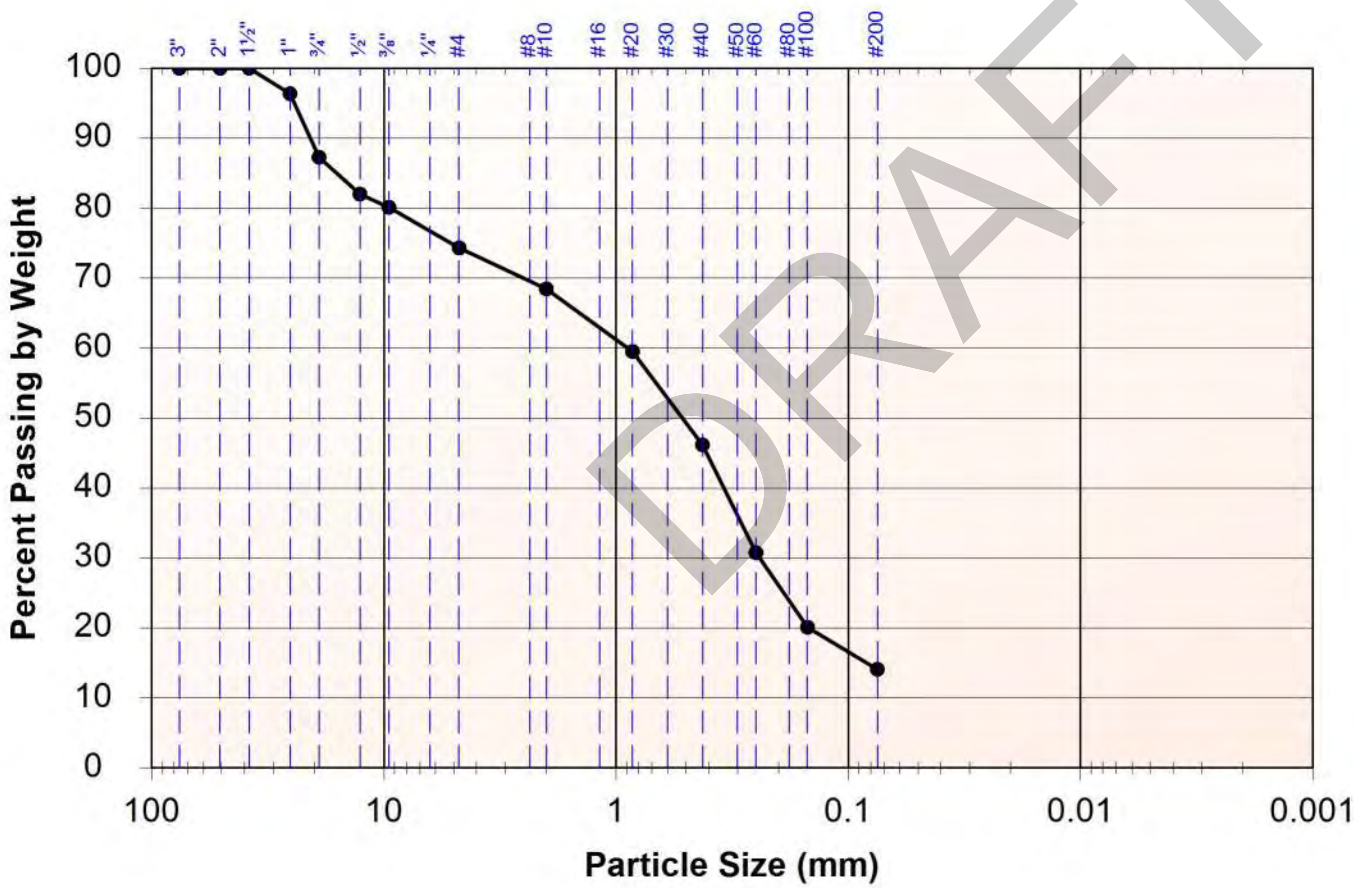
Particle Size Distribution

ASTM D422

Location: HDTP-01, Sample 1

Lab Number	2019-1491
Received	12/20/2019
Reported	12/31/2019

Engineering Classification: Silty Sand with Gravel, SM
Frost Classification: Not Measured



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	96%	
¾"	87%	
½"	82%	
⅜"	80%	
#4	74%	
Total Weight of Sample 1353.5g		
#10	68%	
#20	59%	
#40	46%	
#60	31%	
#100	20%	
#200	14.1%	
Total Weight of Fine Fraction 387g		

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Alaska Testlab

Testing Report Summary

		Date Sample Recv'd	12/20/2019
Client	CRW Engineering Group	W.O. #	753
Project	APC Kokhanok W&S	Lab #	See Below
Location	TP-01, TP-03		

Test Performed
Limited Mechanical Analysis
Results (%)

Sample ID	Gravel	Sand	Silt	USCS
TP-01, S3 (ATL#1486)	35	41	24	SM
TP-03, S3 (ATL#1490)	47	36	17	GM

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

		Date Sample Recv'd	12/20/2019
Client	CRW Engineering Group	W.O. #	753
Project	APC Kokhanok W&S	Lab #	1486
Location	TP-01, Sample 3		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		USCS of Finer Fraction
TP-01, SA 3 Lab No. 1486	Plasticity Index	ASTM D4318	Liquid Limit	NP	ML
			Plastic Limit	NP	
			Plasticity Index	NP	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar

Oscar Lage

Laboratory Supervisor

Alaska Testlab

Testing Report Summary

		Date Sample Recv'd	12/20/2019
Client	CRW Engineering Group	W.O. #	753
Project	APC Kokhanok W&S	Lab #	1484
Location	TP-01, Sample 1		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results	
TP-01, SA 1 Lab No. 1484	Moisture, Ash & Organic Matter of Peat Materials	ASTM D2974	% Organics (by weight)	5.3
			% Ash	94.7
			% Moisture	33.2

If you have questions regarding this summary report or the test procedures, please contact us.

oscar
Oscar Lage
Laboratory Supervisor

DRAFT

Appendix C

Site Investigation Photos

Included in this section:

1) Select Site Photos

Kokhanok Water and Sewer Site Investigation Photos	
Photo	Description
	Excavation of TP-01.
	Excavation of TP-02.

Kokhanok Water and Sewer Site Investigation Photos	
Photo	Description
	Excavation of TP-03.
	Excavation of HDTP-01

Kokhanok Water and Sewer Site Investigation Photos	
Photo	Description
	Completion of percolation test PERC-01.
	Example of cobble

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Concept Design Memorandum

TO: Alaska Peninsula Corporation

SUBJECT: Newhalen Sewage Treatment Improvements

DATE: 1/23/2020

BY: Steven Hebnes, PE, Civil Engineer

CRW Engineering Group, LLC (CRW) is providing subcontract services with the Alaska Peninsula Corporation (APC) to assess various sanitation needs in the community of Newhalen as a component of the mitigation planning for the Pebble Project. As a part of the evaluation effort, CRW has reviewed current Sanitation Deficiency System (SDS) documentation provided by Alaska Native Tribal Health Consortium (ANTHC), performed a site assessment, interviewed community members familiar with the system operation, and reviewed record documents for past specific projects, including previous design reports, field assessments, and related correspondence. The community of Newhalen is served by ANTHC for addressing public sanitation needs. ANTHC has summarized various sanitation needs in Newhalen for seeking Indian Health Service (HIS) funding through the SDS program. The Newhalen wastewater lagoon project has been developed to a preliminary design level by ANTHC, and is in need of funding to finalize the design and construct the facility.

Existing Conditions

About 40% of Newhalen's population is served by a community piped sewer system and community percolation sewage lagoon, which is used for wastewater treatment and disposal. The remaining population utilizes on-site wastewater disposal systems. Prior to 2016, it was discovered that the existing community septic tanks and sewage lift station were failing. The existing pump station was reportedly no longer reliably operating and consequently was backing up the sewage system. The existing septic tanks are also reportedly of steel construction and have experienced significant corrosion and are leaking. In this condition, these septic tanks have a high collapse potential and potentially for introducing contaminates to the soil and/or groundwater.

In 2016, ANTHC designed and constructed a new sewage lift station for the community system. In the design of this facility, it was assumed that the existing percolation lagoon would be able to receive and treat raw sewage, thereby eliminating the need for the two existing septic tanks. During a plan review conducted by the Alaska Department of Environmental Conservation

(ADEC), it was determined that the existing sewer lagoon was originally approved only as an effluent lagoon, and was not permitted to handle or treat raw sewage. Based on this determination, ADEC conditionally-approved the new lift station design, contingent to the existing effluent lagoon being enlarged to receive and treat raw sewage. Currently, the failing septic tanks have been left in place until the lagoon work can be permitted and completed to accept raw sewage. Based on this current evaluation, it is evident that wastewater system improvements are necessary to upgrade failing components that do not meet current and future capacity requirements. Additionally, the community does not currently have the ability to maintain the septic tanks, as both pumper trucks are not operational. Consequently, there is a high likelihood that raw sewage is being introduced into the percolation lagoon.

Risk to the Environment from the Current Wastewater System Deficiencies

The existing community septic tanks are at risk of collapsing. The result of a septic tank breach could create a substantial release of wastewater into the adjacent wetlands and waterbodies, as much as the daily volume of 6,000 gallons per day. Untreated releases of wastewater into the surrounding environment can impose threats to community health and damage aquatic habitats from high BOD, pathogens and other contaminants. Furthermore, if the existing septic tanks continue to operate with the current deficiencies, then raw sewage will continue to pass through them substantially untreated. The solids that would otherwise be captured in the septic tank would eventually be introduced to the undersized percolation lagoon, wherein sludge deposits would reduce the percolation rate and ultimately cause the lagoon to overtop.

Recommended Improvement

The recommended improvement for the community of Newhalen is to increase the treatment capacity of the sewage lagoon to meet ADEC standards for treating raw sewage. Further, the improvements should also provide adequate percolation and hydraulic storage capacity.

With these improvements, the treatment of domestic wastewater would be performed in a three-cell lagoon having a total surface area of approximately 90,000 SF (2.1 acres). Primary treatment would be performed in Cells #1 and #2. The lagoon would be bounded by berms constructed from local granular fill. The berms would be built in one-foot lifts to create 3:1 interior and exterior slopes. A vegetative cover on the exterior slopes would be graded at a 4:1 slope. The new berm height would be 8 feet above the existing grade. The top-of-berm elevation for the primary treatment cells would provide a 3-foot freeboard height above the liquid volume and a 6-inch depth for sludge storage (67,000 gallons), in accordance with the ADEC design criteria.

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Improvements to Cells #1 and #2 would be limited to regrading their berm slopes and adding fill as required (2 feet of additional fill anticipated). Cell #1 currently features a liner which provides 1 foot of freeboard volume. The additional berm height around Cell #1 would not necessitate the replacement of this liner. However, installation of a liner in Cell #2 is recommended to prevent short-circuiting of wastewater flow before treatment is sufficiently achieved. Percolation will occur in Cell #3, and be constructed similar to Cell's #1 and #2. The new percolation cell is anticipated to replace the existing sludge disposal area, which has not been used. Full surface grading and berm development is anticipated in this area. With the upgraded geometry, the berm construction will require approximately 10,000 CY of granular fill. Approximately 1 foot of organic material will cap the exterior slopes to be vegetated for erosion control and bank stability.

Concept Design Requirements

- Lagoon Design Criteria:
  - 6,000 GPD [1]
  - Percolation Rate: 0.5 gal/SF/day (ADEC conventional rate).
  - Maximum Organic Loading: 20-30 lb/acre [2]
  - Minimum Wetted Surface Area for BOD Treatment: 0.54 acres.
  - Total Effective Volume: 1,220,000 gallons.
- Upgrade existing polishing Cell #1 and Cell #2 berms to meet ADEC primary treatment surface area requirements based on the calculated organic loading [3]:
  - Cell #1 would provide an effective operating volume of 96,000 gallons and wetted surface area of 0.1 acres.
  - Cell #2 would provide an operating volume of 633,000 gallons and wetted surface area of 0.67 acres.
  - A liner would be installed in Cell #2.
- Design of a new percolation Cell #3 based on design percolation rate with a minimum winter volume storage capacity of 90 days:

[1] Alaska Native Tribal Health Consortium, Environmental Health & Engineering; *Newhalen, Alaska Waste Water Upgrades Record Drawings (Phase One) NHL-14-001; November 13, 2019.*
[2] Heath Research, Inc., Health Education Services Division, *Recommended Standards for Wastewater Facilities, 2004,* Member States and Province.
[3] Heath Research, Inc., Health Education Services Division, *Recommended Standards for Wastewater Facilities, 2004,* Member States and Province.

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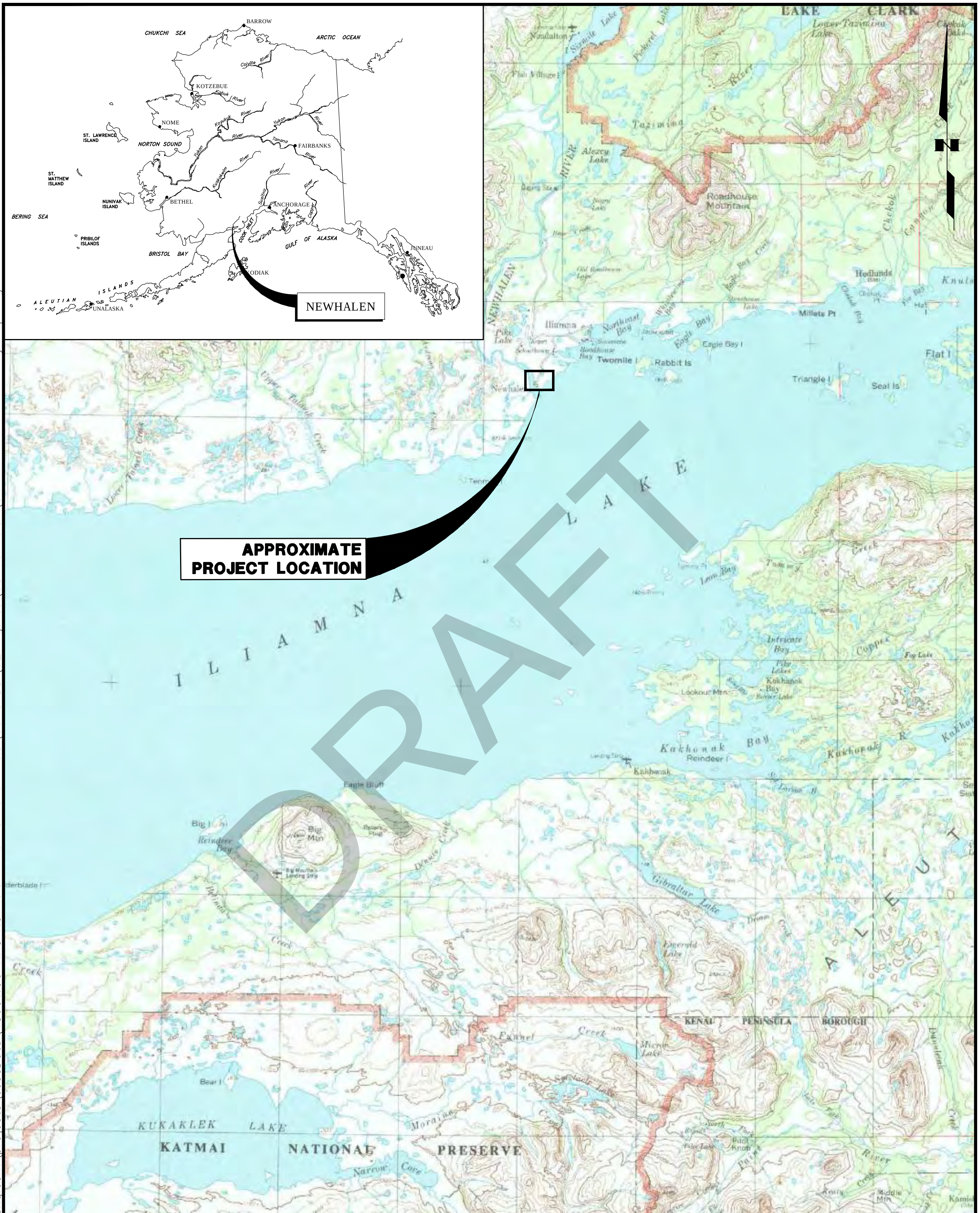
- The new percolation Cell #3 would provide an effective winter storage capacity of 600,000 gallons, percolation surface area of 17,000 SF and a wetted surface area of 0.45 acres (area not included for organic loading requirements).

The proposed action would result in the construction of a fully-permitted community sewage treatment system, which would protect the environment and public health from the hazards identified.

Conceptual Construction Drawings

Newhalen Sewage Lagoon Site Photos – October 2019



FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\08 Newhalen\01 - NEWHALEN Vicinity Map.dwg

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FINAL

NEWHALEN, ALASKA

VICINITY MAP

Project No:	48601.00
Drawn By:	MCH
Scale:	NTS
Date:	1/18/20
Figure:	1

FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\08 Newhalen\02 – NEWHALEN Community Overview.dwg

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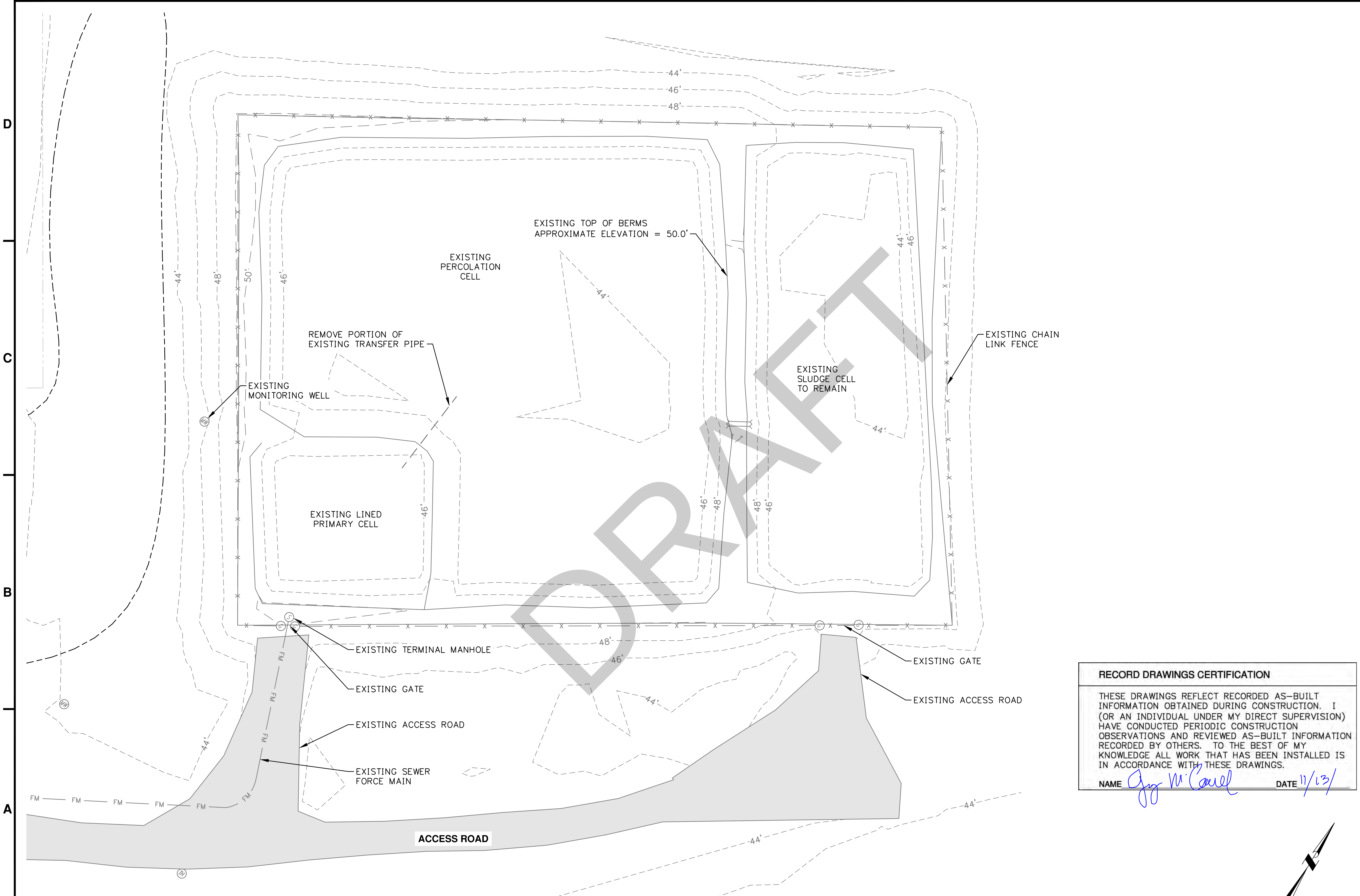
0 250 500

NEWHALEN, ALASKA

COMMUNITY OVERVIEW

LAGOON IMPROVEMENT PLAN

Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	2



EXISTING SEWAGE LAGOON

A1
1" = 20'

0 10' 20' 40'

RECORD DRAWINGS CERTIFICATION

THESE DRAWINGS REFLECT RECORDED AS–BUILT INFORMATION OBTAINED DURING CONSTRUCTION. I (OR AN INDIVIDUAL UNDER MY DIRECT SUPERVISION) HAVE CONDUCTED PERIODIC CONSTRUCTION OBSERVATIONS AND REVIEWED AS–BUILT INFORMATION RECORDED BY OTHERS. TO THE BEST OF MY KNOWLEDGE ALL WORK THAT HAS BEEN INSTALLED IS IN ACCORDANCE WITH THESE DRAWINGS.

NAME Greg McConnell DATE 11/13/

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM
Division of Environmental Health and Engineering
4500 Diplomacy Drive
Anchorage, Alaska 99508
(907) 729-3600

0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING, IF NOT ADJUST SCALES ACCORDINGLY

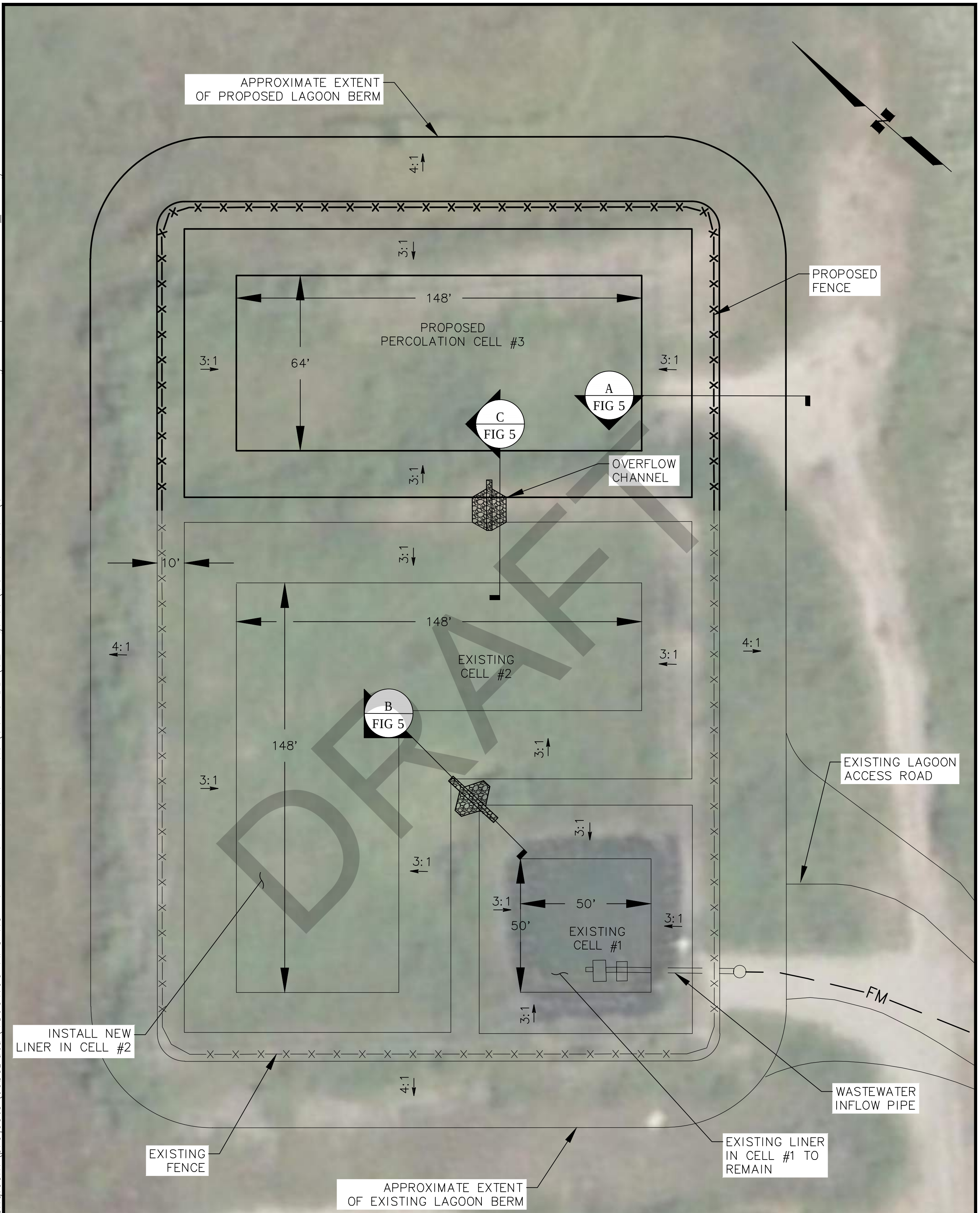
NEWHALEN, AK
WASTE WATER UPGRADES
ISSUED FOR CONSTRUCTION

MRK	DATE	DESCRIPTION	INIT

PLAN SET:	NHL–14–001
PROJ MGR:	KS
PROJ ENG:	SAE
DRUMS ENG:	PC
DRAWN BY:	SSM

SHEET TITLE
EXISTING SEWAGE LAGOON

FIGURE 3



FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\08 Newhalen\03 – NEWHALEN Lagoon Improvement Plan_v2.dwg

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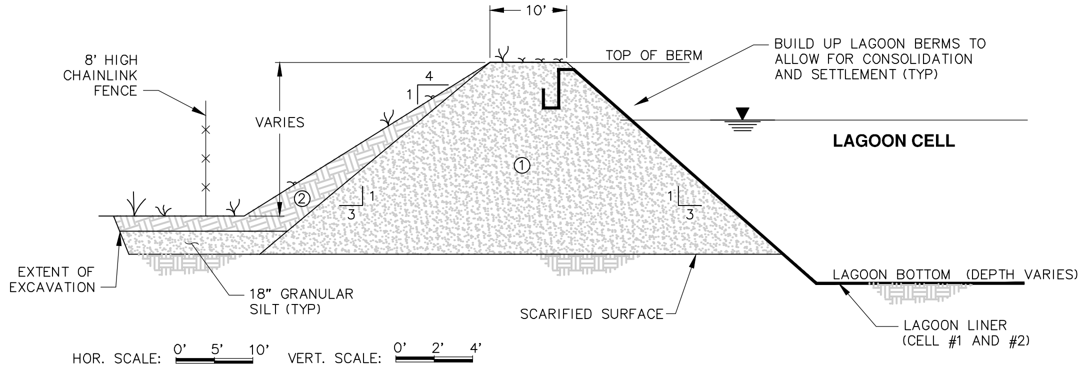
0 25 50

NEWHALEN, ALASKA

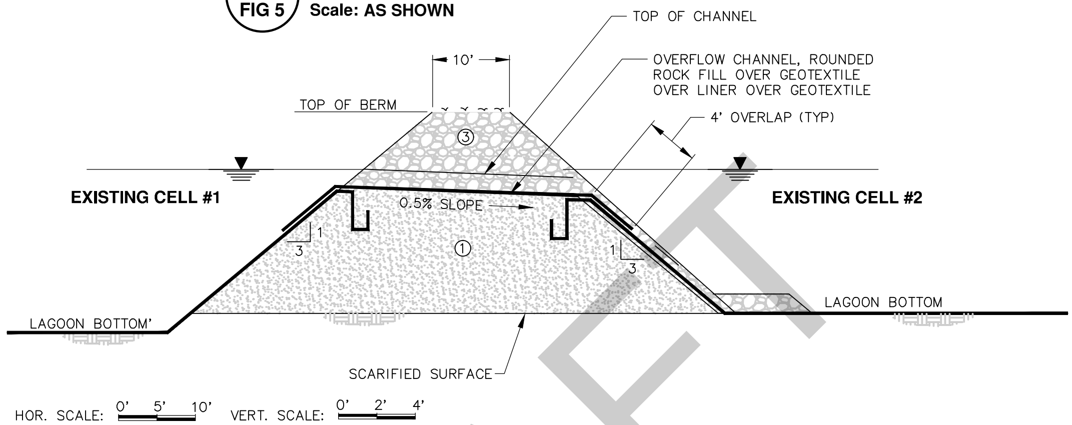
PROPOSED SEWAGE LAGOON

LAGOON IMPROVEMENT PLAN

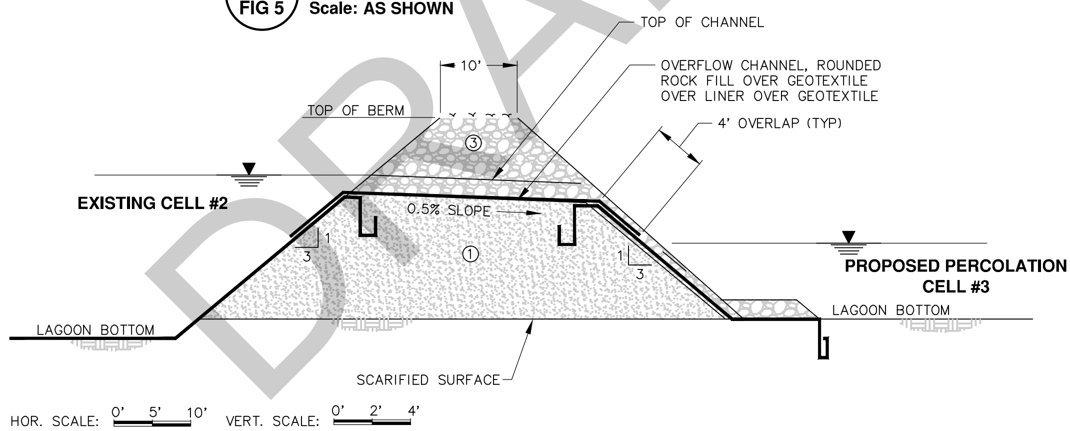
Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	4



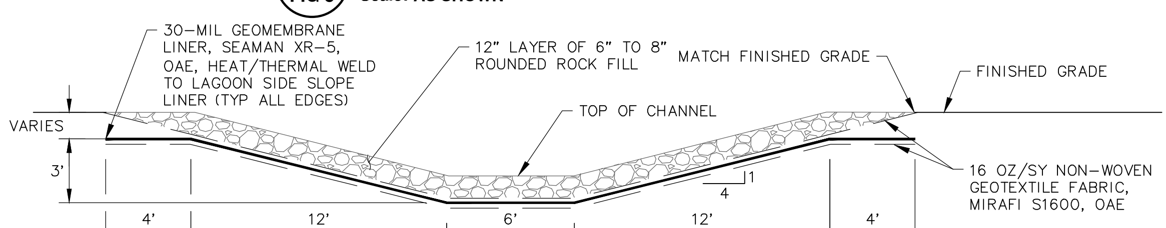
A / FIG 5 — TYPICAL BERM SECTION A
Scale: AS SHOWN



B / FIG 5 — TYPICAL BERM SECTION B
Scale: AS SHOWN



C / FIG 5 — TYPICAL BERM SECTION C
Scale: AS SHOWN



- / FIG 5 — OVERFLOW CHANNEL DETAIL
Scale: NOT TO SCALE

FILE NAME: \\crweng.com\projects\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\08 Newhalen\04 - NEWHALEN Lagoon Sections.dwg

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DRAFT

LAGOON IMPROVEMENT PLAN

Project No:	46801.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/18/2020
Figure:	5

Newhalen Lagoon Site Investigation Photos	
Photo	Description
	Existing Cell #1. – October 30, 2019
	Existing Cell #1 with liner visible. – October 30, 2019

<table>
<tr><th colspan="2">Newhalen Lagoon
Site Investigation Photos</th></tr>
<tr><th>Photo</th><th>Description</th></tr>
<tr><td></td><td>Existing Cell #2. – October 30, 2019</td></tr>
<tr><td></td><td>Existing Cell #2, view two. – October 30, 2019</td></tr>
</table>

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www.crweng.com

Concept Design Memorandum

TO: Alaska Peninsula Corporation

SUBJECT: Nondalton Sewer Collection System Improvements

DATE: 1/23/2020

BY: Steven Hebnes, PE, Civil Engineer

CRW Engineering, LLC (CRW) is providing subcontract services currently under contract with the Alaska Peninsula Corporation (APC) to assess various sanitation needs in the community of Nondalton as a component of the mitigation planning for the Pebble Project. For the evaluation effort, CRW performed a site assessment of the community wastewater system, held discussions with community members, reviewed record documents provided by the State of Alaska Remote Maintenance Worker (RMW) program for specific past projects, and performed sewer manhole assessments. Nondalton is a community served by Alaska Native Tribal Health Consortium (ANTHC), which was planning to evaluate the community sewer system for Indian Health Service (IHS) funding through its Sanitation Deficiency System (SDS) program.

Existing Conditions

About 90 percent of Nondalton's population is served by a community sewer system, and the remaining population utilizes on-site wastewater disposal systems. The sewer system is a gravity collection system comprised of over 30 manholes and which drains into a central lift station. From the lift station, wastewater is discharged through a force main into a percolating treatment lagoon. The sewer system was originally installed prior to 1980 and included 17 original manholes. The system has had four expansions with various types of manhole configurations, and now features a total of 31 manholes. The community has reported that the manholes are in a state of significant deterioration.

Table 1. Sewer System Expansions and Associated Manhole Construction

Sewer System Expansion	Manholes Constructed
Original	MH1-MH15, MH7A
#1	MH7B

#2	MH3A-MH3D
#3	MH7C-MH7E
#4	MH14A-14F

As part of the evaluation effort, CRW traveled to Nondalton in early January 2020 to examine the sewer system manholes and identify the extent of deterioration and need for replacement. This effort revealed that the condition of the manholes from the original construction and first two expansions are in poor-to-failing condition. Manhole issues include: generally-aging infrastructure, missing lids, disintegrating concrete tops and bases, infiltration, gravel and solids buildup in the base, and separation between the base and barrel. In some manholes, service lines were also found to be directly connected, which is a discouraged practice due to a high potential of plugging those service lines with manhole debris. Sewer main inlets and outlets are primarily insulated PCV pipe and appeared to be in fair condition with no obvious signs of collapsed or breached pipes.

Manholes from the 3rd and 4th system expansions were observed to be in fair-to-good condition. Sewer main piping in these areas consist of insulated HDPE, and are in good condition.

In their current condition, the degraded manholes allow excessive inflow and infiltration, which can overload the sewage lift station and lagoon, result in overflows at manholes, reduced wastewater treatment capability and lagoon berm overtopping. Additionally, the degraded manholes allow debris and rocks to enter the system, which constricts wastewater flow, causes substantial blockages and damages pumps, all of which increase the potential for sewage to back-up, overflow into surrounding areas and contaminate surface water and groundwater. During the manhole assessment it was observed that, due to relatively flat pipe slopes, sewer back-ups are experienced in Manholes 6 through 14 due the existing lift station's failure to operate as intended. Manholes 1 through 15 are located along Main Street, and are all located about 150 feet or less from Six Mile Lake per the Record Drawings. Manholes with missing lids create a significant safety hazard, as people, animals and/or vehicles could fall into open or plywood-covered manholes. Many of these manholes were very difficult to locate in this assessment, so falls could occur inadvertently.

Based on the current evaluation it is evident that wastewater system improvements are necessary to upgrade the failing manholes to eliminate unnecessary hydraulic overloading and gravel intrusion that currently burden the community's ability to collect, convey and treat its wastewater.

Potential Hazards

Failure to perform these improvements will diminish the community's ability to treat and dispose of its wastewater and increases the risk of environmental and health hazards. Excess infiltration from the degraded manholes increases the potential for untreated wastewater overtopping the lagoon. As manholes continue to deteriorate, the potential for build-up and blockages increases, which causes flow restrictions and wastewater back-ups in manholes, which in turn increases the risk of wastewater spillages in the community and associated contamination of nearby water bodies. In addition, manholes without sufficient lids present safety hazards to the public.

Recommended improvement

The recommended improvement for the community of Nondalton is to replace 21 aging manholes from the original construction and first two sewer system expansions that are in poor-to-failed condition with new manholes that conform to the ANTHC design standards.

Concept Design Requirements

- Sewer Manholes Design Criteria[1]:
    - Placement of manholes: at changes in the sewer main alignment and at no more than 400 foot intervals.
    - Concrete barrel and base with 48-inch inside diameter.
    - Eccentric cones for manholes deeper than 4 feet; and flat tops for manholes less than 4 feet deep.
    - Ladder rungs installed in all manholes deeper than 4 feet.
    - Manhole tops in isolated areas should be 6 inches to 12 inches above the ground surface.
    - Grouted channels/beaver slides should be used in manholes with drops less than 24 inches where grade adjustment is not possible.

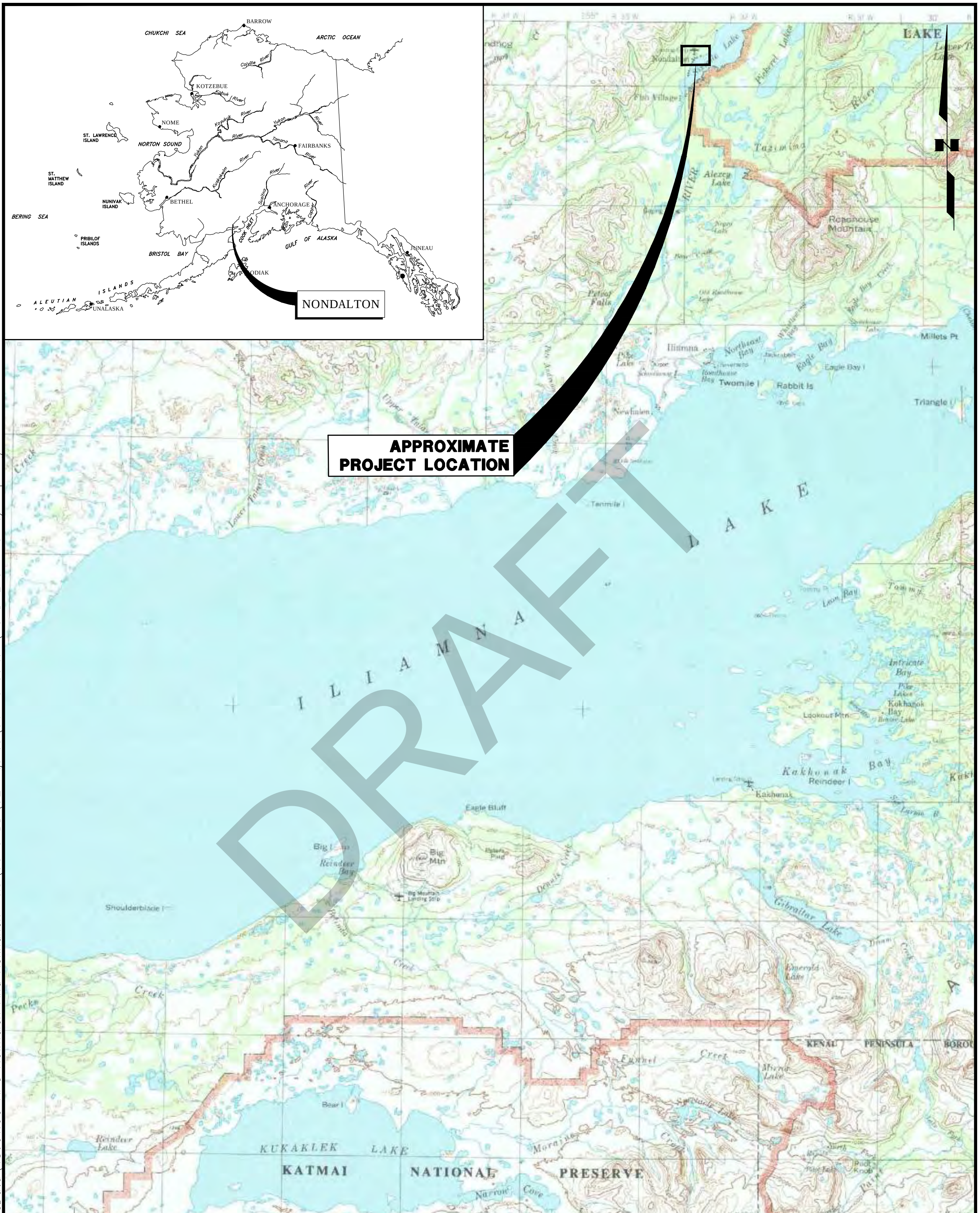
[1] Alaska Native Health Consortium, Environmental Health and Engineering; *Technical Directive 18-3 – Standard Design Criteria for Sanitation Facilities; July 11, 2018*.

- Service lines will not be connected directly into manholes.

- Manholes in straight run sections should be replaced upstream of the existing manholes within 10 feet so the existing sewer main alignment are not impacted.
- Intersection Manholes with 3 or more sewer main connections should be replaced in-place.
- Wastewater flow will need to be maintained during construction. This can be accomplished with temporary bypass pumping.

Conceptual Construction Drawings

Manhole Inspection Reports – January 2020



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CRW ENGINEERING GROUP, LLC
3940 ARCTIC BLVD. SUITE 300
ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
#AECL882-AK

FINAL

NONDALTON, ALASKA

VICINITY MAP

Project No:	48601.00
Drawn By:	MCH
Scale:	NTS
Date:	JAN 2020
Figure:	1

LEGEND
- MH TO BE REPLACED
- MH TO REMAIN IN PLACE
- WELL

250' 0 250' 500'

PROJECT: 48601.00

STATUS: DRAFT

CRW ENGINEERING GROUP, LLC
3940 ARCTIC BLVD, SUITE 300
ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
#AECL882-AK

NONDALTON, ALASKA

SEWER SYSTEM IMPROVEMENT PLAN

MANHOLE LOCATION AND CONDITION

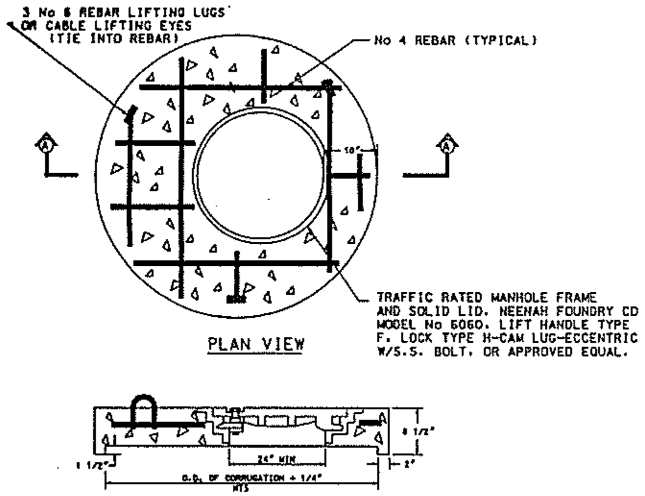
DATE
JAN 2020

SCALE
GRAPHIC

FIGURE
2

File: J:\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\06 Nondalton CDR\03 - NONDALTON Exiting System_V2a.dwg

ORIGIONAL MANHOLE CONSTRUCTION DETAILS

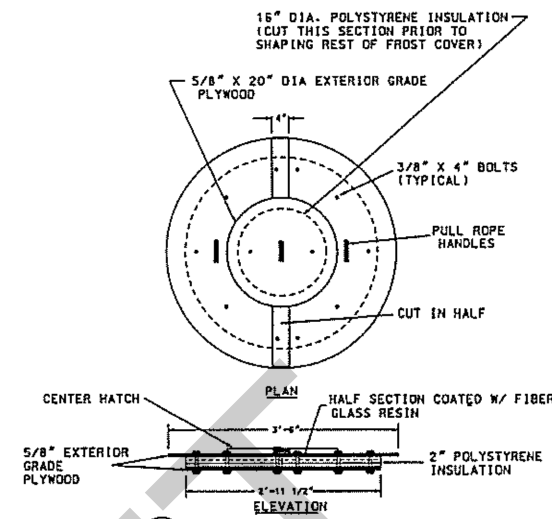


TYPICAL LONG LEAD ORDER
1 PRECAST MANHOLE COVER
NTS

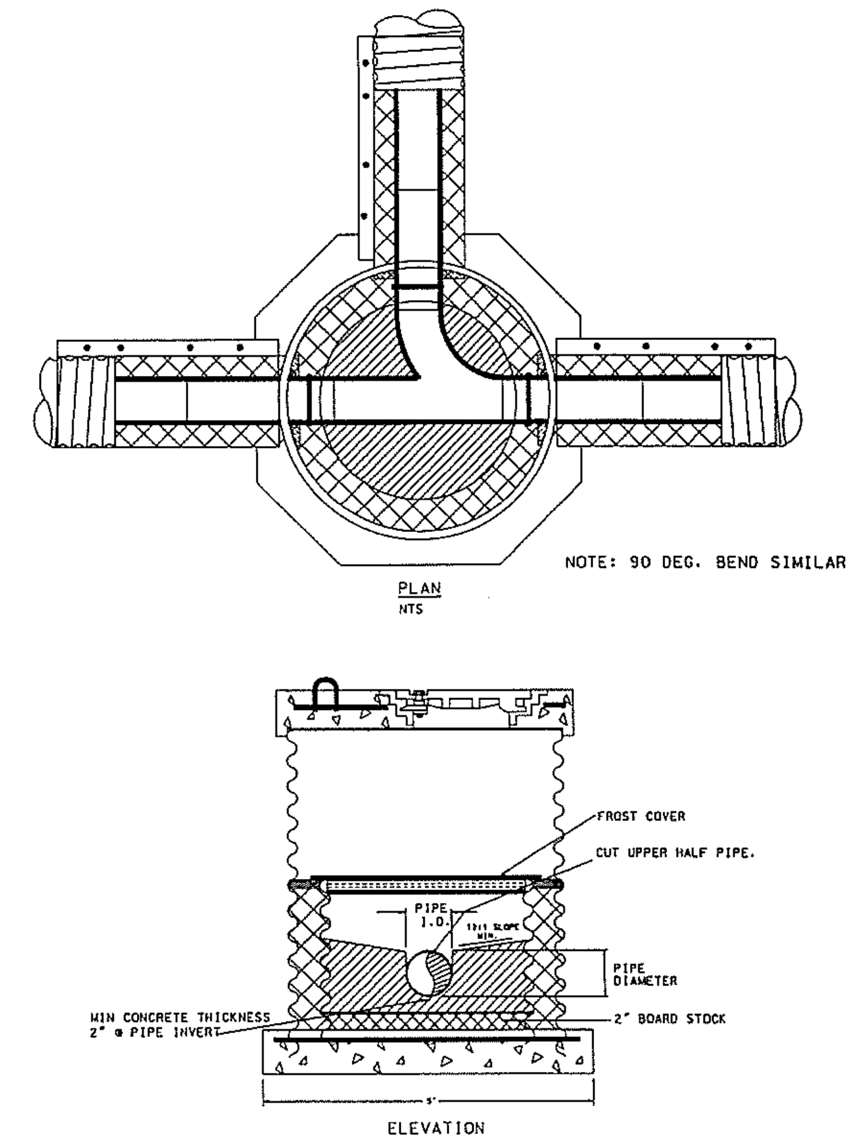
3

NOTES:

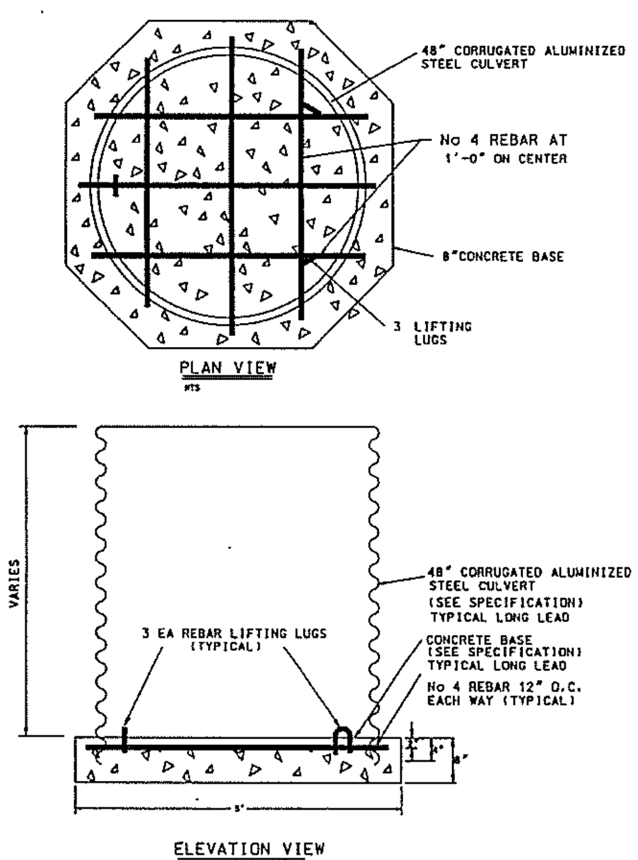
1. INSTALLER SHALL PROVIDE AS-BUILT DRAWING FOR ALL MANHOLES IN ACCORDANCE WITH SANITATION FACILITES SECTION GUIDELINE D-9
2. A MINIMUM INVERT ELEVATION DROP OF THREE-TENTHS (0.3) OF A FOOT FROM THE ENTRANCE TO THE OUTLET SHALL BE PROVIDED IN ALL MANHOLES WHERE THERE IS A CHANGE IN DIRECTION. STRAIGHT THRU MANHOLES ELEVATION DROP SHALL FOLLOW THE GRADE OF THE SEWER MAIN OR 0.1 FOOT MIN., THE GREATER OF THE TWO SHALL BE USED.
3. DROP INSIDE THE MANHOLE SHALL NOT EXCEED TWO FEET. MEASURED FROM THE INVERT OF THE INLET PIPE TO THE INVERT OF ITS CORRESPONDING CHANNEL.
4. CUT OFF MANHOLE COVER LIFTING LUGS AFTER INSTALLATION IS COMPLETED.
5. PROVIDE 2 EACH LADDERS OF SUFFICIENT SIZE TO ACCESS ALL MANHOLES TO THE O&M DEPARTMENT. NOTE MUTUALLY AGREEABLE LOCATION ON AS BUILT PLANS.
6. FOR INSTALLION IN GRAVEL TRAVELED WAYS. LID ELEVATION SHALL BE 6-INCHES BELOW GRADE.
7. IN OTHER THAN TRAVELED WAYS LID ELEVATION SHOULD BE 6-18- INCHES ABOVE GRADE OR THE FLOOD PLAIN (WHICH EVER IS HIGHER) WHERE EVER FEASIBLE. IN ANY EVENT FINAL SITE GRADING SHALL DIRECT SURFACE RUNOFF AWAY FROM THE MANHOLES TO LIMIT INFILTRATION.
8. IN HIGH WATER CONTENT PERMAFROST SUBSTITUTE PE FILM FOR 2" X 2" X 8' EXTRUDED POLYSTYRENE INSULATION SHEET BANDED LONGITUDINALLY TO CULVERT EXTENSION THIS WIL PROTECT AGAINST FROST JACKING AND LIMIT PERMAFROST DEGRADATION DURING WORMER MONTHS



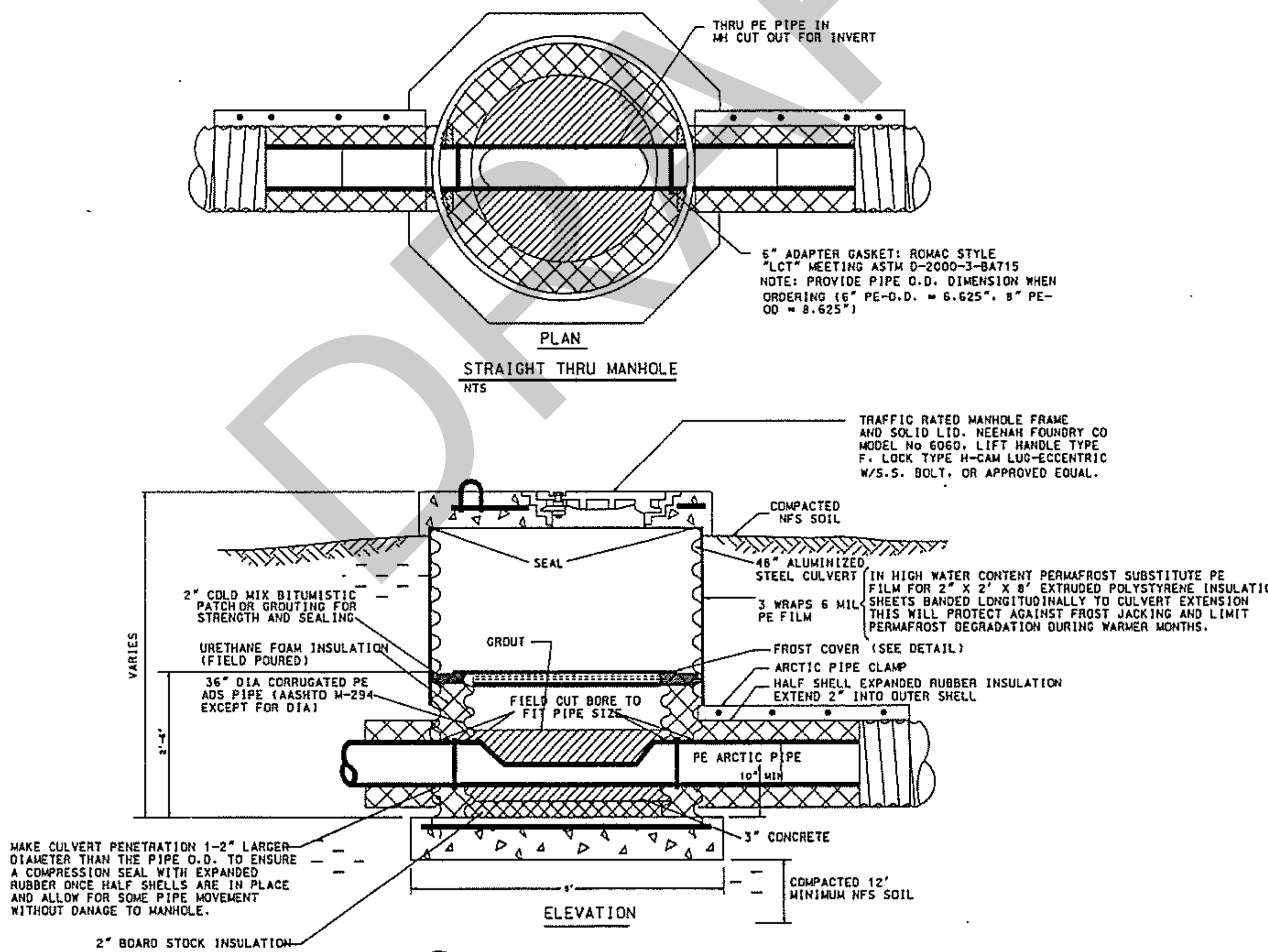
6 TYPICAL FROST COVER
NTS



5 SIDE INLET MANHOLE
NTS



TYPICAL LONG LEAD ORDER
2 PRECAST MANHOLE BASE WITH CULVERT SECTION
NTS



4 TYPICAL ARCTIC MANHOLE
NTS

DATE	REVISIONS	INIT

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
PUBLIC HEALTH SERVICE
INDIAN HEALTH SERVICE

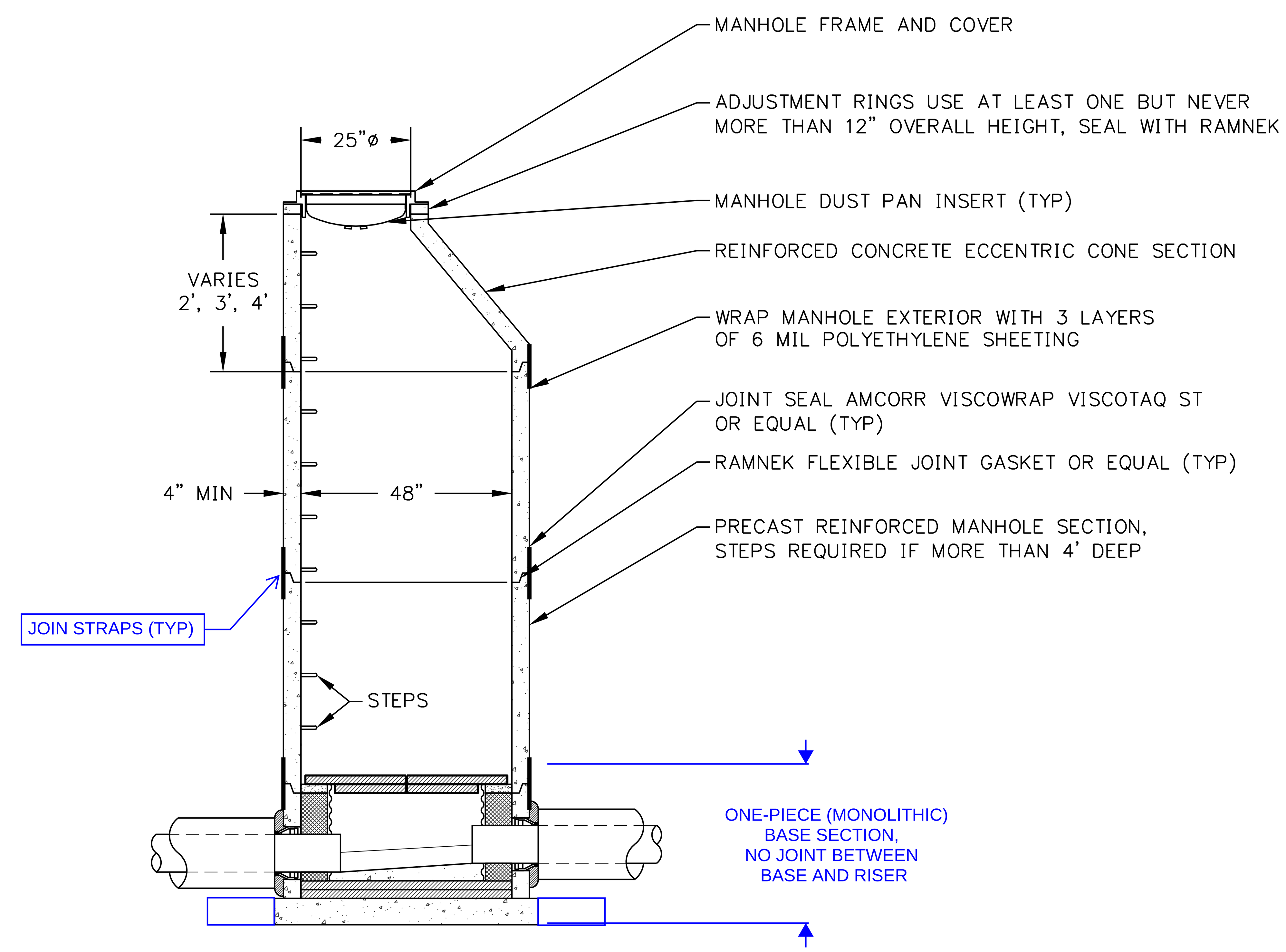
NONDALTON, ALASKA
NITATION FACILITIES
YPICAL ARCTIC MANHOLE DETAIL
PUBLIC LAW 86-121 PROJECT
PROJECT NO. 93-A14

SHEET NO. C-4 OF 9 SHEETS

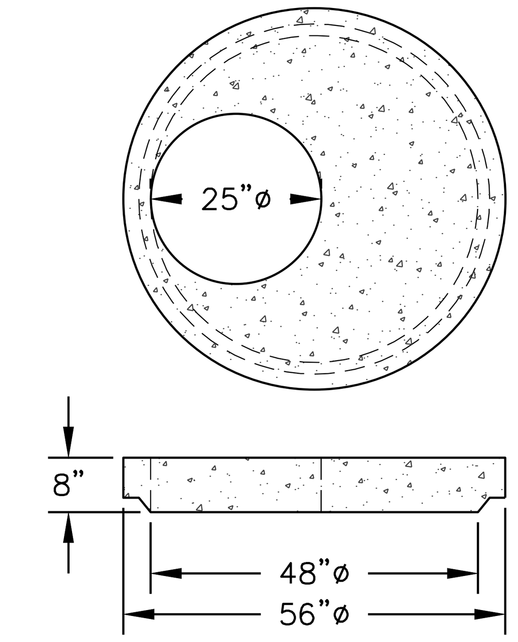
WN BY: PH
E: 7/93
CHECKED BY:
DATE:

FIG 3

PROPOSED MANHOLE CONSTRUCTION DETAILS



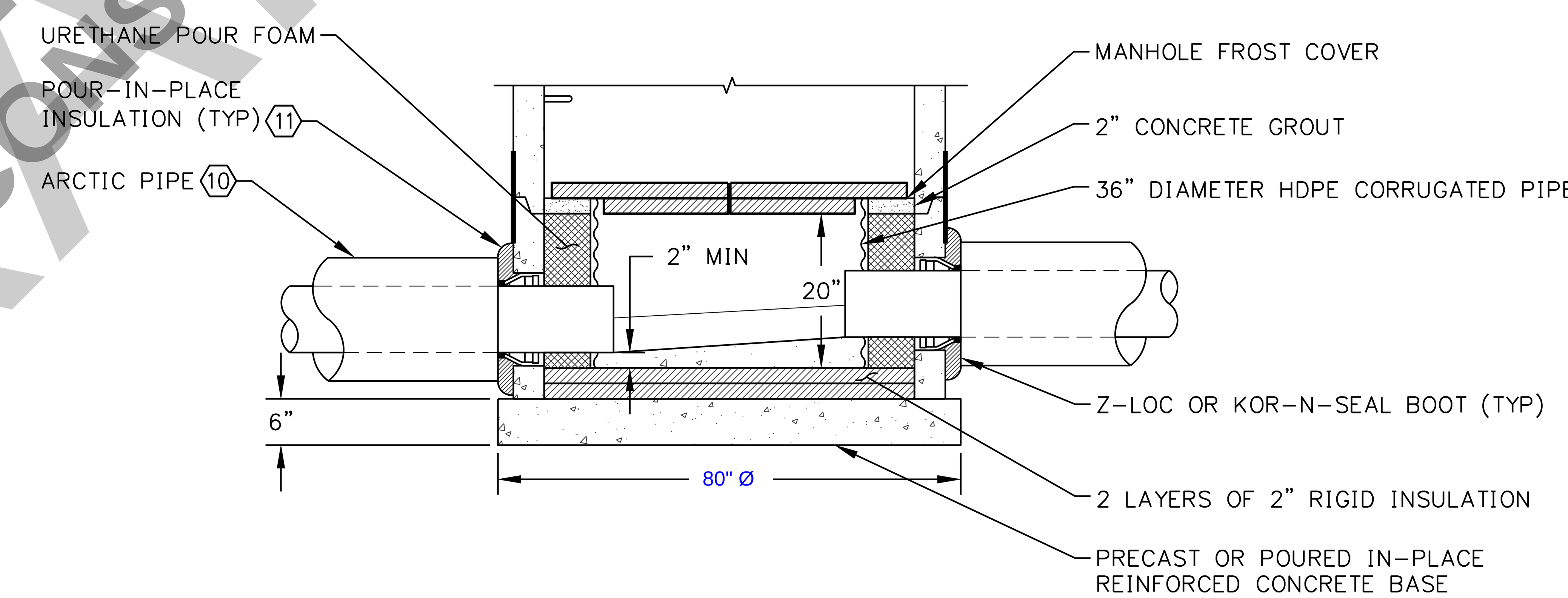
C1 ARCTIC MANHOLE
1/2" = 1'-0"



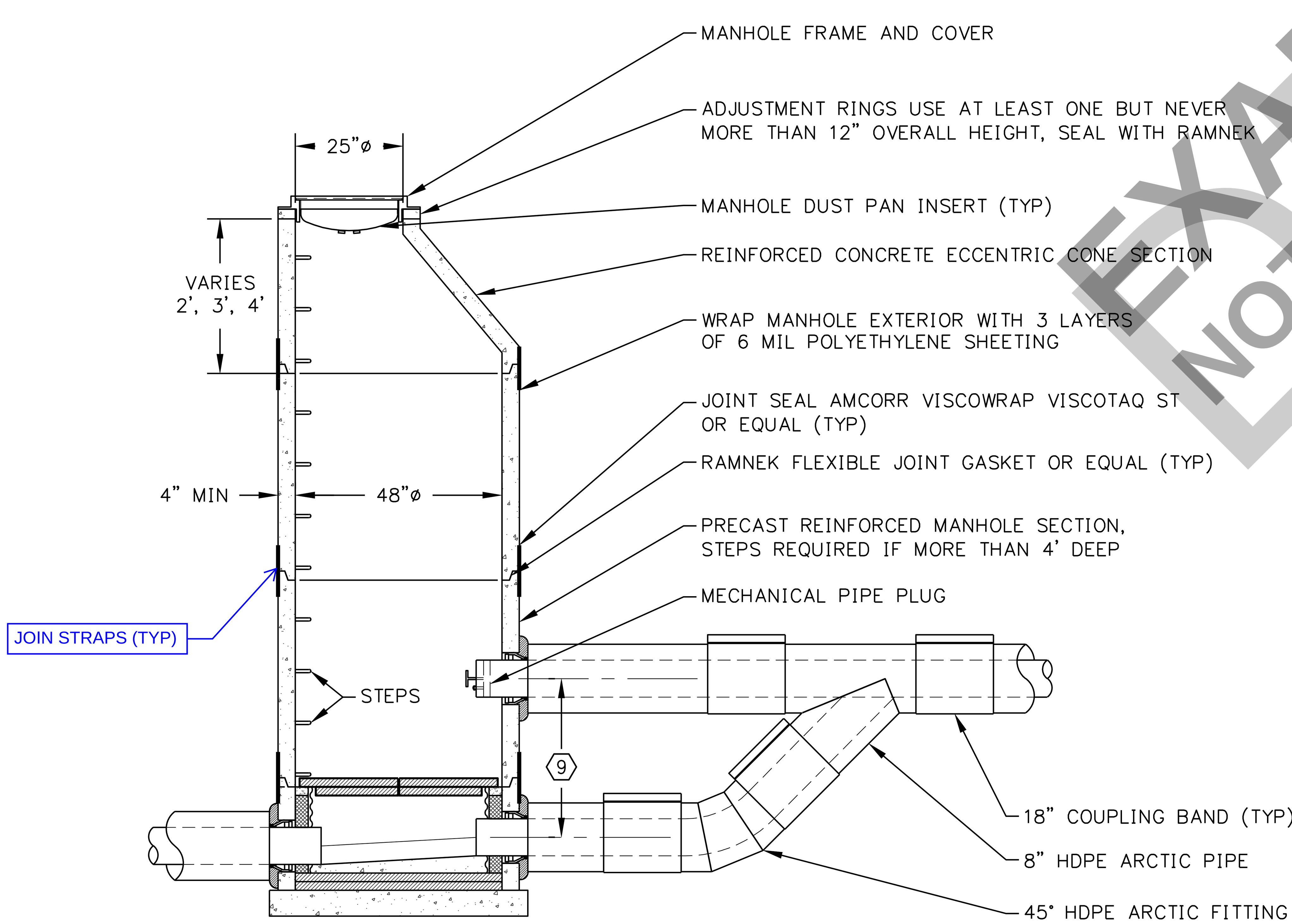
D3 MANHOLE FLAT TOP
1/2" = 1'-0"

NOTES:

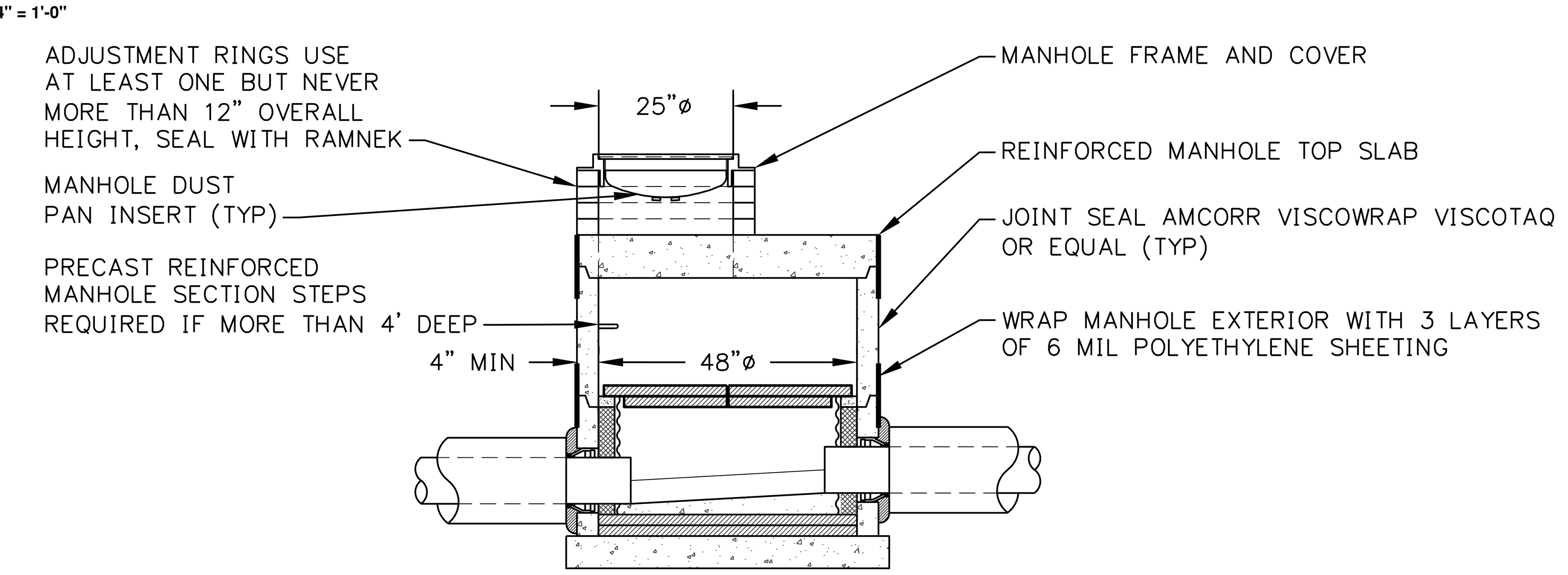
1. DUST PANS (MANHOLE INSERTS) SHALL BE INSTALLED IN ALL MANHOLES.
2. MANHOLE AND CLEAN-OUT FRAMES AND COVERS SHALL BE INSTALLED AS NOTED UNDER MANHOLE HEIGHTS.
3. ALL SEWER MAIN LINE STUB-OUTS SHALL BE PLUGGED AND MARKED WITH A 2X4 PRESSURE TREATED WOOD POST PAINTED GREEN. THE POST SHALL EXTEND APPROXIMATELY 24" ABOVE GRADE.
4. MANHOLE RISER SECTIONS SHALL BE FASTENED TO RESIST PULLING APART DUE TO FROST HEAVE BY INSTALLING 3 EACH HOT DIPPED GALVANIZED STEEL BARS (2" x 10" x 1/4") PER JOINT AND FASTENED TO THE CONCRETE USING 5/8" DIAMETER ANCHOR BOLTS (REDHEAD OR EQUAL) – 2 PER BAR.
5. PIPE INVERT FOR INSULATED MANHOLES SHALL BE PLACED 6" ABOVE THE INTERIOR BASE SLAB.
6. CHECK BUOYANCY OF MANHOLE IN HIGH GROUNDWATER CONDITIONS.
7. ALL MANHOLE BASES SHALL BE 24" HIGH UNLESS OTHERWISE SPECIFIED..
8. SEE PLAN AND PROFILE SHEETS FOR ORIENTATION OF PIPE PENETRATIONS AND INVERT ELEVATIONS.
9. USE A BEAVER SLIDE FOR DROP WHEN DISTANCE BETWEEN INVERTS IS LESS THAN 33".
10. SEE ARCTIC PIPE SPECIFICATION AND DETAILS.
11. SEAL GAP WITH POUR-IN-PLACE INSULATION (TYP), INSTALL 2" THICK CONCRETE GROUT LEVELING COURSE ON TOP OF INSULATION.



B3 INSULATED MANHOLE BASE
3/4" = 1'-0"



A1 ARCTIC DROP CONNECTION MANHOLE
1/2" = 1'-0"



A3 ARCTIC SHALLOW MANHOLE
1/2" = 1'-0"

Division of Environmental Health and Engineering
4500 Diplomacy Drive
Anchorage, Alaska 99508
(907) 729-3600

ARCTIC CONCRETE MANHOLE

STANDARD DETAIL

0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING, IF NOT ADJUST SCALES ACCORDINGLY

FIG 4

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	11:30am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	1	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: Northeast part of the community. See Figure 2.

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: STEP (PVC) and outlet PVC(?)

DEPTH TO BOTTOM: 4 feet

MANHOLE CONDITION NOTES:

Plywood cover with insulation approximately below lid.

STEP systems feed into this MH.

Base appears to be attached.

Gravel and sludge at base.

MH1 from road.

Insulation plug in MH1.

Insulation plug open, MH1.

MH1 interior.

STEP service line into MH1.

MH1 outlet.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 11:40am

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 2 FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: Northeast part of the community. See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: steel (?)

DEPTH TO BOTTOM: 5.9 feet

MANHOLE CONDITION NOTES:

Concrete top with metal lid.

No insulation.

Portion of concrete lid was covered with snow, portion uncovered showed signs of deterioration.

Base appears to be attached.

Some gravel in bottom.

Barrel shows some degradation.

Uncovering MH2.

View into MH2.

MH2 looking north.

MH2 looking south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 12:05pm

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 3 FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟷			**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP Yes

PRESENCE OF INFILTRATION/INFLOW Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 9.5 feet

MANHOLE CONDITION NOTES:

Rope in MH to help catch rocks, should have been removed prior to winter.

Some separation at base.

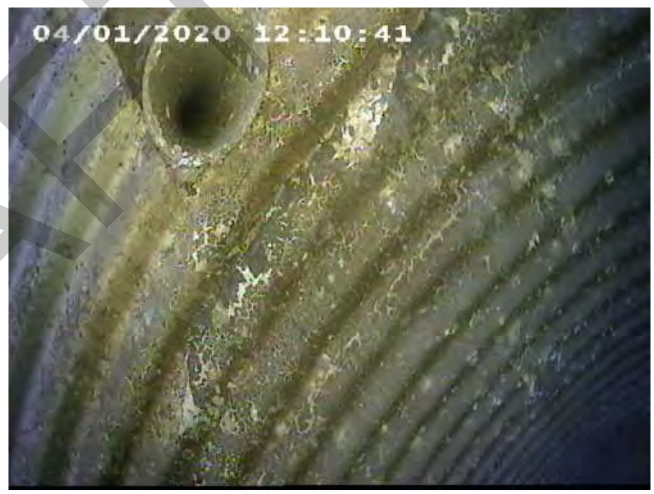
Ricco (City maintenance employee) reports that gravel needs to be cleaned out of this MH frequently.

Concrete lid with metal cover.

MH3 concrete lid.

MH3 concrete lit with metal cover.

View into MH3.



MH3 service connection entering from east.

MH3 view to north.

MH3 view to south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	11:57am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	3A	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 9.5 feet

MANHOLE CONDITION NOTES:

Disintegrated concrete lid with metal cover.

No insulation.

Inlet might enter MH at elevation lower than outlet.

Manhole barrel might have been set on top of connecting pipes.

 MH3A from road.	 View into MH3A.
 MH3A view east.	 MH3A.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	11:20am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	3B	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟵		⟶	**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 9 feet

MANHOLE CONDITION NOTES:

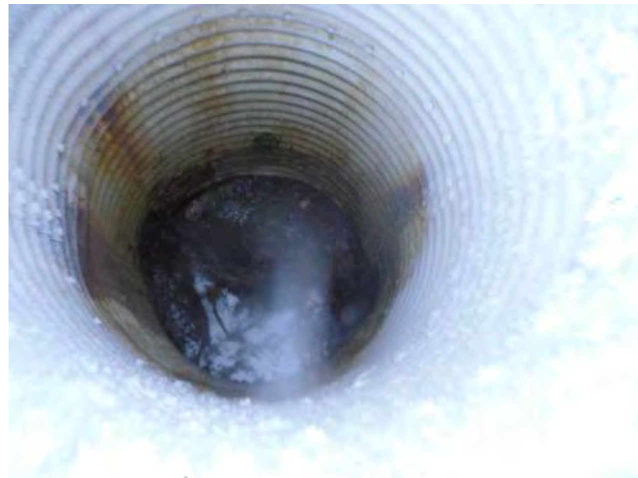
"Concrete" top with metal lid.

Concrete top is almost fully disintegrated. Lid was not removed as it likely would have fallen into the MH in the process of removal, and would not have been able to readily replace.

No insulation.

Separation at base.

Has a collapsed pipe or notch in barrel to accommodate entry of one connecting pipe.

 MH3B from road.	 View into MH3B.
 MH3B collapsed pipe or nonexistent pipe with barrel notch.	 MH3B rocks in bottom of MH.
 MH3B.	

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 11:10am

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 3C FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 7 feet

MANHOLE CONDITION NOTES:

Concrete top with metal cover.

Concrete is deteriorating.

Separation at bottom.

Not insulated.

<table>
<tr>
<td>
MH3C from Road.</td>
<td>
Opening MH3C.</td>
</tr>
<tr>
<td>
View into MH3C.</td>
<td>

MH3C collapsed pipe or nonexistent pipe with barrel notch..</td>
</tr>
</table>

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 11:30am

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 3D FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR ⟷			GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 7 feet

MANHOLE CONDITION NOTES:

Plywood cover.

PVC line comes in from west.

Rebuilt 3 years ago.

Bottom has some separation.

Some infiltration.

 MH3D from Road.	 MH3D another view from Road.
 View into MH3D.	 MH3D looking east.
 MH3D looking south.	 MH3D looking south zoomed in.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 12:15pm

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 4 FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 8 feet

MANHOLE CONDITION NOTES:

Concrete lid has almost completely disintegrated. As such, did not take cover off.

Rope installed in MH for rock catching.

Hose and snow inside MH.

MH4 from Road.

MH4 lid view.

View into MH4.

MH4 looking east.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	12:25pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	5	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟷			**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 6.5 feet

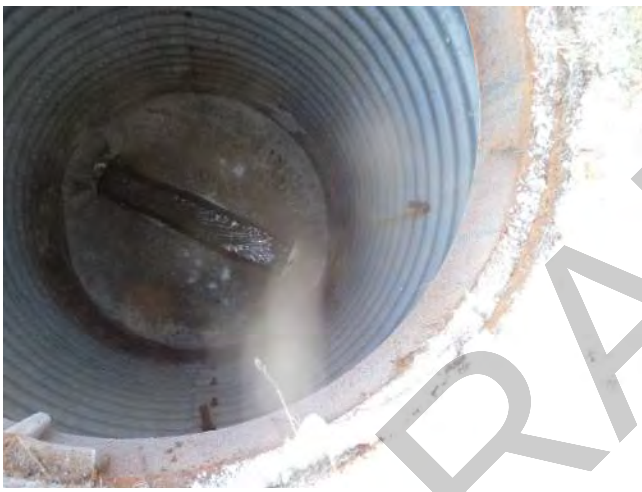
MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

No insulation.


MH5 from Road.


MH5 lid view.


View into MH5.

MH5 looking north.

MH5 looking south

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	2:43pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	6	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	Full of water – did not observe			
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	Full of water – did not observe			

PRESENCE OF SOLIDS OR BUILDUP: Not observable.

PRESENCE OF INFILTRATION/INFLOW: Not observable.

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 5 feet to top of water.

MANHOLE CONDITION NOTES:

Plywood cover with no insulation.

Water was present in manhole and obscured view of the bottom.

 MH6 from Road.	 View into MH6,.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	2:45pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	6A	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟵		⟶	**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	Full of water – did not observe.			
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	Full of water – did not observe.			
PRESENCE OF SOLIDS OR BUILDUP	Not observable.			
PRESENCE OF INFILTRATION/INFLOW	Not observable.			
DIAMETER OF MANHOLE:	42 inches			
MANHOLE CONSTRUCTION TYPE:	CMP w/ concrete base			
SEWER PIPING MATERIALS:	PVC			
DEPTH TO BOTTOM:	Not observable.			

MANHOLE CONDITION NOTES:

No cover.

Unfrozen wastewater was observed in MH. Fluid level nearly full. MH appears to be surcharged from lift station not operating.

MH6A behind MH6.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	4:00pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: Figure 2.

CONDITION	**POOR**	⟵	⟶	**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4

CONDITION OF PIPE INLETS/OUTLETS: Full of water - not observed.

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: Not observable.

DEPTH TO BOTTOM: 5 feet

MANHOLE CONDITION NOTES:

Plywood cover.

No insulation.

Base full of wastewater and sludge. Bottom was not observable.

 MH7 lid.	 MH7 view from inside.

NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	11:15am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7A	FIRST PHOTO NUMBER:	
APPROXIMATE LOCATION:	See Figure 2.		

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS		Not observable.		
PRESENCE OF SOLIDS OR BUILDUP	No			
PRESENCE OF INFILTRATION/INFLOW	Yes			
DIAMETER OF MANHOLE:	42 inches			
MANHOLE CONSTRUCTION TYPE:	CMP w/ concrete base			
SEWER PIPING MATERIALS:	PVC			
DEPTH TO BOTTOM:	7.5 feet			

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

Concrete base is separating from MH barrel.

Concrete lid is deteriorating.

MH7A lid.

MH7A Lid.

MH7A view from above

MH7A view east.

MH7A view west.

MH7A north service.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	11:02am
WEATHER:	-17°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7B	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟵	⟶	**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 6 feet

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

Concrete base is separating from MH barrel.

Concrete lid is deteriorating.

Service line runs directly to MH.

 MH7B from road.	 MH7B north view.
 MH7B lid.	 MH7B view from above.
 MH7B north.	 MH7B, west service.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	1:20pm
WEATHER:	-17°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7C	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟷			**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM:

MANHOLE CONDITION NOTES:

Galvanized metal hatch cover.

Insulation plug present, near bottom.

Newer construction.

Due to insulation plug, was not able to get good photos of MH bottom.

 MH7C from road.	 MH7C insulation plug.
 MH7C from above.	MH7C south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	9:59am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7D	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 11.36 feet to bottom, 10 feet to top of insulation.

MANHOLE CONDITION NOTES:

Galvanized metal hatch cover.

Insulation plug present, near bottom.

Newer construction.

Due to insulation plug, was not able to get good photos of MH bottom.

MH7D from road.

MH7D insulation plug.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	10:11am
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	7E	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟷			**GOOD**
CONDITION OF LID	1	2	3	**4**
CONDITION OF BASE	1	2	3	**4**
CONDITION OF BARREL	1	2	3	**4**
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	**3**	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 48 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 9.75 feet

MANHOLE CONDITION NOTES:

Galvanized metal hatch cover.

Insulation plug present, near bottom.

No trash in MH.

MH7Efrom road.

MH7E Barrel

MH7Efrom above.

MH7E view north.

MH7E view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 3:48pm

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 8 FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR ⟷			GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP No

PRESENCE OF INFILTRATION/INFLOW Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: Approx 5 feet

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

Concrete base is separating from MH barrel.

Barrel seems to not be plumb—leaning towards road.

MH8 from road.

Using camera in MH8.

MH8 view from above

MH8 view north.

MH8 view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	3:10pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	9	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC with HDPE service

DEPTH TO BOTTOM: 6 feet

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

No insulation.

Located in front of two-story house.

MH9 from road.

MH9 view from above.

MH9 with lid open.

MH9 view north.

MH9 view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	3:33pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	10	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 8.3 feet

MANHOLE CONDITION NOTES:

Plywood lid with insulation.

Concrete base is separating from MH barrel.

Infiltration present.

Cracked PVC on south inlet.

 MH10 from road.	 MH10 view with insulation on lid.
 MH10 view from above.	 MH10 insulated lid.
 MH10 north view.	 MH10 south view.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	4:10pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	11	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR** ⟷			**GOOD**
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 6 feet

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

Concrete is falling apart. We did not remove lid as it did not look re-installable.

Surface infiltration from road.

Rocks in base.

Concrete base is separating from MH barrel.

MH11 from road.

MH11 cement deterioration.

MH11 view from above.

MH11 north view.

MH11 south view.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/4/2020 INSPECTION TIME: 3:05pm

WEATHER: -15°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 12 FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR ⟷			GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM:

MANHOLE CONDITION NOTES:

Plywood cover (vehicle impacted 60-inch collar and it broke off)

Lid frozen in place—had to chip away snow and ice to open.

Surface infiltration from road.

Rocks in base of MH.

Concrete base is separating from MH barrel.


MH12 from road.


MH12 from road view 2.


MH12 view from above.


MH12 with lid propped open.

MH12 north view.

MH12 south view.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	2:46pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	13	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: PVC

DEPTH TO BOTTOM: 6 feet

MANHOLE CONDITION NOTES:

Concrete lid with metal cover.

Water in base obscured view of beaver slide.

Lid buried slightly.

No insulation.

Fencing in MH.

Debris in MH.

MH13 with cover open.

MH13 with fence inside.

MH13 view north.

MH13 view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/4/2020	INSPECTION TIME:	2:32pm
WEATHER:	-15°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	14	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION:

CONDITION	POOR	⟵	⟶	GOOD
CONDITION OF LID	1	2	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER (not applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: Yes

PRESENCE OF INFILTRATION/INFLOW: Yes

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: HDPE (West) /PVC

DEPTH TO BOTTOM: 8.5 feet

MANHOLE CONDITION NOTES:

Plywood cover.

60” top culvert top with 42-inch barrel.

Barrel is separated halfway up at joint.

Some ice buildup in bottom.

 Opening MH14.	 MH14 with 60” Lid and 42” barrel..
 MH14 view from above.	 MH14 view west
 MH14 view north.	 MH14 view southwest

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/5/2020 INSPECTION TIME: 10:36am

WEATHER: -17°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 14A FIRST PHOTO NUMBER:

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟷		GOOD
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP No

PRESENCE OF INFILTRATION/INFLOW No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP w/ concrete base

SEWER PIPING MATERIALS: HDPE (West) /PVC

DEPTH TO BOTTOM: 10 feet

MANHOLE CONDITION NOTES:

Metal cover with grade ring.

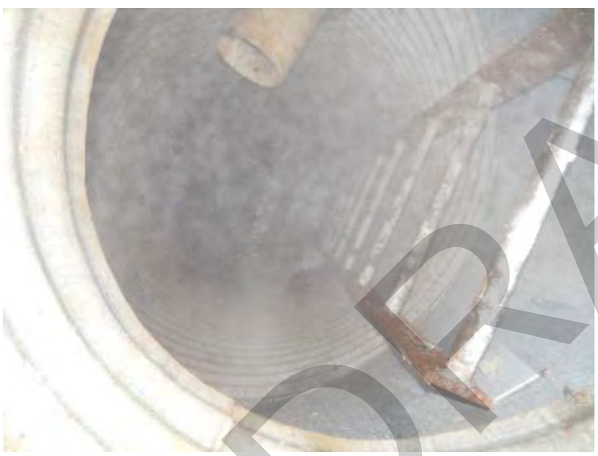
Metal cover is a little slanted/not level.

Has insulated plug.

Inlet PVC pipe might be service from school.

Opening MH14A.

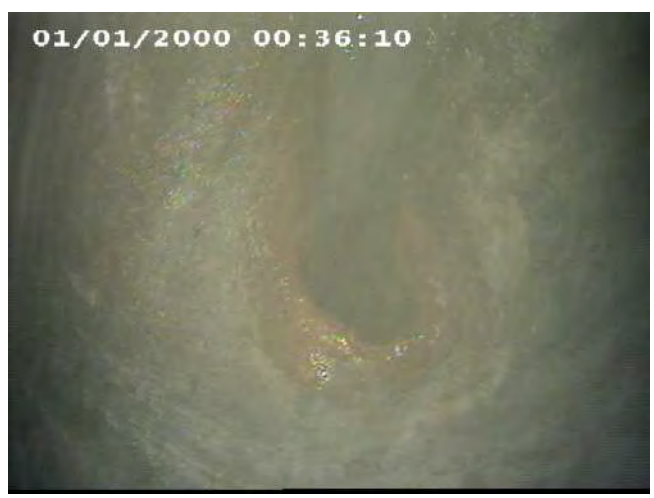
MH14A view from above with PVC inlet in view.



MH14A view from above.

MH14A view east.

MH14A view west, high PVC service.



MH14A view west.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	10:20am
WEATHER:	-17°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	14B	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟵	⟶	**GOOD**
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 6 feet

MANHOLE CONDITION NOTES:

Metal cover with grade ring.

NO insulated plug.

In base seems to be few inch grade change between inlet and outlet.

 Opening MH14B.	 MH14B view from above with lid.
 MH14B view east.	 MH14B ladder.
 MH14B view west.	

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	10:20am
WEATHER:	-17°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	14C	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟵	⟶	**GOOD**
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 10 feet

MANHOLE CONDITION NOTES:

Metal cover with grade ring.

With insulated plug.

In base seems to be few inch grade change between inlet and outlet.

 Opening MH14C.	 MH14C with lid and insulation plug.
 MH14C view from above.	 MH14C view east.
 MH14C view south.	 MH14C view of barrel.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/5/2020 INSPECTION TIME: 9:56am

WEATHER: -17°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 14D FIRST PHOTO NUMBER: ______

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟵	⟶	**GOOD**
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 9.5 feet

MANHOLE CONDITION NOTES:

Metal cover.

Has insulated plug.

Lid is crooked and at ground level.

Barrel has slight bulging.

May have put too much concrete in bottom.

Barrel axis does not appear to be plumb.
Steamy inside—difficult to take clear pictures.

Opening MH14D.

MH14D view from above.

MH14D view north.

MH14D south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE:	1/5/2020	INSPECTION TIME:	9:48am
WEATHER:	-17°F	INSPECTED BY:	CRW SH/MH
MANHOLE NUMBER:	14E	FIRST PHOTO NUMBER:	

APPROXIMATE LOCATION: See Figure 2.

CONDITION	POOR	⟵	⟶	GOOD
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER(applicable)	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No

PRESENCE OF INFILTRATION/INFLOW: No

DIAMETER OF MANHOLE: 42 inches

MANHOLE CONSTRUCTION TYPE: CMP

SEWER PIPING MATERIALS: HDPE

DEPTH TO BOTTOM: 6.8 feet

MANHOLE CONDITION NOTES:

Metal cover with grade ring.

With insulated plug.


MH14E from road.


Opening MH14E.


MH14E view from above.

MH14E ladder.

MH14E view north.

MH14E view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/5/2020
INSPECTION TIME: 9:37am
WEATHER: -17°F
INSPECTED BY: CRW SH/MH
MANHOLE NUMBER: 14F
FIRST PHOTO NUMBER:
APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP: No
PRESENCE OF INFILTRATION/INFLOW: No
DIAMETER OF MANHOLE: 42 inches
MANHOLE CONSTRUCTION TYPE: CMP
SEWER PIPING MATERIALS: HDPE
DEPTH TO BOTTOM: 8 feet

MANHOLE CONDITION NOTES:
Metal cover.

With insulated plug.

MH14F from road.

Opening MH14F and removing insulation plug.

MH14F view from above.

MH14F view north.

MH14F view south.

SEWER MANHOLE FIELD INSPECTION FORM
NONDALTON, ALASKA

INSPECTION DATE: 1/5/2020 INSPECTION TIME: 10:55am

WEATHER: -17°F INSPECTED BY: CRW SH/MH

MANHOLE NUMBER: 15 FIRST PHOTO NUMBER: ______

APPROXIMATE LOCATION: See Figure 2.

CONDITION	**POOR**	⟷		**GOOD**
CONDITION OF LID	1	2.5	3	4
CONDITION OF BASE	1	2	3	4
CONDITION OF BARREL	1	2	3	4
CONDITION OF LADDER	1	2	3	4
CONDITION OF PIPE INLETS/OUTLETS	1	2	3	4

PRESENCE OF SOLIDS OR BUILDUP

PRESENCE OF INFILTRATION/INFLOW ______

DIAMETER OF MANHOLE: ______

MANHOLE CONSTRUCTION TYPE: ______

SEWER PIPING MATERIALS: ______

DEPTH TO BOTTOM: ______

MANHOLE CONDITION NOTES:
Could not locate this manhole. Yard had many sheds and raised garden beds. Attempted to use metal detector to find. However, the yard had metal tanks and other metal debris. Hence, we were not able to use the metal detector to locate.

 Looking for MH15 in yard.	 Looking for MH15 in yard.

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Concept Design Memorandum

TO: Alaska Peninsula Corporation

SUBJECT: Nondalton Lift Station Improvements

DATE: 1/23/2020

BY: Steven Hebnes, PE, Civil Engineer

CRW Engineering, LLC (CRW) is providing subcontract services currently under contract with the Alaska Peninsula Corporation (APC) to assess various sanitation needs in the community of Nondalton as a component of the mitigation planning for the Pebble Project. For the evaluation effort, CRW performed a site assessment of the community wastewater system, held discussions with community members, reviewed record documents provided by the State of Alaska Remote Maintenance Worker (RMW) program for specific past projects, and performed sewer manhole assessments. Nondalton is a community served by Alaska Native Tribal Health Consortium (ANTHC), which was planning to evaluate the community sewer system for Indian Health Service (IHS) funding through its Sanitation Deficiency System (SDS) program.

Existing Conditions

About 90 percent of Nondalton's population is served by a community sewer system, and the remaining population utilizes on-site wastewater disposal systems. The sewer system is a gravity collection system comprised of over 30 manholes and which drains into a central lift station. From the lift station, wastewater is discharged through a force main into a percolating treatment lagoon. The lift station was constructed in 1984 for a design population of 246 people and 12,300 GPD average flow. The lift station is substantially aged and suffering from significant deterioration and equipment failure. On multiple occasions during our two community visits, the existing lift station pumps were found to not be operating when the wet well was filled with wastewater. This condition has required the operators to frequently reset the pump controls. The cause of the pump failures has yet not been determined, but may be a result of a deteriorated electrical system, pump hydraulic deficiencies, flow constrictions or other reasons.

During the sewage manhole assessments it was very apparent that when the lift station pumps were not operational, wastewater backs up in the sewage collection system. This condition has a relatively high potential for wastewater overtopping manholes or backing up into homes. The existing lift station alarm system is also no longer operational, so problems with the lift station are often realized only when residents notify the operators of strong sewer odors. During the manhole inspection, we witnessed Manhole 6A filling to within 8 inches below the top of the manhole. If the lift station pumps had not started at the time, the overtopping of Manhole 6A would've been likely. Manhole 6A is the first upstream manhole from the lift station, and is located 110 feet up hill of Six Mile Lake and 190 feet from community well #1 per the Record Drawings. The elevation of Six Mile Lake varies significantly, based on the 2006 Google Earth image where the lift station was approximately 150 feet from Six Mile Lake but in the 2019 Google Earth image the lift station was approximately 75 feet from Six Mile Lake. During the manhole assessment it was observed that, due to relatively flat pipe slopes, sewer back-ups are experienced in Manholes 6 through 14. Manholes 1 through 15 are located along Main Street, and are all located about 150 feet or less from Six Mile Lake per the Record Drawings.

Potential Hazards

Failure to replace the community sewage lift station will continue to reduce the community's ability to treat and dispose of wastewater. When the lift station fails to convey wastewater, sewer system back-ups occur, which increases the potential for overflows at the lower manholes. The lowest point of the system appears to be at Manhole 6A. Overflows at Manhole 6A have a potential to flow into Six Mile Lake, in addition to exposing the community and local environment to contamination. All the community manholes along Main Street are accessible to the public and could result in human exposure to contaminated water in these areas.

Recommended Improvement

The recommended improvement for the community of Nondalton is to replace the existing lift station with a new facility that conforms to the ANTHC standard lift station details and standard design criteria.

Concept Design Requirements

- Lift Station Design Criteria[1]:
  - Sewage Flow Requirements - 12,300 GPD[2]
    - The 1984 design population was 246 people.

[1] Alaska Native Health Consortium, Environmental Health and Engineering; *Technical Directive 18-3 – Standard Design Criteria for Sanitation Facilities; July 11, 2018*.
[2] US Department of Health and Human Services, Public Health Service, Indian Health Service, *Construction Plans Sanitation Facilities, Nondalton, Alaska, Public Law 86-121, Project Number AN-82-275C; Wastewater Feasibility Study, June 6, 1984*.

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        - Based on census information taken between 1940 and 2018, the population has varied significantly, and is currently at a low level.
        - Keeping the design population of 246 people would represent a 1.05% growth rate since 1980 and is recommended for future design considerations.
    - Community lift station must feature a duplex pump system, with each pump capable of handling the maximum flows expected with one pump out of service.
    - Pump intake size must pass 3-inch diameter solids.
    - Flow Velocities:
        - Vertical Pipe -5 fps minimum.
        - Horizontal Pipe - 3.5 fps minimum.
    - Maximum pump starts: 10 per hour.
    - Maximum wet well detention time: 20 minutes. Small systems may allow for increased detention times.
    - Lift station wet wells are considered confined spaces and the surrounding working space is a classified electrical safety area. These spaces are hazardous environments. Designs must therefore minimize the operator's need to enter these hazardous areas and in a lift station facility should include two separated rooms: a control room and a wet well room.
- Lift Station setbacks requirements[3] [4]:
    - 100 feet from mean annual high water level of a lake.
    - 200 feet from Community Well.
- Additional inflow and infiltration base flow consideration: 10,000 GPD.
    - The existing collection system currently experiences significant inflow and infiltration due to deteriorated manholes. The lift station design should anticipate the need to convey additional flow if it is constructed prior to the repair or replacement of the manholes.
    - Annual precipitation is comprised of 23.1 inches of rain in the summer and 80.9 inches of snow in the winter. A high daily rain/snow melt has been assumed at 1 inch/day, with a runoff coefficient of 0.3, over a basin area of 90 acres, with total

[3] State of Alaska, Department of Environmental Conservation; *18 AAC 72, Wastewater Disposal; November 7, 2017*.
[4] State of Alaska, Department of Environmental Conservation; 18 AAC 80, Drinking Water; May 3, 2019.

infiltration area percentage of 1.3% (fifteen 3-foot diameter manhole openings over a 3,200-foot width of drainage front).

The proposed action would result in the construction of a sewage lift station that would prevent system back-ups and would facilitate the proper disposal and treatment of the community's wastewater, which would protect the environment and public health from the hazards identified.

Conceptual Construction Drawings

Sewage Lift Station Photos – January 2020

FILE NAME: J:\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\06 Nondalton\NONDALTON Vicinity Map.dwg

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ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
#AECL882-AK

FINAL

NONDALTON, ALASKA

VICINITY MAP

Project No:	48601.00
Drawn By:	MCH
Scale:	NTS
Date:	JAN 2020
Figure:	1

LEGEND

- MH TO BE REPLACED
- MH TO REMAIN IN PLACE
- WELL

250' 0 250' 500'

PROJECT: 48601.00

STATUS: FINAL

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#AECL882-AK

NONDALTON, ALASKA

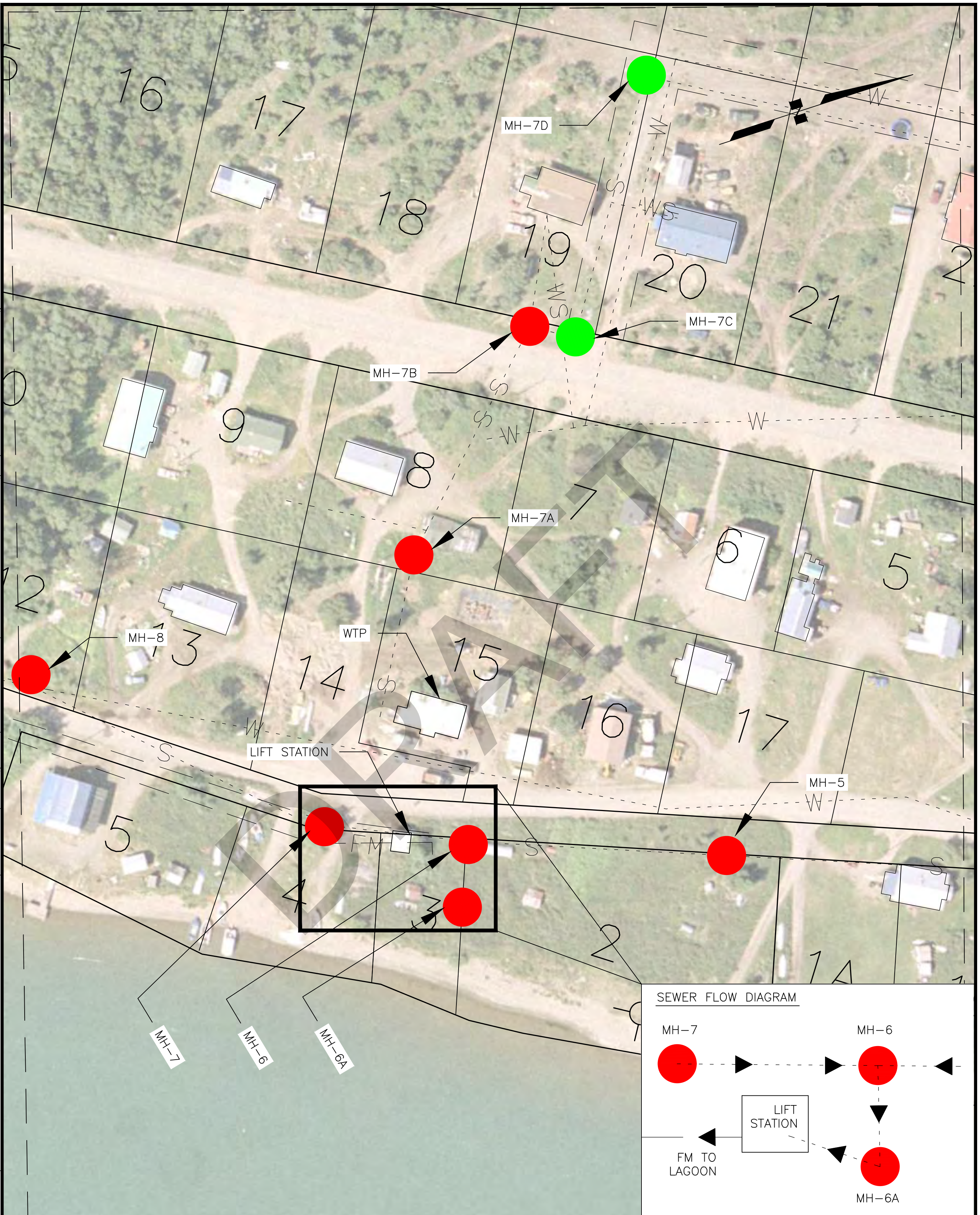
SEWER SYSTEM IMPROVEMENT PLAN

COMMUNITY MAP

DATE JAN 2020

SCALE GRAPHIC

FIGURE 2



FILE NAME: J:\JobsData\48601.00 APC Newhalen And Kokhanok W&S\00 CADD\02 Figures\06 Nondalton\03 - NONDALTON Exiting System_V2a_recover.dwg

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#AECL882-AK

FINAL

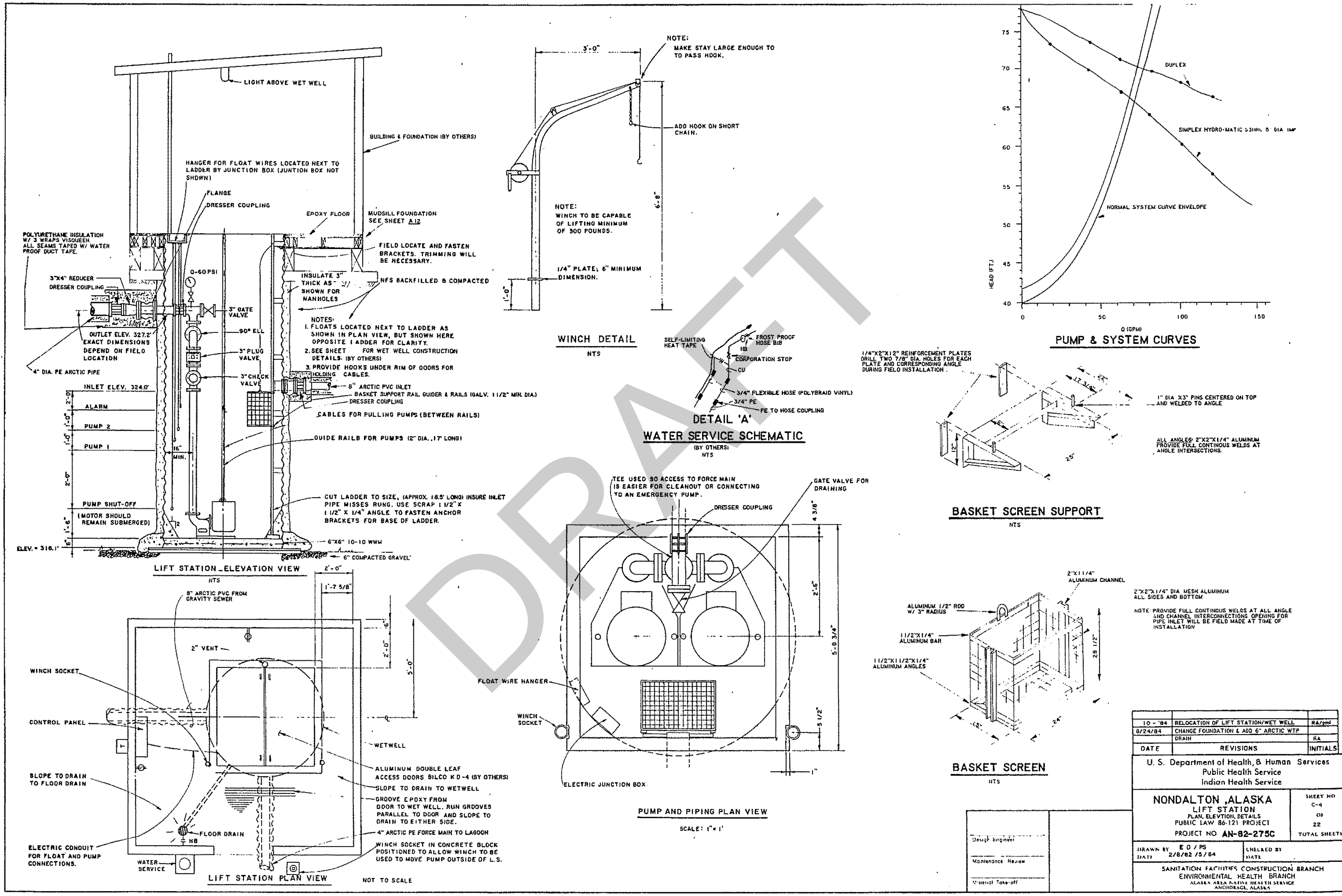
0 50 100

NONDALTON, ALASKA

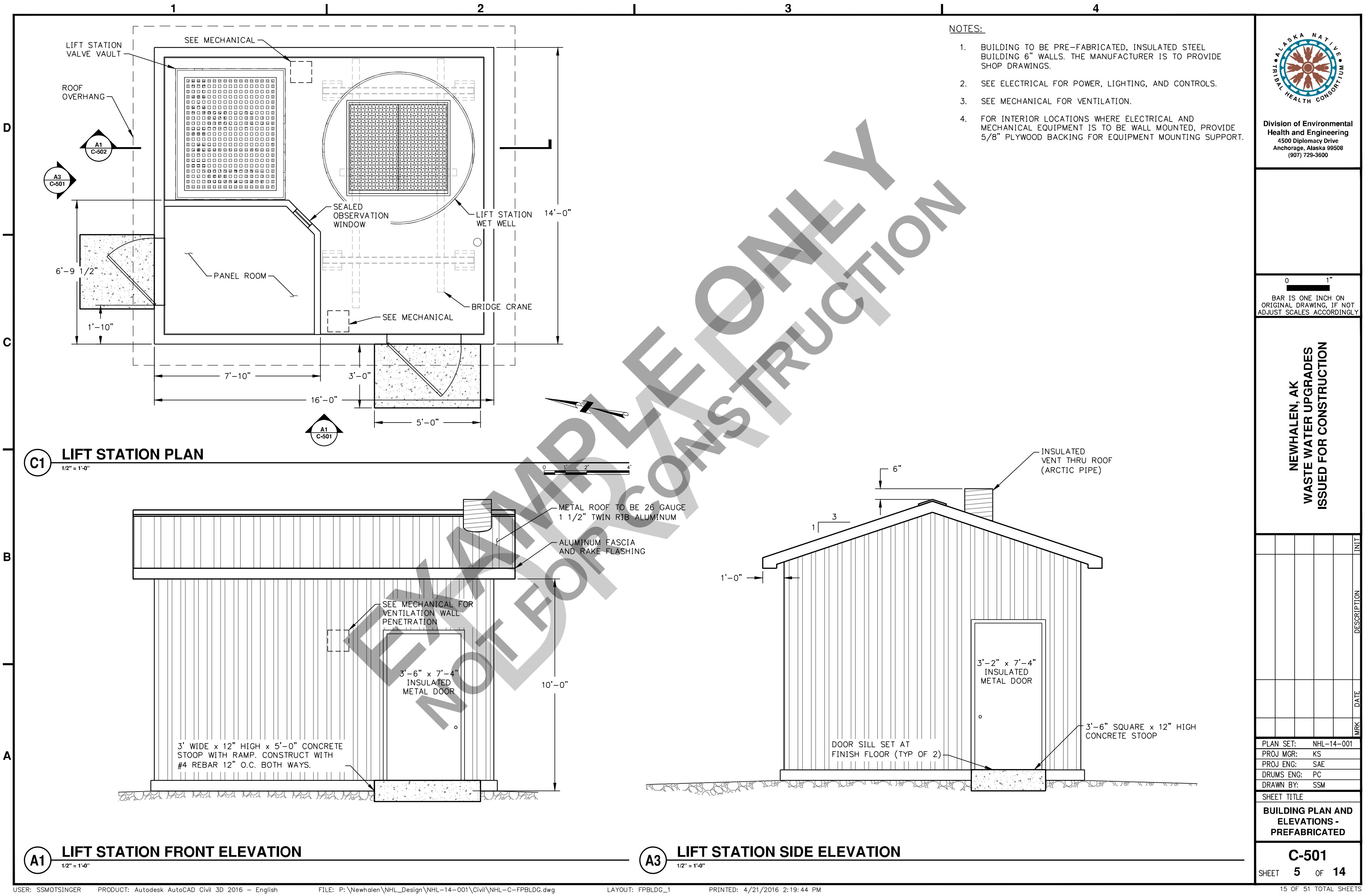
LIFT STATION VICINITY

SEWER SYSTEM IMPROVEMENT PLAN

Project No:	48601.00
Drawn By:	MCH
Scale:	GRAPHIC
Date:	01/19/2020
Figure:	3

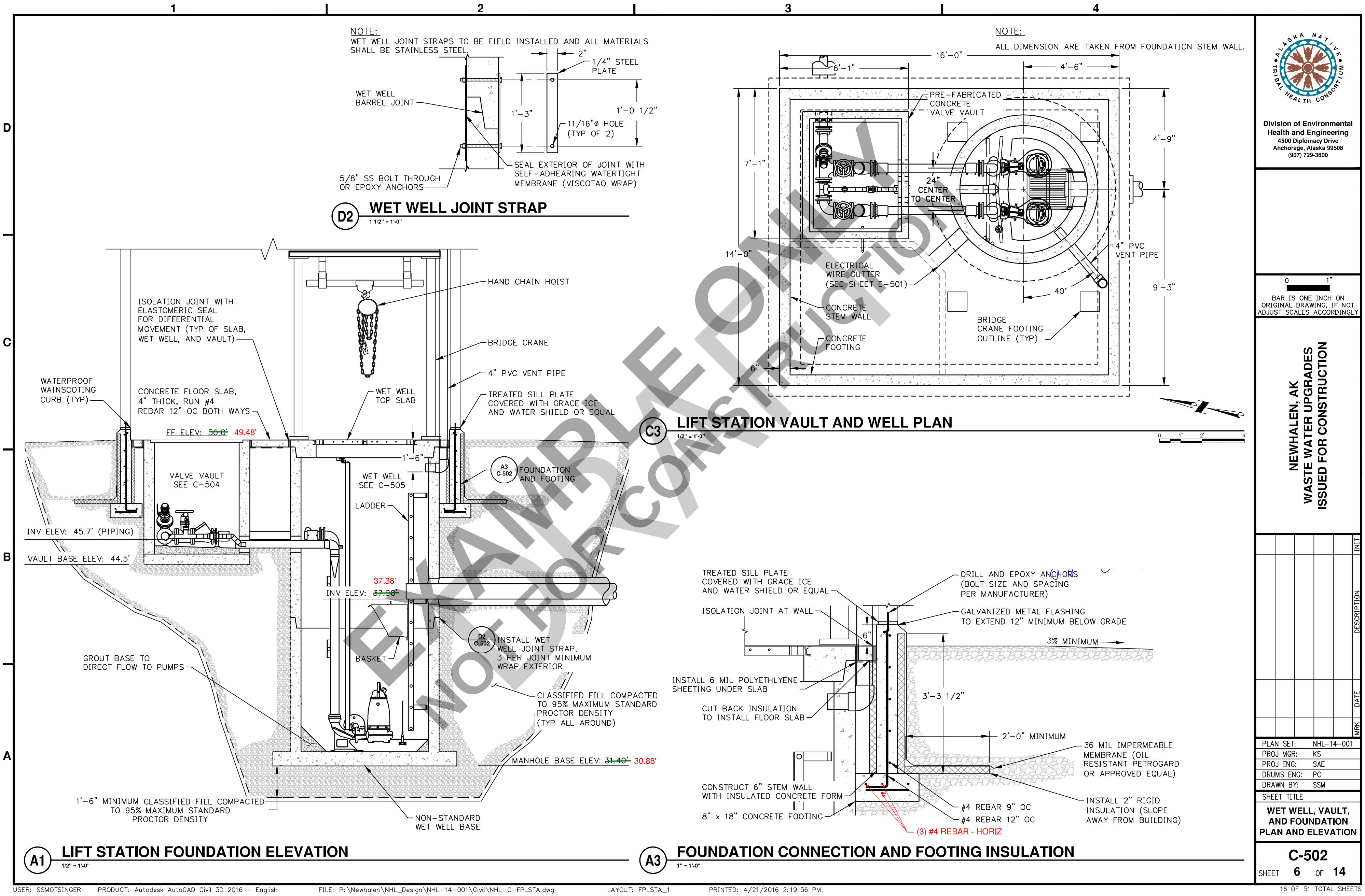


EXISTING LIFT STATION RECORD DRAWINGS **FIG 4**



ANTHC STANDARD LIFT STATION

FIG 5



ANTHC STANDARD LIFT STATION

FIG 6

PUMP CONTROL DATA

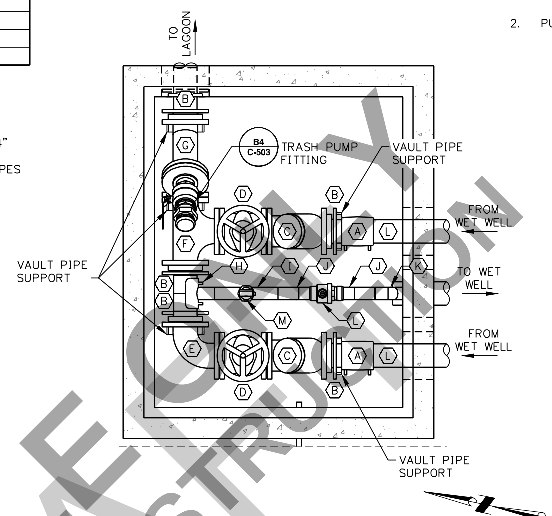
CONTROL	ELEVATION
HIGH LEVEL ALARM	36.07
LAG PUMP ON	35.57
LEAD PUMP ON	35.07
PUMPS OFF	33.07

NOTES:

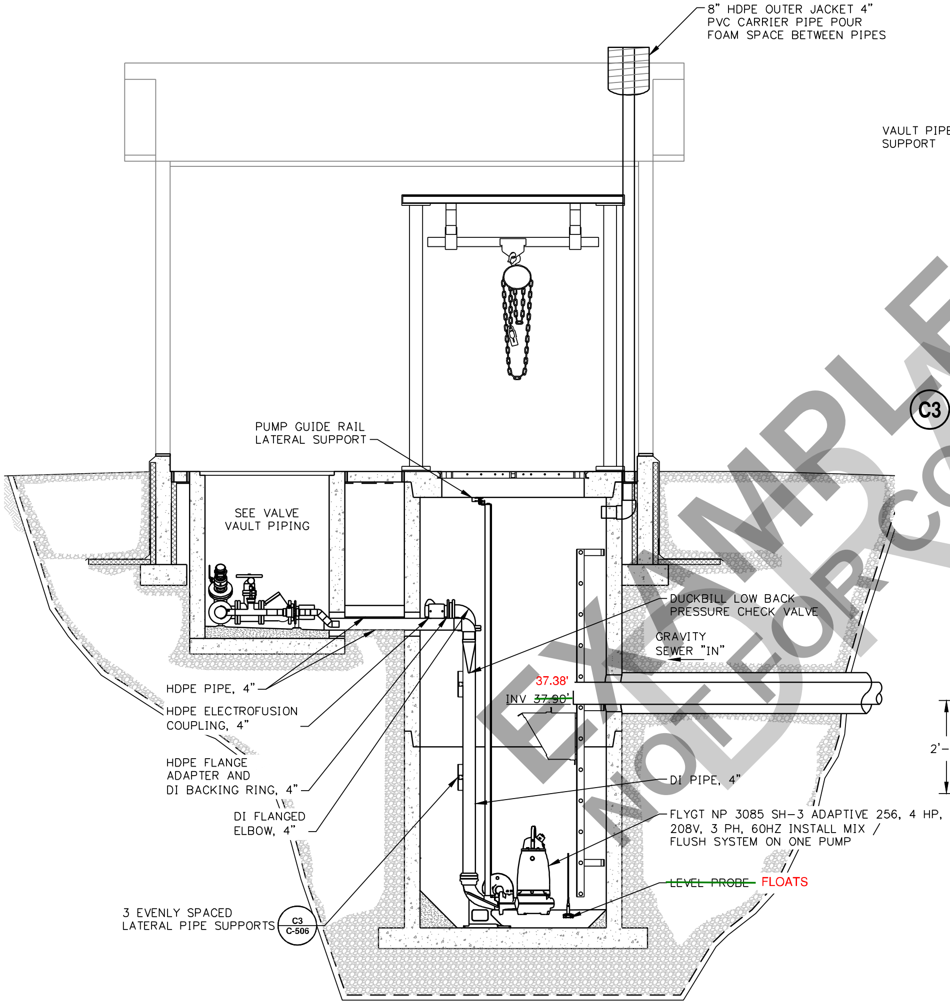
1. FLYGHT TOP FIBERGLASS SUMP INSERT AN OPTIONAL ALTERNATIVE.
2. PURCHASE 3 EACH PUMPS, ONE TO SERVE AS A BACKUP.

PARTS LIST

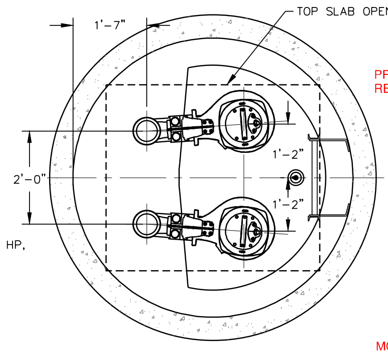
TAG	DESCRIPTION
A	HDPE ELECTROFUSION COUPLING, 4"
B	HDPE FLANGE ADAPTER AND DI BACKING RING, 4"
C	~~BALL CHECK VALVE, 4" (FLYGT OR APPROVED EQUAL)~~ 4" SWING CHECK VALVE W/ WEI
D	RESILIENT SEATED GATE VALVE, 4" (M&H OR APPROVED EQUAL)
E	DI FLANGED ELBOW, 4"
F	DI FLANGED TEE, 4"
G	DI FLANGED WYE WITH TAPPED BLIND FLANGE, 4" (SEE TRASH PUMP FITTING)
H	ELECTROFUSION SERVICE SADDLE, 4" x 2" TAP BRANCH (ROMAC 202 OR APPROVED EQUAL)
I	HDPE POLYCAM, 2" 914
J	HDPE POLYCAM 914
K	HDPE 45° ELBOW, 2"
L	2" FB500-7-NL BALLCORP FORD
M	PRESSURE GAUGE ASSEMBLY, SEE DETAIL A4, THIS SHEET



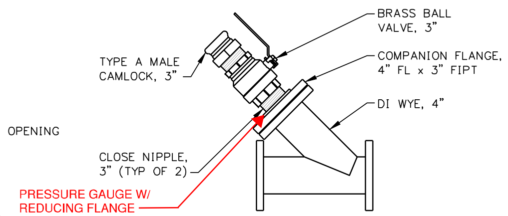
C3 VALVE VAULT PIPING
1" = 1'-0"



A1 LIFT STATION PIPING ELEVATION
1/2" = 1'-0"

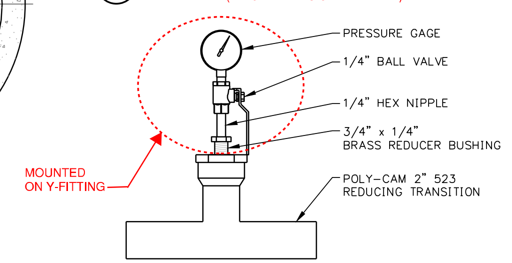


A3 LIFT STATION PUMP INSTALLATION
3/4" = 1'-0"



B4 TRASH PUMP FITTING
1 1/2" = 1'-0"

(PROVIDED AS SPARE PART)



A4 PRESSURE GAUGE
1" = 4'

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BAR IS ONE INCH ON ORIGINAL DRAWING, IF NOT ADJUST SCALES ACCORDINGLY

NEWHALEN, AK
WASTE WATER UPGRADES
ISSUED FOR CONSTRUCTION

MRK	DATE	DESCRIPTION	INIT

PLAN SET:	NHL-14-001
PROJ MGR:	KS
PROJ ENG:	SAE
DRWNS ENG:	PC
DRAWN BY:	SSM

SHEET TITLE

PIPING PLAN AND ELEVATION

C-503

SHEET 7 OF 14

ANTHC STANDARD LIFT STATION

FIG 7

Nondalton Lift Station Site Investigation Photos	
Photo	Description
	Lift Station.
	Interior of Lift Station.

Nondalton Lift Station
Site Investigation Photos

Photo	Description
	Lift Station wetwell.
	Lift Station control panels.

Nondalton Lift Station Site Investigation Photos	
Photo	Description
	MH-6 with wastewater in bottom on 1/4/2020 at 3:00pm.
	MH-6A nearly full on 1/5/2020 at 2:00pm.

Attachment 4 – Permittee-Responsible Mitigation Plan for the Removal of Pacific Salmon Passage Barriers

D R A F T   R E P O R T

Pebble Project
Permittee-Responsible Mitigation Plan for the Removal of Pacific Salmon Passage Barriers

January 2020

CONTENTS

Figures

ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
AWC	Anadromous Waters Catalog
CFR	Code of Federal Regulations
CMP	Compensatory Mitigation Plan
DA	Department of the Army
FPID	Fish Passage Inventory Database
HUC	Hydrologic Unit Code
PLP	Pebble Limited Partnership
PRM	Permittee-responsible Mitigation
ROW	Right-of-way
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WOUS	Waters of the U.S., including wetlands

1. Objectives

The Pebble Limited Partnership (PLP) is proposing this permittee-responsible mitigation (PRM) plan to restore Pacific salmon habitat as compensatory mitigation for the unavoidable losses to aquatics resources that would result from the Pebble Project's discharges to waters of the U.S., including wetlands (WOUS). The goal of this PRM plan is to rehabilitate 8.5 miles of Pacific salmon habitat by removing or replacing culverts that limit the passage of juvenile and/or adult Pacific salmon.

Properly designed culverts have little or no adverse effect on fish, aquatic organisms, and other riverine animals, but when culverts do not mimic the characteristics of the stream, including bankfull width, slope, and depth, they can impede both upstream and downstream fish movement (Eisenman and O'Doherty 2004) and degrade aquatic habitats. Undersized culverts cause channel constriction at the culvert inlet, in turn causing upstream ponding, increased bank erosion and suspended sediment loads, and reduced water quality. Channel constriction increases flow velocity within the culvert structure, a potential barrier to fish passage. High flow velocities result in high energy at the culvert outlet that can erode or "scour" the streambed downstream. Downstream scour further contributes to water quality degradation, as well as dewatering of wetlands and, in some cases, results in an elevation drop at the culvert outlet that compounds the problem of fish passage. The replacement of an undersized culvert with a properly sized and well-designed structure can restore stream connectivity and improve the environmental quality of riparian habitats (O'Hanley 2011).

The removal of fish passage barriers meets the goals of PLP's Compensatory Mitigation Plan. The proposed Pebble Project wetland impacts will occur in remote watersheds with large expanses of relatively undisturbed wetlands, and the remaining wetlands are at low risk of being cumulatively degraded. The impacted wetlands in the affected watersheds are not rare or unique; however, construction would place fill in Pacific salmon streams and adjacent wetlands, which are an important resource to the economies and subsistence activities of local communities. PLP's proposed discharge of fill material will result in the removal of 8.5 miles of Pacific salmon habitat within the headwater streams of the Koktuli River, a tributary to the Nushagak River. The city of Dillingham is located downstream of the project site at the mouth of the Nushagak River. Approximately 6 miles of Pacific salmon habitat in streams that are tributaries to the Nushagak River near Dillingham, have already been degraded by undersized culverts associated with local infrastructure. Consistent with the watershed approach outlined in 33 CFR Part 332.3(c) and 40 CFR Part 230.93(c), PLP's watershed analysis concludes that compensatory mitigation opportunities that benefit water quality and fish habitat, would best meet the watershed needs. This PRM plan targets those needs by rehabilitating 8.5 miles of Pacific salmon stream habitat through the replacement of undersized culverts. This quantification of restoration includes only upstream benefits of replaced culverts, as benefits downstream would be difficult to quantify.

PLP is proposing to implement this PRM through ad hoc payments to private individuals, and non-governmental or governmental organizations (partners) that would perform the culvert replacement activity that would provide the compensatory mitigation for PLP. PLP would retain responsibility for ensuring that required compensatory mitigation activities are completed and successful, and any long-term management of the compensatory mitigation project as described in Section 10 of this plan. The selection of specific culvert replacement projects would occur after receipt of the approved Department of the Army (DA) Permit for the Pebble Project, in coordination with the Alaska Department of Fish and Game (ADF&G), interested land or Right-of-Way (ROW) owners, and partners.

2. Site Selection

The ADF&G maintains the Fish Passage Inventory Database (FPID) (ADF&G 2001) that stores the results of over 2,500 stream crossings assessed for fish passage by ADF&G since 2001. This database includes detailed physical data for each culvert evaluated, and a determination regarding the culverts adequacy to allow passage of juvenile fish. The database is updated annually to reflect the results of ongoing mitigation efforts by the State of Alaska and other entities. PLP's site selection process will consider all current culvert sites identified by ADF&G as limiting fish passage. Sites will then be prioritized based on their location, restoration potential, and practicability.

- Location. Sites closer to the proposed impacted watersheds will be given higher priority over more distant sites when all other factors are equal. PLP has established five Preference Areas based on proximity to the location of proposed impacts (Dillingham, King Salmon, Beluga-Tyonek, Kenai Peninsula, and Matanuska-Susitna) and organized by hydrologic unit code (HUC) watersheds (a national system of water resource classifications based on geographic area). Table 1 summarizes potential candidates projects for rehabilitation as of March 2019. The FPID includes a total of 710 culverts with a fish passage rating of 'inadequate passage'; 350 as 'unlikely passage'; and 232 that are yet to be determined in preference areas 1 – 5 (Table 1). Exhibit A lists the locations and site information of potential candidate culverts that were reviewed by PLP to assess restoration potential for the Program. Figure 1 provides an overview of potential candidate culverts by preference area and figures 2 – 8 provide a detailed view for each preference area.

Table 1 – Preference area by ADF&G Culvert Fish Passage Rating as of March 2019.

Preference Area	Description	ADF&G Culvert Fish Passage Rating[1]		
		Inadequate Passage	Unlikely Passage	Insufficient Information
1	HUC 10 watersheds that intersect with the Pebble Project wetlands impacts	0	0	0
2	HUC 10 watersheds downstream of the Pebble Project wetlands impacts	2	2	6
3	HUC 8 watersheds that intersect with the Pebble Project wetlands impacts	0	0	0
4	HUC 6 watersheds that intersect with the Pebble Project wetlands impacts	20	15	4
5	HUC 4 watersheds that intersect with the Pebble Project wetlands impacts	688	333	222
	Grand Total	**710**	**350**	**232**

1. Source: Fish Passage Inventory Database (FPID), ADF&G 2019

- Restoration potential. Upstream Pacific salmon rehabilitation habitat will be calculated for each potential fish barrier project site. Projects with the larger potential to rehabilitate Pacific salmon habitat that are practicable will be given priority, when other factors are equal.

- Practicability. Practicability will be evaluated in consideration of engineering feasibility, authorization by land or ROW owners for the construction work, and construction costs.

PLP will evaluate proposals from partners, or PLP's own selections, using the above criteria for location, restoration potential, and practicability. A list of potential culvert replacement projects has been prepared (Exhibit A). However, the final selection of culvert replacement projects would occur after receipt of the approved DA Permit Application for the Pebble Project, in coordination with interested partners. As an alternative PLP could select culvert replacement projects and perform the culvert replacement activity.

3. Site Protection Instrument

PLP is not proposing site protection for the fish habitats enhanced, other than protections that are already in place through compliance with local, state, and federal regulations, which includes compliance with current ADF&G fish passage design practices.

4. Baseline Information

The following studies will be completed to gather the ecological characteristics of the proposed mitigation sites:

- Hydrology and hydraulics study. This study will describe area drainage patterns and provide culvert design information.

- Stream habitat inventory study. This study will provide baseline information on Pacific salmon habitat upstream of the culvert locations. Data sources will include the Anadromous Waters Catalog (AWC) (ADF&G 2018), field site observations, and detailed stream mapping. Field observations on Pacific salmon presence or absence may be used to update the AWC. In addition to identifying fish passage issues, this study will also include information on additional actions that would benefit the stream (e.g., bank stabilization).

5. Determination of Credits

The replacement of undersized culverts will restore or enhance at least 8.5 miles of streams that contain Pacific salmon habitat. The total linear feet of habitat restoration and enhancement will be calculated by adding the linear feet of Pacific salmon aquatic habitat identified upstream of the culvert as determined through monitoring.

6. Mitigation Work Plan

The mitigation work plan includes the following items:

- Geographic boundaries. Sites will be selected from Preference Areas 1-5 (See section 2).

- Construction methods. Existing culvert structures will be replaced with structures designed to restore the hydrologic functioning of the streams being crossed, and that mimic the natural stream characteristics, including juvenile fish passage, and connectivity of wetlands and riparian areas adjacent to the stream channels to the greatest extent possible. Structure design would conform to the Fish Passage Guidelines (U.S. Fish Wildlife Service 2018) and would be reviewed by ADF&G during the permitting process. Construction activity will require in-water work using heavy equipment such as excavators, and support equipment such as trucks. Typical construction requirements for in-water work include silt curtains or cofferdams and temporary diversion channels or bypass pumping to isolate work areas from the flowing water of a stream or river. Temporary stream diversions, if required, would provide a sufficient quantity of water and a slope and velocity approximating that of the original stream to provide for both upstream and downstream travel of fish. Disturbed areas in the construction sites will be stabilized and erosion and sediment control measures will be installed to direct stormwater away from fish bearing waterbodies.

- Timing. Culvert replacement construction would be timed to occur prior to or concurrent with Project construction activities. The installation of culverts will be timed to avoid sensitive fish life stages such as spawning and/or migration periods as required by permit conditions.

- Water source(s). Existing flow at each mitigation site is sufficient to support Pacific salmon habitat.

- Methods for establishing the desired plant community. Plant communities will be established consistent with species and methods described in the Alaska Coastal Revegetation & Erosion Control Guide (Wright and Czapla 2011), and the Streambank Revegetation and Protection (Muhlberg, et al. 2005).

- Plans to control invasive plant species. Invasive species control methods for each species will be selected in accordance with an invasive species management plan that will be developed for the project.

- Grading plan. Site-specific grading plans would be developed for each location.

7. Maintenance Plan

PLP will maintain the mitigation sites on an as-needed basis to resolve erosion problems, wood debris removal, vegetation planting, etc. or to correct structural issues that affect juvenile fish passage, if discovered during a site inspection. The frequency of site inspections is addressed in sections 9 and 10.

8. Performance Standards

Performance standards will be met when both of the following conditions are satisfied:

- Final stabilization of the construction site is achieved. This is defined as: "all soil disturbing activities are completed, and the exposed soil has been stabilized with at least a 70 percent vegetative cover with a uniform density, or by equivalent means (e.g., concrete, rip rap, gravel, asphalt), over the entire site to prevent soil failure."

- Site conditions at the culvert are adequate to pass juvenile salmon, as determined using techniques employed by ADF&G (Eisenman and O'Doherty 2004).

9. Monitoring Requirements

The following monitoring will be conducted for each site:

- Site inspections. During construction and until final site stabilization is achieved, each site will be inspected for signs of erosion once every 7 days, or once every 14 days, and after a 0.25-inch storm event, consistent with applicable stormwater management regulations.

- Fish passage assessment. Fish passage will be assessed at each rehabilitated site after final site stabilization is achieved using the same techniques employed by ADF&G (Eisenman and O'Doherty 2004).

  Adaptive management will be implemented if:

  - Changes to stormwater controls are needed to avoid and minimize stormwater runoff to facilitate final site stabilization, or
  - The fish passage assessment results in "inadequate" or "unlikely" fish passage.

- Fish habitat use assessment. After fish passage is determined adequate, aquatic monitoring will be conducted to determine the length of stream habitat used by Pacific salmon. This number will be used to determine the number of miles of stream habitat rehabilitated.

- Monitoring report. PLP will submit a monitoring report to the U.S. Army Corps of Engineers (USACE) by December 31st of each year monitoring occurs. The monitoring report will include all data collected from the year's monitoring events and will be used to compare the PRM site's progress toward meeting the performance standards found in Section 8. Additionally, reports would include a detailed discussion of maintenance and management activities conducted during that year, along with a proposed maintenance schedule for the following year based upon the results of the yearly monitoring. The report should also include discussion of all activities that took place at the PRM sites. At a minimum, monitoring reports should also include the following:

  - Photos taken at each site to document overall conditions.
  - A description of the general condition of the culvert structure, including inlet/outlet protection, and embankment as applicable.
  - Copies of the fish passage assessment for each site.
  - A description of the general condition of the seedlings, including survival and mortality, and if applicable, a discussion of likely causes for mortality.
  - A description of vegetative communities developing at each site.
  - A corrective action plan or explanation to address any Performance Standards that have not been achieved if applicable.

10. Long-term Management Plan

PLP will monitor the PRM sites for five years to demonstrate compliance with the Performance Standards:

- Post Construction Annual Inspection: The sites will be monitored for signs of erosion, culvert and fish passage integrity annually during ice and snow free conditions.

11. Adaptive Management Plan

Selection of culvert replacement projects would occur after receipt of the approved DA Permit Application for the Pebble Project, in coordination with interested partners. PLP will submit a list of project and supporting baseline data to the USACE for review an approval.

If performance standards have not been achieved at a site after the year five post-construction monitoring event, PLP will develop a "Remedial Plan" for the agency(s) which discusses the likely reasons for failing to meet requirements, corrective actions, an assessment of risks, and a schedule for conducting the remedial work. Once approved, the "Remedial Plan" will be implemented according to the approved schedule.

12. Financial Assurances

PLP will establish a performance bond to ensure the PRM site construction is complete and all performance criteria are met. PLP is responsible for:

- All permit acquisition and compliance.
- Project design, set up, management, planning, support, and execution of the PRM plan.
- Site inventory, data collection, and monitoring.
- Reporting to USACE.

The bond will be closed once all PRM objectives and performance standards are met, and a final sign-off on the PRM site has been provided by the USACE.

13. Other Information

Not Applicable.

14. References

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Exhibits

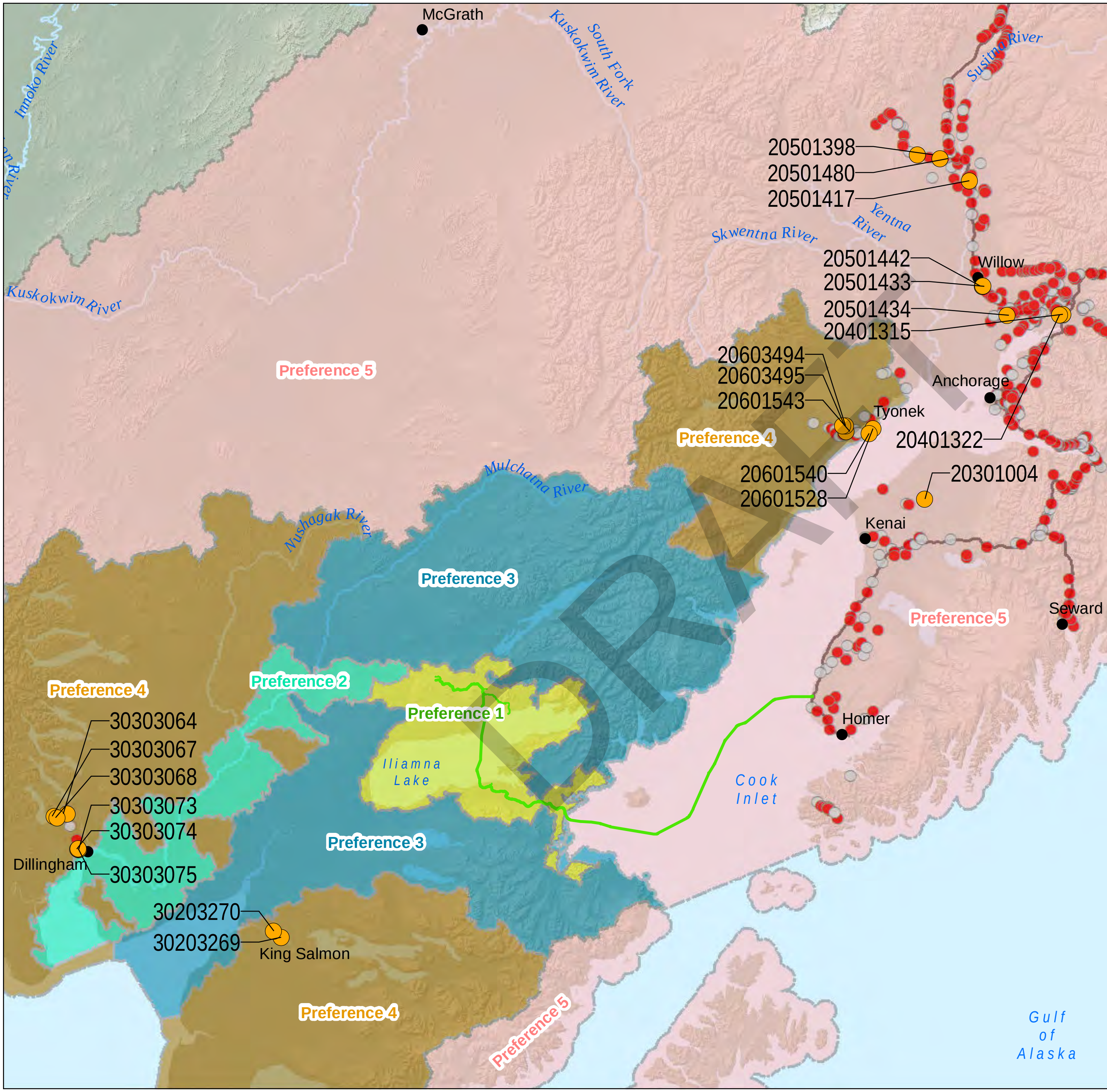
Exhibit A. Potential culvert replacement projects

This list includes a selection of current potential culvert replacement projects. Additional potential projects can be viewed on the ADF&G Fish Passage Inventory Database[1]. The final selection of culvert replacement projects will occur after receipt of the approved DA Permit Application for the Pebble Project, in coordination with interested partners.

Location	River System	Preference Area / Figure	Culverts	Stream Habitat (mi)	Lake Habitat (ac)
Dillingham	Wood River	4 / Figure 3	30303064	2.0	
Dillingham	Snake River	4 / Figure 3	30303067	2.3	
Dillingham	Squaw Creek	4 / Figure 3	30303073 30303074 30303075	5.56	
Dillingham	Otter Creek Trib.	4 / Figure 3	30303068 (DOT&PF[2])	0.67	
King Salmon	Naknek Unknown Trib.1	4 / Figure 6	30203270	0.36	
King Salmon	Eskimo Creek	4 / Figure 6	30203269	1.26	
Beluga-Tyonek	Old Tyonek Creek	4 / Figure 4	20601543 (KPB[3]) 20603494 (MHT[4]) 20603495 (MHT)	1.7	444.2
Beluga-Tyonek	Indian Creek	4 / Figure 5	20601528	1.53	60.1
Beluga-Tyonek	Tyonek Creek	4 / Figure 5	20601540	11.74	
Kenai	Swanson R.	5 / Figure 2	20301004 (USFWS[5])	2.29	1,100.0
Mat-Su	Lily Creek	5 / Figure 8	20501433 20501442	6.17	12.9
Mat-Su	Various Susitna River tribs. (E. Petersville Rd.)	5 / Figure 7	20501398 (DOT&PF) 20501480 (DOT&PF)	4.64	
Mat-Su	Answer Creek	5 / Figure 7	20501417 (DOT&PF)	8.17	
Mat-Su	Lucile Creek	5 / Figure 8	20501434 (DOT&PF or MSB[6])	12.47	
Mat-Su	Various Wasilla Creek Tribs. (Nelson Rd./ Matanuska Old Town Site Rd.)	5 / Figure 8	20401315 (ARR[7]) 20401322 (SOA[8])	3.68	
				64.54	**1,617.2**

Notes:
1. http://www.adfg.alaska.gov/index.cfm?adfg=fishpassage.database
2. DOT&PF – Alaska Department of Transportation and Public Facilities
3. KPB – Kenai Peninsula Borough
4. MHT – Alaska Mental Health Trust
5. USFWS - U.S. Fish and Wildlife Service
6. MSB – Matanuska-Susitna (Mat-Su) Borough
7. ARR – Alaska Railroad
8. SOA – State of Alaska

Figures



THE pebble PARTNERSHIP

Proposed Pebble Project

Culverts Reviewed by PLP

Existing Access

Other Potential Culverts by Rating

Gray

Red

Prioritized Mitigation Areas

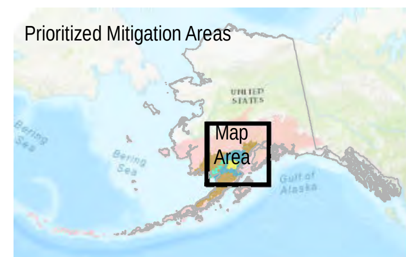
Preference 1

Preference 2

Preference 3

Preference 4

Preference 5



Miles 0 10 20 30 40 50

Scale 1:2,972,586

NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian

Figure: 1

Potential Culvert Replacement Project

Pebble Project

File: PLP149	Date: 1/23/2020
Revision: 08	Author: ORNRC

THE pebble PARTNERSHIP

Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red

Miles

0 0.65 1.3 1.95 2.6

Scale 1:68,110

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

Figure: 2

PRM Culverts
Kenai Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd

Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red

Miles

0 1 2 3 4

Scale 1:134,130

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

Figure:
3

PRM Culverts
Dillingham Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd

THE pebble PARTNERSHIP

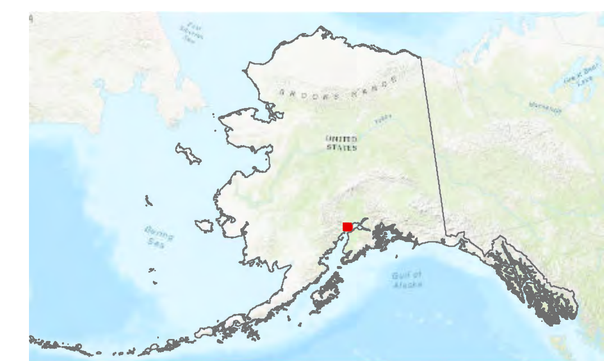
Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red



Miles

0 0.5 1 1.5 2

Scale 1:50,980

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

Figure:
4

PRM Culverts
Beluga-Tyonek Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd

Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red

Miles

0 0.5 1 1.5 2

Scale 1:51,230

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

Figure:
5

PRM Culverts
Beluga-Tyonek Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd

THE pebble PARTNERSHIP

Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red

Miles

0 0.9 1.8 2.7 3.6

Scale 1:92,950

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

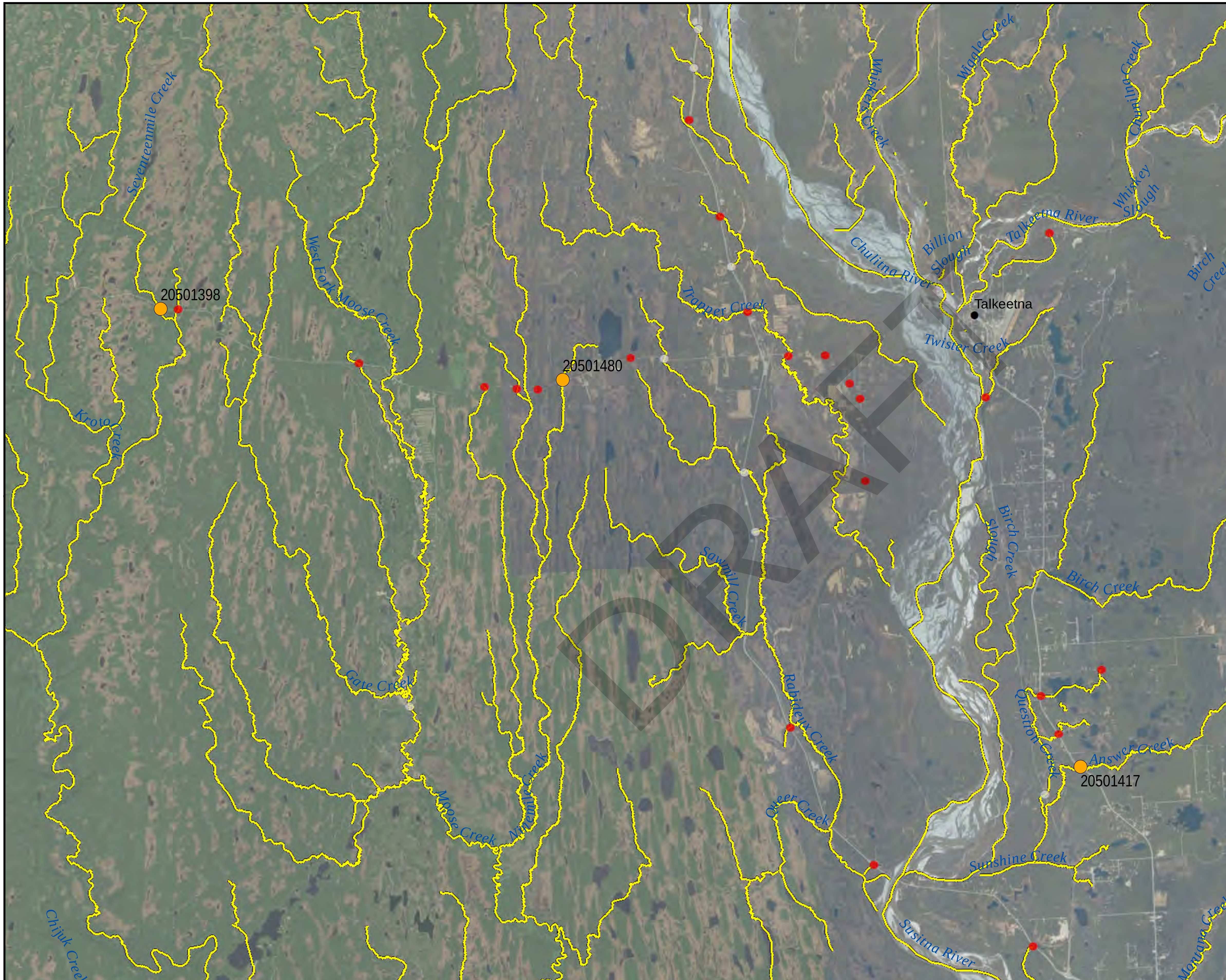
Figure:
6

PRM Culverts
King Salmon Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd



THE pebble PARTNERSHIP

Culverts Reviewed by PLP

Anadromous Waters

Other Potential Culverts by Rating

Gray

Red

Scale 1:114,640

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

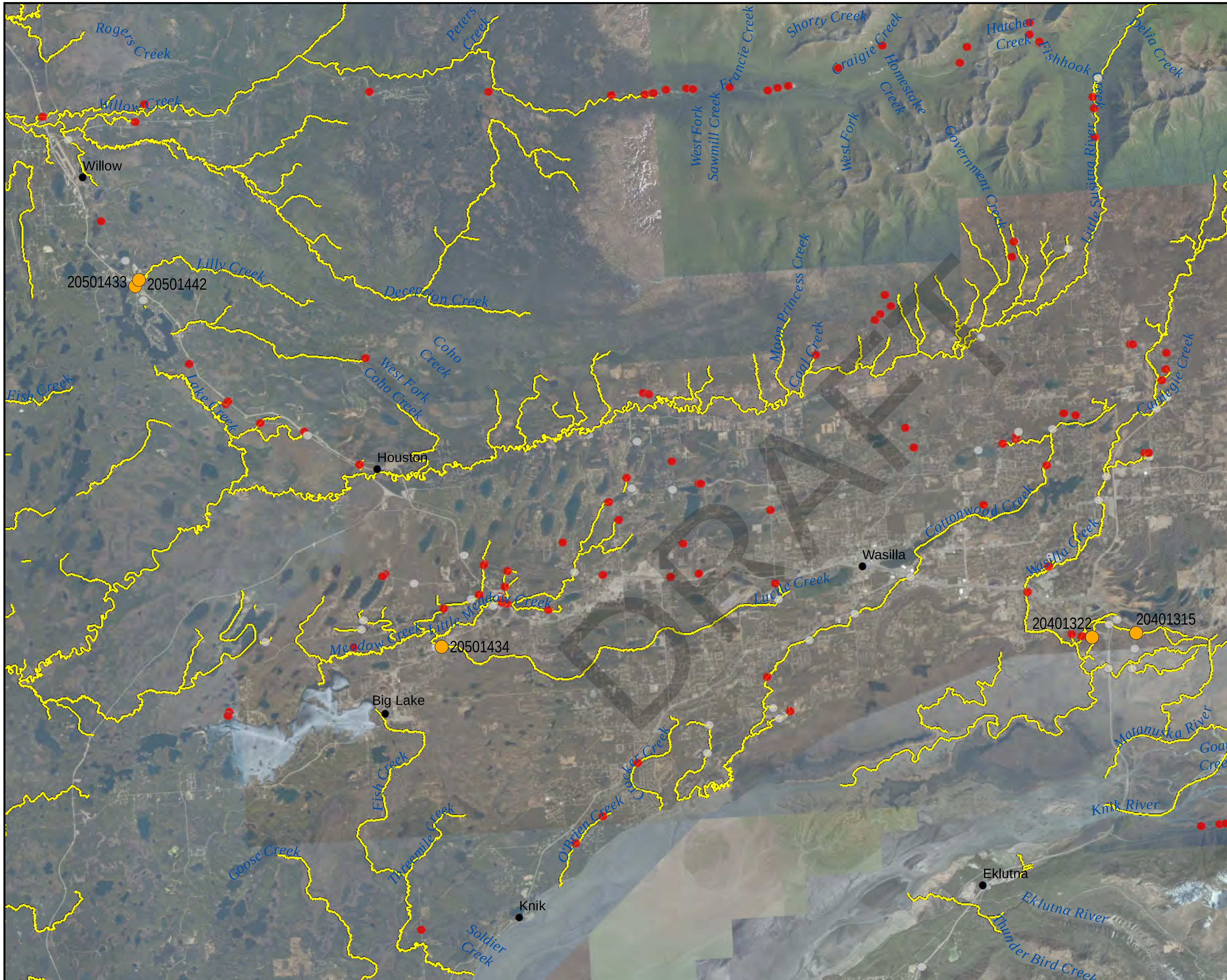
Figure: 7

PRM Culverts
Susitna River Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd



![THE pebble PARTNERSHIP]

- Culverts Reviewed by PLP
- Anadromous Waters

Other Potential Culverts by Rating

- Gray
- Red

Miles

0 1.5 3 4.5 6

Scale 1:163,490

NAD 1983 StatePlane
Alaska 5 FIPS 5005
Seward Meridian

Figure: **8**

PRM Culverts
Mat-Su Area

Pebble Project

File: PLP164	Date: 1/23/2020
Revision: 04	Author: ORNRC

Document Path: G:\Pebble\ARC_Proj\MXD\PLP164.mxd

Attachment 5 – Permittee-Responsible Mitigation Plan for Marine Debris Removal at Kamishak Bay

DRAFT REPORT

Pebble Project

Permittee-Responsible Mitigation Plan for Marine Debris Removal at Kamishak Bay

December 2019

CONTENTS

ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
MPPRCA	Marine Plastic Pollution Research and Control Act
MRSGR	McNeil River State Game Refuge
NPS	National Park Service
NOAA	National Oceanic and Atmospheric Administration
PLP	Pebble Limited Partnership
PRM	Permittee-responsible Mitigation
USACE	U.S. Army Corps of Engineers
WOUS	Waters of the U.S., including wetlands

1. Objectives

The Pebble Limited Partnership (PLP) is proposing this permittee-responsible mitigation (PRM) plan for the removal of marine debris at Kamishak Bay, as compensatory mitigation for the unavoidable losses to aquatics resources that would result from the Pebble Project's proposed discharges of dredge or fill material into waters of the U.S., including wetlands (WOUS). The primary purpose of this PRM project is habitat restoration, although it also provides protection to wildlife, including threatened and endangered species, by removing potential entanglement or ingestion hazards.

Marine debris is defined as persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment (33 USC 1951 et seq. as amended by Title VI of the Public Law 112-213). Potential impacts of marine debris include wildlife entanglement, ingestion, and habitat damage.

- Wildlife entanglement. Derelict nets, ropes, line, or other fishing gear, packing bands, six-pack rings, and a variety of marine debris can wrap around marine life. Entanglement can lead to injury, illness, suffocation, starvation, and even death (NOAA 2019).
- Ingestion. Animals including seabirds and marine mammals have been known to ingest marine debris. The debris item may be mistaken for food and ingested, and animal's natural food (e.g., fish eggs) may be attached to debris, or the debris item may have been ingested accidentally with other food. Debris ingestion may lead to loss of nutrition, internal injury, intestinal blockage, starvation, and even death (NOAA 2019).
- Habitat damage. Marine debris can scour, break, smother, and otherwise damage important marine habitat. Many of these habitats serve as the basis for marine ecosystems and are critical to the survival of many other species (NOAA 2019).

Marine debris has become one of the most recognized pollution problems in the world's oceans and waterways today and was officially recognized as a problem by the federal government with the passing of the Marine Plastic Pollution Research and Control Act (MPPRCA) in 1987 (Public Law 100-200, Title II). This act provides specific mandates for the National Oceanic and Atmospheric Administration (NOAA) including mapping, identification, impact assessments, removal and prevention activities, research and development of alternatives to gear posing threats to the marine environment, and outreach activities (NOAA 2013).

High tides and storm events deposit marine debris along beaches and other coastal habitats, where they can further degrade and break down into smaller pieces or microplastics. Debris accumulated on coastal habitats may remain onshore or be returned to the sea during storm events or high tides. Coastal cleanup projects can help reduce the thread of marine debris in coastal ecosystems. In the United States, federal agencies such as NOAA and the U.S. Army Corps of Engineers (USACE), and non-profit organizations have organized coastal cleanup events to restore coastal habitat degraded by marine debris. In 2015 the Ocean Alaska Science and Learning Center, supported by a grant from the National Park Foundation, removed approximately 22,000 pounds of marine debris from 50 miles (mi) of coastal habitats from Alaska national parks and preserves (NPS 2019). Coastal cleanup events in Cook Inlet have taken place near established communities such as Anchorage and Homer, but rarely take place in remote areas such as Kamishak Bay due to access limitations.

The goal of this PRM plan is to address the thread of marine debris to coastal ecosystems within Kamishak Bay.

Objectives of this PRM include:

- Remove and properly dispose of marine debris from 7.4 mi of coastal habitat in Kamishak Bay.

PLP is proposing to implement this PRM using company resources or contractors. In addition, PLP may consider public and community involvement during the cleanup effort, or participation in informational community events, to enhance public understanding of marine debris concerns.

2. Site Selection

This PRM plan targets mitigation opportunities of land contiguous to the proposed WOUS impacts in Kamishak Bay (i.e., on-site) that would result from construction of the proposed project, including Amakdedori Port, lightering mooring facilities, navigation buoys, airstrip, and segments of access road.

The restoration sites were selected from within an approximately 13-mile long continuous stretch of coastline in Kamishak Bay where large amounts of marine debris have been documented by PLP personnel and contractors. Areas that are inaccessible to cleanup crews because of potentially hazardous terrain conditions (e.g., rocky bluffs) were excluded from potential consideration. The three selected sites include a total of 7.4 mi of coastal habitat (Figure 1):

- Amakdedori Beach - 4.6 mi.
- Chenik Point - 1.5 mi.
- Amakdedulia Cove – 1.3 mi.

Marine debris would be removed from the supratidal (the area above spring high tide) and intertidal zones.

3. Site Protection Instrument

The 7.4 mi of coastal habitat that makes up the restoration area is composed of tidelands and submerged lands that are owned by the State of Alaska. Approximately 3.3 mi are on state-owned public lands and the remaining 4.1 mi are within the McNeil River State Game Refuge (MRSGR). The MRSGR is a special use area managed by the Alaska Department of Fish and Game (ADF&G). In 1996 the ADF&G adopted the McNeil River State Game Refuge and State Game Sanctuary Management Plan (ADF&G 2008), which provides some protection from development. Under this plan MRSGR lands cannot be sold, but leasing may be possible if the activity is compatible with the purpose for which the refuge was established.

Establishment of a site protection instrument is not feasible because PLP does not have a real estate interest but would obtain authorization to conduct this environmentally beneficial activity. Furthermore, the project site is a dynamic coastal environment and the long-term sustainability of the project cannot be assured because of the natural littoral processes that occur in the area.

AMAKDEDORI BEACH
CHENIK POINT
AMAKDEDULIA COVE
MCNEIL RIVER SGR
MCNEIL RIVER SGS
KAMISHAK BAY
CHENIK POINT
Amakdedulia Cove
AIRSTRIP
Amakdedori Creek
AMAKDEDORI PORT
Amakdedori Creek Mouth
State Game Refuge Boundary
DRAFT
THE pebble PARTNERSHIP
Kamishak Bay Cleanup Areas
Project Components
Lighted Navigation Buoys
Proposed Access Road
Proposed Natural Gas Pipeline
Proposed Port Site Footprint
Reference
Mcneil River State Management
Amakdedori Creek-Frontal Kamishak Bay Watershed (HUC 10)
Miles
0 1 2 3 4
Scale 1:96,672
NAD 1983 StatePlane Alaska 5 FIPS 5005 Seward Meridian
Figure: 1
Potential Beach Cleanup Project
Pebble Project
File: PLP197
Date: 1/2/2020
Revision: 01
Author: ORNRC

4. Baseline Information

Geoengineers (2018) conducted habitat mapping of nearshore habitats in Kamishak Bay. Amakdedori Beach consists of a long gravel/sand beach that receives strong wave action. The beach extends for several miles north and south of the mouth of Amakdedori Creek. North of the creek mouth the beach extends approximately 2 mi until it meets high cliff bluffs and mountains. Near the north end of this long beach, the low tide flats narrow in width and change from gavel and sand to a more stable hard clay substrate. Beyond the zones of finer material at Amakdedori Beach, the shallow subtidal flats become dominated by gravels and cobbles with increasing numbers of large boulders on the surface, likely derived from the high cliffs to the north. South of the mouth of Amakdedori Creek, the section of beach identified for cleanup at Chenik Point and Amakdedulia Cover, are more varied with bedrock outcrops and geologically active cliffs that often feed large angular rock to the upper beach (GeoEngineers 2018).

A wetlands delineation was completed for an approximately 1,700-foot-long reach of Amakdedori Beach (HDR 2019), and is representative of most of the site. Starting on the water's edge (Figure 2), the site includes bare marine intertidal unconsolidated shore composed of cobbles and gravel. The lower portion of this intertidal zone (closest to the water's edge) is flooded at least once daily, while the higher portion is flooded less often than daily. This is because of the variability in high tides. At the highest point of the beach (furthest from the water's edge) is a vegetated zone that may be affected by marine spray or surges during high marine storm events.

Figure 2. Amakdedori Beach (view south)

Amakdedori Beach, Chenik Point, and Amakdedulia Cove border habitats that are used by marine wildlife including Steller's sea lion, harbor seals, northern sea otters, beluga whales, humpback whales, Steller's eiders and other sea ducks (ADF&G 2008). The Steller's sea lion, northern sea otter, beluga and humpback whale, and Steller's eider are protected species under the Endangered Species Act, and the beach borders designated critical habitat for the northern sea otter, and beluga and humpback whales.

Marine debris observed at the restoration sites include buoys of a variety of materials (e.g., plastic, metal, polystyrene foam), insulation materials (e.g., polystyrene foam sheets and fragments), barrels, buckets, plastic bottles, propane canisters, fish nets and seines, rope, pallets, lumber, coolers, fish totes, pressurized cannisters for paint and lubricant, tarps and fabric (Figure 3, Figure 4).

Figure 3. Marine debris at Amakdedori Beach (view north)

Figure 4. Polystyrene foam buoy and ropes at Amakdedori Beach

5. Determination of Credits

Marine debris has several documented impacts to habitats and natural resources. It can cause physical damage to shoreline, marshes, and the benthos. Marine debris can also cause injury to wildlife from entanglement, ingestion and ghost fishing (where derelict fishing gear continues to catch and kill marine life for many years after it has been lost or discarded). The removal of marine debris will result in ecosystem service benefits to 7.4 mi of Kamishak Bay beach habitats, adjacent marine habitat, and the wildlife species that use these habitats. This restoration would not result in a gain of aquatic resources area for purposes of tracking "no net loss" of wetlands; however, the benefit to the habitat can still be used to compensate for a loss in resource area.

6. Mitigation Work Plan

The mitigation work plan includes the following items:

- Geographic boundaries. The restoration site encompasses approximately 7.4 mi of coastline in Kamishak Bay (Figure 1).
- Marine debris baseline density study. PLP will conduct a standing-stock study to identify and quantify the types and amount of debris along the shoreline prior to cleanup. Debris within discrete 100 meter transects at the shoreline site will be tallied. The results will provide an assessment, and the baseline, of the total load of debris and will be used to determine the density (# of items per unit area) of debris present. Debris density reflects the long-term balance between debris inputs and removal and is important to understanding the overall impact of debris. The standing-stock study would use and follow the procedures and forms described in the NOAA Marine Debris Shoreline Survey Field Guide (NOAA 2012, or current version) included in Exhibit A. The standing-stock study will be shared with the NOAA Marine Debris Program.
- Marine debris cleanup plan.
    - Cleanup team. Marine debris cleanup from sites will be completed by a 12-person field crew consisting of eight cleanup technicians, two bear guards, one hazardous material (hazmat) trained technician, and one project field team coordinator. All crew members will be trained in applicable site-specific safety and environmental procedures. At least one member of the field crew will be a qualified EMT. The field crew will be based in Kokhanok and transported to the cleanup site each day by helicopter.
    - Debris size criteria and volume estimates. Small debris items measuring over 1 inch (~bottle cap size) will be picked by hand and placed in light trash bags which will then be consolidated in super sacks. Heavy and larger items will be placed directly in super sacks. For planning, PLP estimates a total of 12,500 pounds (lbs) of marine debris would be removed from Kamishak Bay coastal habitats, based on a debris density of 1,650 lbs/mi that was calculated from the National Park Service (NPS) cleanup of beaches in Katmai and the Gulf of Alaska (NPS 2019).
    - Collection. Collected debris will be segregated as necessary for final disposal at regulated facilities. Any items that are known or suspected to contain hazardous materials (e.g., oil, paint or unknown substances) will be segregated from other wastes and managed in

accordance with applicable state and federal regulations. Supersacks that have been filled will be closed or covered and slung by helicopter to a designated temporary upland staging area just above the tidal zone. Any debris items that cannot be moved by hand will be lifted by helicopter and placed in the storage area or in a super-sack.
    - Removal. Once cleanup is completed at each of the three beach project sites, a barge will be mobilized to a safe offshore location near each beach staging areas. As soon as the barge is in-place the super sack will be slung by helicopter to the barge and secured on the deck.
    - Disposal. The loaded barge will transit to Nikiski or other Cook Inlet dock where the supersacks would be offloaded and transferred to trucks for transport to a Kenai Peninsula Borough (KPB) landfill for proper disposal. Alternative disposal, other than the KPB landfill, would be considered on a case-by-case basis for waste types that may not be accepted at the landfill (i.e., hazardous materials).
- Schedule. Marine debris removal work at Kamishak Bay is estimated to last approximately 20 days, followed by a 36-hour period to transfer the consolidated marine debris from land to the barges. The work would be completed during ice the free season between May and October when favorable weather is forecasted. Clean-up work can be scheduled to avoid sensitive wildlife or land use periods. PLP will consult with the relevant landowner or land management agency prior to the start of the cleanup work.

- Reporting. On completion of the cleanup, a report will be prepared that includes:
    - Results of the pre-clean-up standing-stock survey.
    - Summary narrative of the debris removal effort.
    - Breakdown of the debris types and weights removed.
    - Before and after photographs of cleanup sites.

7. Maintenance Plan

Kamishak Bay is exposed to substantial wave energy generated by wind waves and swells coming from the Gulf of Alaska (GeoEngineers 2018) that can transport marine debris. It is expected that after the initial cleanup, marine debris will continue to accumulate along cleaned beaches, however the rate at which marine debris will accumulate is unknown. To ensure the continued viability of the restored habitat, additional cleanup event(s) may be necessary to suppress the build-up of marine debris.

Five years after the initial marine debris removal action, PLP will initiate monitoring (Section 9) by conducting a standing-stock survey (NOAA 2012). The calculated marine debris density will be used to determine what additional actions are needed:

- If the marine debris density is less than 10 percent of the baseline, monitoring will be continued.

- If the marine debris density is greater than 10 percent of the baseline, additional beach cleanup efforts will be conducted to remove accumulated marine debris.

After the initial five-year monitoring event post cleanup, additional monitoring events would be scheduled using adaptive management.

8. Performance Standards

The following performance standard will be used to determine whether the compensatory mitigation project is achieving its objectives:

- All visible marine debris is removed from the 7.4 mi of beach during the initial cleanup event.

9. Monitoring Requirements

Standing-stock surveys (NOAA 2012) will be completed at the start of the project prior to debris removal, and 5 years post clean-up to record marine debris densities as indicated in the following Table 1:

Table 1 Restoration Site Monitoring Schedule

Timing	Purpose
Pre debris removal	Determine baseline conditions prior to start of cleanup
5-year post debris removal	Ensure recovered resource is stable
Schedule as determined by adaptive management	Ensure continued viability of the resource

10. Long-term Management Plan

After the initial clean up event, PLP will continue to manage and be financially responsible for maintenance and monitoring activities. PLP will assume long-term management until conclusion of mine operation activities, currently estimated to 20 years after construction. PLP is not proposing long-term management beyond this point.

11. Adaptive Management Plan

PLP will use adaptive management as an overall approach to ensure the plan goals and objectives are met:

- PLP will prepare a report of the initial cleanup event and submit to USACE for review. USACE will review the report and determine whether performance standards have been met, or if additional work is needed to meet the performance standard.

- Monitoring results will be used to determine marine debris accumulation rates. This information will be used to schedule the timing of future monitoring or to determine if and when an additional cleanup is required. PLP will provide the USACE with schedule updates of monitoring and cleanup events.

- In the unlikely event that the proposed cleanup sites, or a portion of them, cannot be completed because of land management restrictions, wildlife, or safety reasons, PLP will substitute those areas with others of equal length within Kamishak Bay, or elsewhere in Cook Inlet. Should this become necessary, PLP will notify the USACE for verification and approval.

- Any required revisions to this PRM will be provided to the USACE for review and approval.

12. Financial Assurances

PLP will establish a performance bond to ensure the PRM projects are satisfactorily constructed and all performance criteria are met. PLP will be responsible for:

- All permit acquisition and compliance.
- Project design, set-up, management, planning, support, and execution of the PRM plan.
- Site inventory, data collection, and monitoring.
- Reporting to USACE.

The bond will be closed once the PRM objective and performance standard has been met, and a final sign-off on the PRM plan has been provided by the USACE.

13. Other Information

No other information is provided.

14. References

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—. 2008. "NcNeil River State Game Refuge and Sanctuary Map." June. Accessed December 26, 2019. http://www.adfg.alaska.gov/index.cfm?adfg=mcneilriver.maps.

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Exhibit A

NOAA Marine Debris Shoreline Survey Field Guide

DRAFT

Sarah Opfer, Courtney Arthur, and
Sherry Lippiatt

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Response and Restoration
Marine Debris Program

January 2012

This shoreline protocol was developed and tested by the NOAA Marine Debris Program. This document is a revised version of the August 2011 field guide, and should be treated as a draft protocol that may be altered in the future. Further testing is currently underway to develop a statistically robust survey design that will recommend the frequency of sampling, number of transects, and sampling unit size at site, location, and regional spatial scales.

Mention of trade names or commercial products does not constitute endorsement or recommendation for their use by the National Oceanic and Atmospheric Administration.

NOAA Marine Debris Shoreline Survey Field Guide

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January 2012

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Website: www.MarineDebris.noaa.gov

Contents

Introduction

Marine debris has become one of the most widespread pollution problems in the world's oceans and waterways today. The NOAA Marine Debris Program (MDP) serves as a centralized marine debris resource within NOAA, coordinating and supporting activities within NOAA and with other federal agencies. The MDP uses partnerships to support projects carried out by state and local agencies, tribes, non-governmental organizations, academia, and industry.

Marine debris monitoring programs are necessary to compare debris sources, amounts, locations, movement, and impacts across the US and internationally. Monitoring data can be used to evaluate the effectiveness of policies to mitigate debris and provide insight into priority targets for prevention. Thus, the NOAA MDP has developed standardized marine debris shoreline survey protocols to facilitate regional and site-specific comparisons. This document provides a standard data sheet and two different methods for shoreline monitoring and assessment.

Types of Shoreline Surveys

The objectives of your study will determine how you monitor for marine debris. There are two main types of shoreline surveys: accumulation and standing-stock surveys.

- Accumulation studies provide information on the rate of deposition (flux) of debris onto the shoreline. These studies are more suited to areas that have beach cleanups, as debris is removed from the entire length of shoreline during each site visit. This type of survey is more labor-intensive and is used to determine the rate of debris deposition (# of items per unit area, per unit time). Accumulation studies can also provide information about debris type and weight. These surveys cannot be used to measure the density of debris on the shoreline because removal of debris biases the amount of debris present during subsequent surveys.
- Standing-stock studies provide information on the amount and types of debris on the shoreline. Debris within discrete transects at the shoreline site is tallied during standing-stock surveys. This is a quick assessment of the total load of debris and is used to determine the density (# of items per unit area) of debris present. Debris density reflects the long-term balance between debris inputs and removal and is important to understanding the overall impact of debris.

Table 1. Salient characteristics of standing-stock and accumulation surveys.

CHARACTERISTIC	STANDING-STOCK	ACCUMULATION
Debris removed during surveys?	No	Yes
Time required per survey	Less	More
Length of shoreline site	100 m	100 m or longer
Is a set survey interval required (e.g., once per week or per month)?	Yes	Yes
Types of data that can be collected	• Debris density (# of items / unit area) • Debris material types	• Debris deposition rate (# of items / unit area / unit time) • Debris material types • Debris weight

We suggest that users give careful consideration to which type of survey best suits their goals and objectives. Table 1 provides important information to take into account when deciding how to monitor. Once a survey type is chosen, meaningful data can be collected through regular monitoring. The following sections describe how to choose survey sites and conduct surveys.

How to Pick Your Site

To select your sampling site(s), follow these steps:

1. The first step is to choose an appropriate shoreline location based on the objectives of your study. For example, if you wish to examine the impact of land use, you should select locations in watersheds with various land use types. Next, categorize the various areas within your location (it may help to use an aerial photo or map, as shown below). For example, your location may cover a span of shoreline 1 km long. Within that 1 km, there may be an area with heavy recreational use and another area where an urban stream mouth is located. Identify any barriers to shoreline access or offshore structures that may affect nearshore circulation (e.g. jetties).

2. Select shoreline sites (where you will sample) according to the characteristics below. If your location includes different use areas (for example, an area with heavy recreational use and a more remote area), it is preferable to select a site within each use category.

Shoreline sites should have the following characteristics:

- Sandy beach or pebble shoreline
- Clear, direct, year-round access
- No breakwaters or jetties
- At least 100 m in length parallel to the water (note that standing-stock surveys require a 100-m shoreline site)
- No regular cleanup activities

These characteristics should be met where possible, but can be modified.

Before You Begin Your Surveys

Before any data collection begins, the Shoreline Characterization Sheet should be completed for each shoreline site. On this data sheet you will note:

- GPS coordinates in decimal degrees at the beginning and end of your shoreline site, or at the site's four corners if the width of the beach is > 6 m;
- Shoreline characteristics (e.g. tidal range and substrate); and
- Surrounding land-use characteristics that may influence the delivery of land-based debris to the site (e.g., farmland 5 km from a small town or urban parkland 50 m from a river mouth).

The Shoreline Characterization Sheet needs to be completed only once per site per year unless major changes occur to the shoreline.

Shore IDs (on the Shoreline Characterization Sheet) should be created based on the initials of the shoreline name (e.g., Fort Smallwood = FS). This will make it easier to keep track of multiple sampling sites.

The Shoreline Characterization Sheet and Debris Density Data Sheet were adapted from Cheshire et al. (2009)[1].

You will need the following supplies in order to complete your surveys:

- Digital camera
- Hand-held GPS unit
- Extra batteries for GPS and camera (we recommend rechargeable batteries)
- Surveyor's measuring wheel - *for standing-stock surveys only*
- Flag markers or stakes
- ~100′ fiberglass measuring tape
- First aid kit (including sunscreen, bug spray, drinking water)
- Work gloves
- Sturdy 12″ ruler
- Clipboards for data sheets
- Data sheets (on waterproof paper)
- Pencils
- Trash bag or bucket - *for accumulation surveys only*

Safety is a priority. Do not touch or lift potentially hazardous or large, heavy items. Notify your local officials if such items are encountered.

All of the data collection forms you will need are included in Appendix A at the end of this document. The same data collection forms are used for accumulation and standing-stock surveys.

- Shoreline Characterization Sheet (pp. 8–9)
- Debris Density Data Sheet (pp. 10–12)

[1] Cheshire, A. C., E. Adler, et al. (2009). UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter, UNEP Regional Seas Intergovernmental Oceanographic Commission**:** 132 pp.

Accumulation Surveys

If you decide to conduct accumulation surveys, follow this protocol:

1. BEFORE arriving at the site, check local tide tables and plan to arrive at your site during low tide.

2. ONCE ARRIVED, begin filling out the Debris Density Data Sheet's Additional Information section. Mark the beginning and end of your shoreline site, perhaps with flags or stakes. (Remember to pick up these markers at the end of your survey to make sure they do not become marine debris!) The back of the shoreline is where the primary substrate (e.g., sand) changes (e.g., sand becomes gravel) or at the first barrier (e.g., vegetation line).

3. In order to cover the entire site from water's edge to the back of the shoreline, decide whether you will traverse the survey area parallel or perpendicular to the water. See Appendix B for walking pattern schematics. If more than one surveyor is available, the survey area should be divided evenly with clearly specified areas assigned to each individual. Surveyors should traverse the survey area in a pre-determined walking pattern until the entire site is cleared of marine debris.

4. Record on your Debris Density Data Sheet counts of debris items that measure over 2.5 cm, or 1 inch (~bottle cap size), in the **longest** dimension (see Figure 1). If any part of the item is within the survey area, count the item. Record large debris items, anything bigger than 1 foot (~ 0.3 m, typical forearm length from palm to elbow) in the large debris section of the Debris Density Data Sheet.

5. Take photos of your shoreline site and some of the debris items!

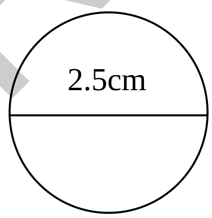


Figure 1. Minimum debris size to be counted. **This size is required to keep surveyors counting the same size items and to help keep the survey results uniform.*

Standing-stock Surveys

If you decide to conduct standing-stock surveys, follow this protocol:

1. Sketch your 100-m shoreline site and divide the 100 m into 5-m segments. There should be 20 of them. Number each section (left to right) from 1 to 20. Each 5-m segment should run from the water's edge to the back of the shoreline (Figure 2). The back of the shoreline is where the primary substrate (e.g., sand) changes (e.g., sand becomes gravel) or at the first barrier (e.g., vegetation line).

2. BEFORE arriving at the site, select four numbers from the Random Number Table (Appendix C) by first choosing a number between 1 and 5, and then a number between 1

and 4. The corresponding number in the table (1–20) is one of the four transects you will survey. Complete this exercise four times to choose four random transects (each transect can be used only once per survey). These numbers correspond to the 5-m segments you drew on your sketch and are called transect ID numbers (see Debris Density Data Sheet). You should fill out one Debris Density Data Sheet per transect. On any sampling day, 20 m of your 100-m shoreline site is analyzed (i.e., 20% coverage of the area). In addition, check local tide tables and plan to arrive at your site during low tide.

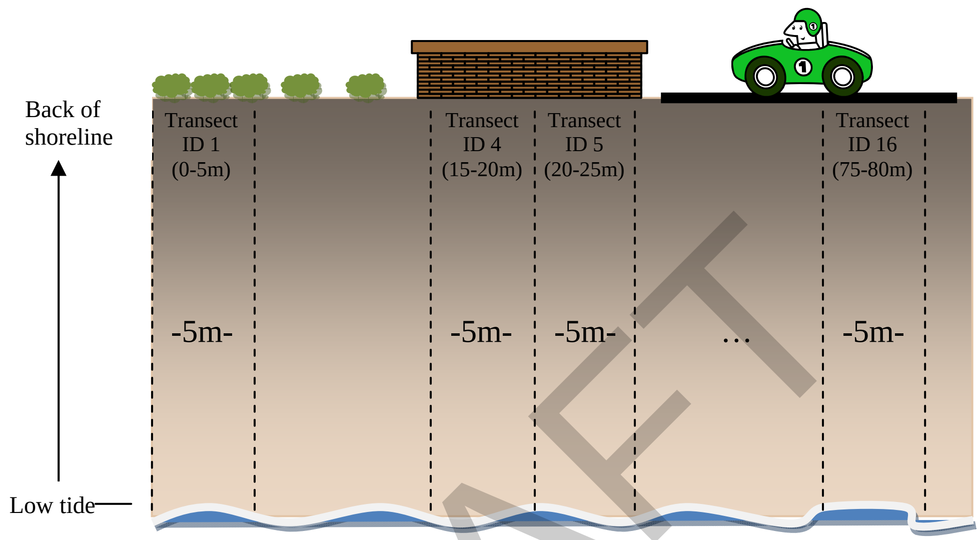


Figure 2. Shoreline section (100 m) displaying perpendicular transects from water's edge at low tide to the first barrier at the back of the shoreline section.

3. ONCE ARRIVED, begin filling out the Debris Density Data Sheet Additional Information section. Using your measuring wheel, begin at the start of your shoreline section and mark the four selected transect boundaries with flags according to the distances provided in the Transect ID table (for example, transect 12 covers 55 to 60 m from the start of your shoreline section).

4. Measure the width of each transect from water's edge to the back of the shoreline. Record GPS coordinates for each transect in decimal degree format. For shoreline segments that are less than 6 m wide from the water's edge to the back of the shoreline, GPS coordinates should be taken at the center (Figure 3). For shoreline segments that are over 6 m wide, take GPS coordinates at two spots—one nearer the back of the shoreline and one nearer the water.

5. Walking each transect from water's edge to the back of the shoreline, record on your Debris Density Data Sheet counts of debris items that measure over 2.5 cm, or 1 inch (~bottle cap size), in the **longest** dimension (see Figure 1). If any part of the item is within the sample transect, count the item. *Remember that for standing-stock surveys, debris is not removed from the shoreline.* Record large debris items, anything bigger than 1 foot (~ 0.3 m, typical forearm length from palm to elbow) in the large debris section of the Debris Density Data Sheet.

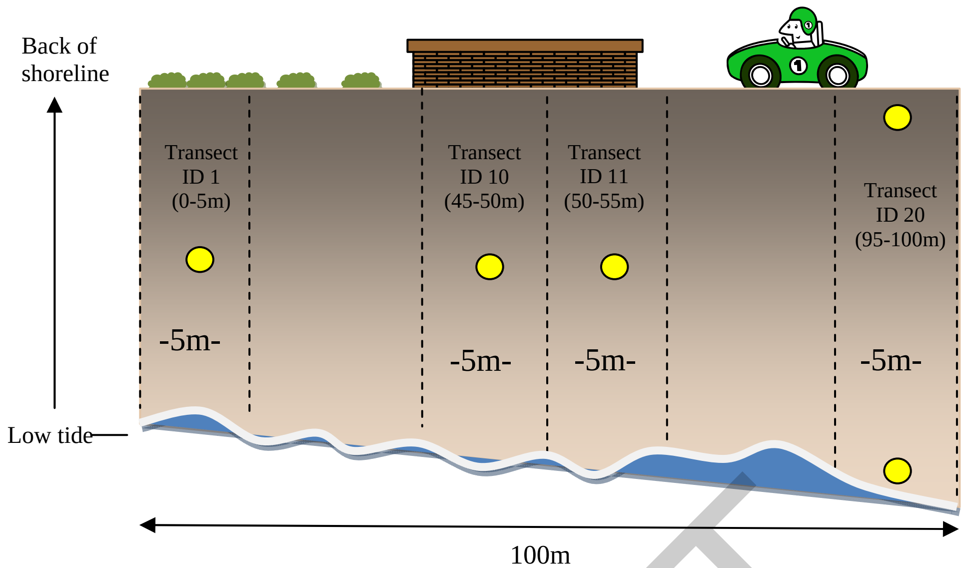


Figure 3. Example of a shoreline section (100m) with yellow circles indicating marked GPS coordinates. Width determines location of GPS coordinates.

6. Take photos of each transect and some of the debris items!

Submitting Your Shoreline Debris Data to NOAA

Marine debris monitoring groups should plan to compile and analyze their own survey results. The NOAA MDP will have periodic calls for data from monitoring groups. If you would like more information on data analysis or to be included in data calls, please send an email to MD.monitoring@noaa.gov.

Appendix A: Data Forms

SHORELINE DEBRIS **Shoreline Characterization Sheet**	Organization		Name of organization responsible for collecting the data
	Surveyor name		Name of person responsible for filling in this sheet
	Phone number		Phone contact for surveyor
Complete this form **ONCE** for each site location	Date		Date of this survey

SAMPLING AREA

Shore ID			Unique code for the shoreline
Shoreline name			Name by which the section of shoreline is known (e.g., beach name, park)
State/County			State and county where your site is located
Coordinates at start of shoreline section	Latitude	Longitude	Recorded as XXX.XXXX (decimal degrees) at start of shoreline section (in both corners if width > 6 meters)
Coordinates at end of shoreline section	Latitude	Longitude	Recorded as XXX.XXXX (decimal degrees) at end of shoreline section (in both corners if width > 6 meters)
Photo number/ID			The digital identification number(s) of photos taken of shoreline section

SHORELINE CHARACTERISTICS – from beginning of shoreline site

Length of sample area (should be 100 m if standing-stock survey)		Length measured along the midpoint of the shoreline (in meters)
Substratum type		For example, a sandy or gravel beach
Substrate uniformity		Percent coverage of the main substrate type (%)
Tidal range		Maximum & minimum vertical tidal range. Use tide chart (usually in feet).
Tidal distance		Horizontal distance (in meters) from low- to high-tide line. Measure on beach at low and high tides or estimate based on wrack lines.
Back of shoreline		Describe landward limit (e.g., vegetation, rock wall, cliff, dunes, parking lot)
Aspect		Direction you are facing when you look out at the water (e.g., northeast)

LAND-USE CHARACTERISTICS – within shoreline location

Location & major usage	Urban		Select one and indicate major usage (e.g., recreation, boat access, remote)
	Suburban		
	Rural		
Access			Vehicular (you can drive to your site), pedestrian (must walk), isolated (need a boat or plane)
Nearest town			Name of nearest town
Nearest town distance			Distance to nearest town (miles)
Nearest town direction			Direction to nearest town (cardinal direction)
Nearest river name			If applicable, name of nearest river or stream. If blank, assumed to mean no inputs nearby
Nearest river distance			Distance to nearest river/stream (km)
Nearest river direction			Direction to nearest river/stream (cardinal direction from site)
River/creek input to beach	YES	NO	Whether nearest river/stream has an outlet within this shoreline section
Pipe or drain input	YES	NO	If there is a storm drain or channelized outlet within shoreline section
Notes (including description, landmarks, fishing activity, etc.):			

SHORELINE DEBRIS **Debris Density Data Sheet**	Organization		Name of organization responsible for data collection
	Surveyor name		Name of person responsible for filling in this sheet
	Phone number		Phone contact for surveyor
Complete this form during **EACH** survey or transect (if standing-stock) per site visit	Email address		Email contact for surveyor
	Date		Date of this survey

ADDITIONAL INFORMATION

Shoreline name			Name for section of shoreline (e.g., beach name, park)
Survey Type	Accumulation ☐	Standing-stock ☐	Type of shoreline survey conducted (check box)
Transect ID # (N/A if accumulation survey)			Transect ID (include shoreline ID, date, and transect #)
Coordinates of start of shoreline site	Latitude	Longitude	Recorded as XXX.XXXX (decimal degrees). Record in both corners if width > 6 m. If transect, record at water's edge.
Coordinates of end of shoreline site	Latitude	Longitude	Recorded as XXX.XXXX (decimal degrees). Record in both corners if width > 6 m. If transect, record at back of shoreline.
Width of beach			Width of beach at time of survey from water's edge to back of shoreline (meters)
Time start/end	Start	End	Time at the beginning and end of the survey
Season			Spring, summer, fall, winter, tropical wet, etc.
Date of last survey			Date on which the last survey was conducted
Storm activity			Describe significant storm activity within the previous week (date(s), high winds, etc.)
Current weather			Describe weather on sampling day, including wind speed and % cloud coverage
Number of persons			Number of persons conducting the survey
Large items	YES	NO	Did you note large items in the large debris section?
Photo ID #s			The digital identification number(s) of debris photos taken during this survey.

Notes: Evidence of cleanup, sampling issues, etc.

DEBRIS DATA: (continued on back)

ITEM	TALLY (e.g., ~~IIII~~)			TOTAL
		PLASTIC		
Plastic fragments	Hard	Foamed	Film	
Food wrappers				
Beverage bottles				
Other jugs or containers				
Bottle or container caps				
Cigar tips				
Cigarettes				
Disposable cigarette lighters				
6-pack rings				
Bags				
Plastic rope/small net pieces				
Buoys & floats				
Fishing lures & line				
Cups (including polystyrene/foamed plastic)				
Plastic utensils				
Straws				
Balloons				
Personal care products				
Other:				
		METAL		
Aluminum/tin cans				
Aerosol cans				
Metal fragments				
Other:				
		GLASS		
Beverage bottles				
Jars				
Glass fragments				
Other:				

ITEM	TALLY (e.g., ~~IIII~~)	TOTAL
RUBBER		
Flip-flops		
Gloves		
Tires		
Rubber fragments		
Other:		
PROCESSED LUMBER		
Cardboard cartons		
Paper and cardboard		
Paper bags		
Lumber/building material		
Other:		
CLOTH/FABRIC		
Clothing & shoes		
Gloves (non-rubber)		
Towels/rags		
Rope/net pieces (non-nylon)		
Fabric pieces		
Other:		
OTHER/UNCLASSIFIABLE		

LARGE DEBRIS ITEMS **(> 1 foot or ~ 0.3 m)**

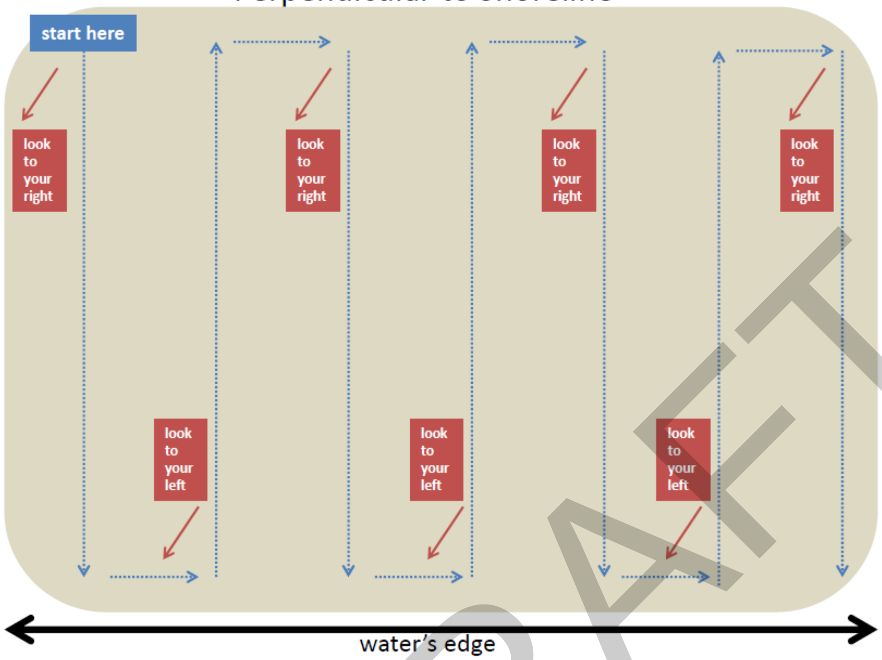
Item type (vessel, net, etc.)	Status (sunken, stranded, buried)	Approximate width (m)	Approximate length (m)	Description / photo ID #

Notes on debris items, description of “Other/unclassifiable” items, etc:

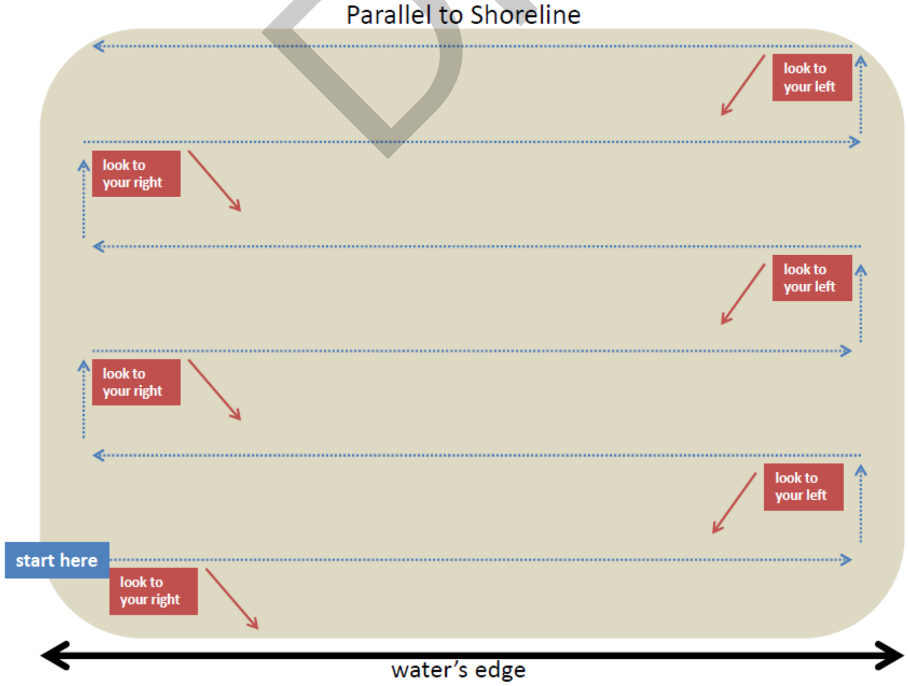
Appendix B: Shoreline Walking Patterns

The schematics below are potential survey walking patterns to ensure that the entire shoreline site or transect is covered. Suggested distance between walking lines is approximately one meter.

Walking Pattern #1:
Perpendicular to Shoreline



Walking Pattern #2
Parallel to Shoreline



APPENDIX C: RANDOM TRANSECT SELECTION

If you are conducting a standing-stock survey, use these tables to select transects. BEFORE arriving at the site, select four numbers from the Random Number Table, by first choosing a number between 1 and 5, and then a number between 1 and 4. The corresponding number in the table (1–20) is one of the four transects you will survey. Complete this exercise four times to choose four random transects (each transect can be used only once per survey).

Random Number Table

	1	2	3	4	5
1	4	8	17	9	1
2	7	19	2	12	20
3	18	14	6	16	11
4	3	5	15	10	13

Transect ID and distance along shore from start of 100-m shoreline section (see Figure 2 above)

Transect ID	Meters	Feet and inches
1	0–5 m	0–16' 4"
2	5–10 m	16'4"–32'9"
3	10–15 m	32'9"–49'2"
4	15–20 m	49'2"–65'7"
5	20–25 m	65'7"–82'
6	25–30 m	82'–98'5"
7	30–35 m	98'5"–114'9"
8	35–40 m	114'9"–131'2"
9	40–45 m	131'2"–147'7"
10	45–50 m	147'7"–164'
11	50–55 m	164'–180'5"
12	55–60 m	180'5"–196'10"
13	60–65 m	196'10"–213'3"
14	65–70 m	213'3"–229'7"
15	70–75 m	229'7"–246'
16	75–80 m	246'–262'5"
17	80–85 m	262'5"–278'10"
18	85–90 m	278'5"–295'3"
19	90–95 m	295'3"–311'8"
20	95–100 m	311'8" - 328'1"

United States Department of Commerce

John Bryson
Secretary

National Oceanic and Atmospheric Administration

Jane Lubchenco, Ph.D.
Undersecretary of Commerce for Oceans and Atmosphere
Administrator, National Oceanic and Atmospheric Administration

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David Kennedy
Assistant Administrator for Ocean Services and
Coastal Zone Management

M3.0—RESTORATION PLAN

Restoration Plan

Pebble Limited Partnership
3201 C Street, Suite 505
Anchorage, Alaska
June 2019

Prepared by:
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2121 Abbott Road, Suite 201
Anchorage, AK 99507
Document No.: PLP006-19-009F0

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Attachment 1 – Figures

ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
PLP	Pebble Limited Partnership
ROW	Right-of-Way

1. Introduction

The Pebble Limited Partnership (PLP) has proposed the development of the Pebble Project (Project), which includes the construction of a mine site at Pebble; a transportation corridor comprised of a mine access road, a port access road, and a ferry crossing of Iliamna Lake; a port at Amakdedori; and a natural gas pipeline (pipeline) from the Kenai Peninsula that crosses Cook Inlet to the port, then follows the transportation corridor to the mine site (PLP 2018).

The construction of these facilities will result in a permanent or temporary loss of natural habitats. This restoration plan describes the processes and measures that will be implemented by PLP to restore temporarily impacted areas to a condition that resembles the pre-construction conditions, or condition of adjacent lands undisturbed by the project, after construction is completed.

Temporary habitat loss areas include construction workspace (e.g., equipment operating areas, temporary material stockpiling areas, and temporary stream crossing areas) associated with road and other infrastructure construction and the pipeline right-of-way (e.g., pipeline trenching, side-casting, and equipment operation/travel) where it is not associated with the access road.

This plan is applicable to all the construction workspaces and pipeline rights-of-way that require restoration. It does not apply to post-mining closure reclamation activities, which will be addressed in the PLP mine closure and reclamation plan (pending), or material sites that require individual material site reclamation plans (to be developed during State permitting). Invasive species will be addressed in the PLP invasive species management plan (to be developed during State permitting). Temporary impact areas have been designated in the GIS data provided for the project and include a 30-foot buffer around project access infrastructure and on land areas of pipeline construction outside of the access road footprint.

2. Plan Goals and Objectives

PLP's goal is to restore temporarily impacted natural habitats, including aquatic habitats, to a condition that resembles the pre-construction condition or that of adjacent lands undisturbed by the project. To meet this goal, PLP has established short- and long-term restoration objectives.

The short-term restoration objective is to stabilize soils through practices including terrain recontouring, spreading stockpiled topsoil, placing erosion control devices, and/or establishing temporary vegetation cover. Restoration would commence post-construction or concurrent with construction activities once the desired grading has been achieved, the workspace is no longer needed, or the pipeline has been installed. Recontouring would occur to blend the disturbed area with the adjacent terrain not disturbed by the construction activity, and erosion control measures would be strategically placed to limit and/or redirect surface flow.

The long-term restoration objective is to establish a permanent vegetation cover with species densities and compositions similar to adjacent lands undisturbed by the project. The long-term objective will be achieved through maintaining or adding new or existing erosion control measures and implementing a monitoring program. Long-term restoration efforts will be deemed complete with successful establishment of the perennial plant cover.

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 (ADNR 2011, ADNR 2012).
- 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.

3. Restoration Schedule

Restoration at any given area would commence once the desired grading has been achieved, the workspace is no longer needed, or the pipeline has been installed, and would occur concurrent with or following construction. Restoration would include clean-up, backfilling, surface grading, placing topsoil, installing erosion control measures, preparing the seedbed, and establishing a permanent plant cover. Some areas may not be seeded until temperatures are suitable for seed survival or germination. A summary of the construction schedule is provided in Table 1.

Table 1. Pebble Project Construction Schedule by Facility Group

Facility Group	Construction Dates
Transportation Corridor	
Temporary access Amakdedori-Kokhanok	June Y1 – September Y1
Temporary access North Ferry Terminal-Mine Site	July Y1 – November Y1
Access road (south)	September Y1 - July Y2
Access road (north)	November Y1 – October Y2
Major bridges	June Y2 - September Y2
Amakdedori Port	September Y1 - September Y2
South Ferry Terminal	June Y2 - September Y2
North Ferry Terminal	June Y2 - September Y2
Access Construction Complete	*October Y2*
Natural Gas Pipeline	
Anchor Point compressor station	June Y3 - August Y3
Cook Inlet sub-sea pipeline	June Y2 - August Y2
Pipeline along road segments	November Y1 - October Y2
Iliamna Lake sub-lake pipeline	June Y3 – July Y3
Natural Gas Pipeline Construction Complete	*September Y3*
Mine Site	
Major site earthworks	September Y2 – May Y4
Mill & infrastructure	May Y3 - October Y4
Pit pre-production mining	September Y3 - October Y4
Commencement of Production	*October Y4*

4. Restoration Process

This section describes the steps necessary to ensure the Project achieves the restoration goal and objectives described in Section 2.

4.1 Revegetation Study Plots and Soil Amendments

Vegetation test plots and/or interim restored sites (study plots) will be established and evaluated to determine the revegetation potential of applied topsoil including seeding rates, species composition, vigor, survival, and soil amendments. Currently, it is assumed fertilizer will not be required or desirable to establish a permanent perennial cover.

4.2 General Restoration Approach

General measures implemented to ensure successful restoration will include topsoil removal and stockpiling during construction, clean-up, backfilling, surface recontouring, soil erosion control, seedbed preparation, seeding, plant establishment, and monitoring. Figure 1 presents a restoration decision flowchart.

4.2.1 Clearing, Grading, and Topsoil Removal

Initial construction activities will include surveying and staking the construction work sites to identify the areas and limits of vegetation clearing, wetlands, or excavation and fill placement.

Depending on the activity, removal of vegetation and topsoil, and grading may be required. If required, vegetation will be removed along with the topsoil and stockpiled separately from the subsoil stockpile, for later use in restoration. As practicable, stockpiled material will not be stockpiled in wetlands. Erosion control measures such as silt fences, or other measures included in the Project's stormwater management plan(s), will be used as appropriate to limit erosion and sediment migration. The topsoil-vegetation mixture and subsoils will be placed in the proper order during backfilling and final grading operations. The topsoil-vegetation mixture should provide plant propagules to support plant re-colonization on the excavated areas in addition to the seed mixtures. Vegetation in the topsoil mixture will serve as mulch.

Where available and useful for restoration, surface rocks will be saved and stockpiled for later use. The rock will be separated from the topsoil after seeding and placed on the construction area in a manner that visually blends with adjacent undisturbed areas for use as an erosion control measure, or to re-create rock outcrops and rock faces to the extent practicable.

During construction of the Project, all vehicle travel will be within the identified (permitted) construction area, ROW, and workspaces. Cross-country travel outside of the permitted construction ROW and workspaces will not be allowed. To the extent practicable, construction of the pipeline will make use of the proposed access road for vehicle movement, equipment storage, and material stockpiling.

4.2.2 Temporary Workspace and Pipeline Corridor Restoration

General site restoration activities for temporary workspaces and pipeline rights-of-way include the process of backfilling, terrain recontouring, preparation of the seeding bed (uncompacting soils and placing topsoil) and installing soil erosion control measures.

Backfilling

Backfilling may be required at some excavated construction sites to return the site to the original pre-construction elevation contours. Backfilling of subsoil materials will be required after the pipeline is aligned in the trench and packed with screened subsoil or other appropriate materials. The excavated subsoils will be used to backfill the trench. In upland locations, excessive ditch spoil will be feathered and blended across the construction corridor, creating a roughened surface to capture precipitation, decrease erosion, and provide safe sites for plant establishment.

Terrain Contouring

Where necessary, sites will be contoured to blend within the surrounding landscape. Contouring will emphasize restoration of existing drainage and landform patterns, to the extent practicable.

Scarification

Equipment travel areas, and equipment or material storage areas may compact the soil, which may negatively affect soil moisture retention, seed germination, and root penetration. Scarification using 'ripper shanks' or other similar methods may be required at sites to reduce subsoil compaction to a depth of 6-8 inches prior to topsoil placement. Soil scarification will occur along contours to minimize soil erosion and facilitate soil-water retention to aid revegetation.

Topsoil and Vegetation Mixture Replacement

The stockpiled topsoil-vegetation mixture will be spread over the sites after recontouring, and scarification (if required) is completed. The topsoil and vegetation mixture will provide seeds, vegetative propagules, and soil microbiota to facilitate plant establishment.

Soil Erosion Control

Soil erosion control measures such as silt fences, straw wattles, rolled erosion control products, water bars, or other measures will be implemented for controlling soil erosion and sediment migration. A permanent plant cover will be established as quickly as possible following construction. Installation of soil erosion control measures will be conducted consistent with the Project's stormwater control plan(s).

4.2.3 Revegetation

Revegetation includes steps for preparing the seedbed, seeding, and adding soil amendments if required.

Seedbed Preparation

Topsoil and subsoil will be prepared in such a manner as to retain moisture and allow adequate root development and penetration in those areas where infiltration and surface water retention are desired. The method of primary seedbed preparation will be scarifying or imprinting using heavy equipment. Highly compacted areas such as equipment lots and roads will be ripped in a linear fashion. If needed, the surface of growth media will be scarified after application just prior to seeding. The broken, roughened surface will serve to trap moisture, minimize surface erosion by increasing infiltration, and create micro habitats conducive to seed germination and development. Seedbed guidelines published by ADNR (2012) recommend the area:

- Be free of construction debris;
- Have relatively few large rocks or objects;
- Be free of ruts and gullies;
- Have the top two inches in a thoroughly tilled, friable, non-compacted condition (allowing a 170-pound person heel print to make a ¼ to ½ inch impression);
- Be scarified to a depth of 6 to 8 inches, if soil is heavily compacted.

Seed and Seeding

The general seed mixes proposed for use are listed in Table 2. The seed mixes consist of native species that have been used extensively in other Alaska reclamation activities (ADNR 2011, ADNR 2012). The mix may be modified over time to include forbs and woody species, depending on factors such as research results (Section 4.1), changes in technology, changes in land management philosophy, and commercial availability. Native species would be the preferred mix. Seeding would be done via drill seeding, broadcast seeding via ground or aerial application, and/or hydro-seeding.

A general bulk seeding rate of 43 pounds Pure Live Seed (PLS)/acre has been recommended for many Alaskan locations based on 3-5 species composition mixture, applied by broadcast spreading (ADNR 2012). Lower seeding rates are becoming the norm as these leave more ground space available and can create a ground surface microclimate suitable for natural colonization (ADNR 2012). Test plot evaluation and monitoring of seeded areas will determine the most suitable seeding rate.

Table 2. General Seed Mixes

Soil Type	Common Name	Scientific Name	Percentage of Mix
Hydric Soil (Wetland)	'Egan' American sloughgrass	*Beckmannia syzigachne*	45%
	'Norcoast' Bering Hairgrass	*Deschampsia beringénsis*	40%
	'Arctared' Red Fescue	*Festuca rubra*	10%
	'Alyeska' Polargrass	*Artagrostis latifolia*	5%
Mesic Soil (Upland)	'Arctared' Red Fescue	*Festuca rubra*	40%
	'Norcoast' Bering Hairgrass	*Deschampsia beringénsis*	40%
	'Wainwright' slender wheatgrass	*Elymus trachycaulus*	10%
	'Gruening' Alpine Bluegrass	*Poa alpina*	10%
	'Nortran' Tufted Hairgrass	*Deschampsia caespitosa*	0% unless substituted for Norcoast

<u>Soil Amendments</u>

Topsoil will be tested for standard soil agricultural constituents, including organic matter, nitrogen (N), phosphorus (P), and potassium (K). Soil amendment will be utilized if required. In the event, nutrient testing indicates a need for soil amendments, the procedures described below will be employed.

Prepared seedbeds will be amended prior to, during (when a hydro-seeder is used), or after the seeding operation. Specific soil amendment requirements will depend on the quality of topsoil used for an area. Based on results at other locations within Alaska, the general recommended rate of fertilizer application would be on the order of 100 to 500 pounds per acre of 20N-20P-10K. Soil amendments will not be used in wetlands.

4.3 Restoration of Wetlands

Wetlands are an important resource that provide valuable, beneficial functions. The following restoration measures are applicable to wetlands directly impacted by the Project's construction activities:

- Where construction activities, such as the pipeline trench, may drain a wetland, construct trench breakers and/or sealing the trench bottom as necessary to maintain the original wetland hydrology.
- For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction ROW at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the stormwater management plan(s). In some areas an earthen berm may be suitable as a sediment barrier adjacent to the wetland.
- Where the access road intersects wetlands, install culverts sized to account for local hydrological conditions to maintain hydrological connectivity.
- Do not use fertilizer, lime, or other soil amendments to restore wetlands.
- Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species. The restoration techniques that would be considered at specific locations include:
    - Wetland sod clump harvesting and transplanting
    - Harvesting and transplanting herbaceous plugs, shrubs and trees
    - Live cutting collection, storage and planting
    - Wetland soil harvesting and transplanting
    - Rolled erosion control products (weed free)
    - Temporary seeding with hydric seed mix
    - Permanent seeding with hydric seed mix
    - Hydro mulching (weed free)
    - Mechanical (mowing, tilling)
- Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after upland revegetation and stabilization of adjacent upland areas are judged to be successful.

4.4 Restoration of Waterbody Crossings

Restoration at waterbody crossings would typically be needed at sites where the pipeline crosses a stream using open-cut methods. The following are restoration measures that would be employed at stream crossings. These measures would also be applicable to perennial or intermittent streams not flowing at the time of construction.

- Remove temporary bridges and culverts.
- For pipeline open-cut crossings, as practicable, use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain resident or anadromous fish.

- For pipeline open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities.
- For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.
- Return all waterbody banks to preconstruction contours or to a stable angle of repose.
- The selecting of bank stabilization techniques will consider the guidelines in *Streambank Revegetation and Protection: A Guide for Alaska* (ADF&G 2005).
- Unless otherwise specified by permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and rolled erosion control products.
- Revegetate disturbed riparian areas with native plant species, preferably woody species.
- Install a permanent slope breaker across the construction ROW at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the stormwater management plan(s).
- In some areas, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

5. Restoration Monitoring and Maintenance

The purpose of post-rehabilitation monitoring is to evaluate long-term soil stability, vegetative cover and density. Restoration monitoring for the Project will include both qualitative and quantitative analysis. Monitoring will occur for a minimum of five years.

The primary objectives of monitoring are presented below.

- Assess the effectiveness of temporary and permanent erosion-control measures to ensure that runoff is naturally controlled in place, with no signs of erosion.
- Identify locations where additional remedial work may be required. The monitoring of restored areas for significant and/or new erosion is an element of PLP's routine surveillance that will be conducted throughout the life of the Project. It is anticipated that any active erosion will be apparent during the first two years following restoration or after the first runoff event.
- Monitor and assess, through quantitative analysis, the success of the reseeding and transplanting efforts for years 1 through 5 annually. Vegetation will be monitored by using a quadrant sampling (1 x 1 meters in size) method to assess species cover and density in the monitoring plots.
- Monitor the survival of special plantings.

- Employ maintenance measures during the five-year monitoring period to ensure successful restoration, plant replacement, erosion control, trash removal, and/or any other related activities. Replace dead plants during the growing season in which they are identified and/or immediately in the beginning of the next growing season (i.e., replacement will occur at the earliest feasible period based on seasonal limitations).
- Maintain the integrity and safety of the pipeline. PLP may selectively remove trees and large shrubs that could limit pipeline surveillance, reduce road traffic wildlife visibility, or whose roots pose a risk to the integrity of the buried pipeline.

5.1 Additional Post-Construction Monitoring and Maintenance for Wetlands and Water Crossings

The following are additional monitoring and maintenance measures specific to wetlands and water crossings:

- Limit vegetation maintenance adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high-water mark, to permanently revegetate with native plant species across the entire construction ROW. To facilitate periodic pipeline inspections, a corridor centered on the pipeline and up to 10 feet wide may be maintained in a herbaceous state. Do not conduct vegetation maintenance over the full width of the pipeline ROW in wetlands. Trees within 15 feet of the pipeline centerline greater than 15 feet in height may be selectively cut and removed from the pipeline ROW.
- If at the end of five years revegetation is not successful, PLP will develop and implement a remedial revegetation plan to actively revegetate the wetland. Revegetation and monitoring efforts will continue until wetland revegetation is successful.

5.2 Revegetation Performance Criteria

Revegetation will generally be considered successful when:

- The vegetation within the restored area supports native plants that are similar in forb, graminoid, and woody plant density and cover to those growing on adjacent lands undisturbed by the Project.
- The herbaceous and woody plant cover of the restored area is 80 percent, or plant cover is similar to adjacent areas not disturbed by the Project construction activities.

5.3 Remedial Action and Maintenance

PLP will address identified erosion problems as soon as practical, based on a comparison and evaluation of conditions outside the restored areas and the original erosion control work. Additional erosion control work will be performed as needed. Temporary erosion control structures, such as sediment barriers, will be removed when sites are deemed stable and restoration is determined to be successful.

Reseeding or replanting efforts, including supplemental mulching, if necessary, will occur in any area where monitoring identifies a restoration failure, particularly where accompanied by observed increases in water erosion.

5.4 Documentation

PLP will document its observations of restoration success following the field inspections and will prepare an annual summary report. Areas needing remedial action will be identified and will include a description of additional erosion controls or restoration work anticipated.

6. References

ADF&G, Alaska Department of Fish and Game. 2005. "Streambank Revegetation and Protection: A Guide for Alaska."

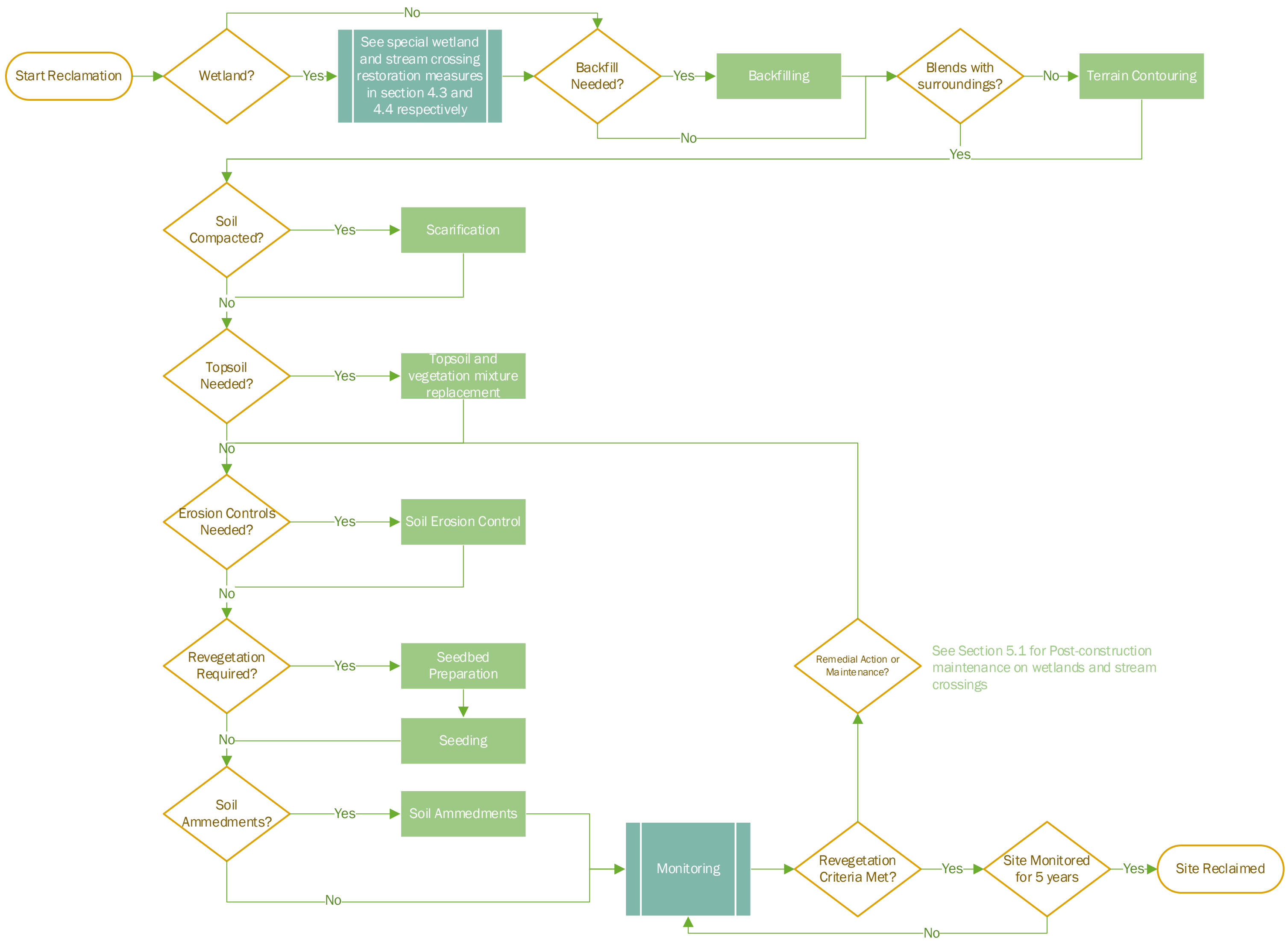
ADNR. 2011. *Alaska Coastal Revegetation & Erosion Control Guide.* Palmer: Alaska Department of Natural Resource Division of Agriculture Alaska Plant Materials Center.

ADNR. 2012. *Interior Alaska Revegetation & Erosion Control Guide.* Palmer: Alaska Department of Natural Resource Division of Agriculture Alaska Plant Materials Center.

PLP. 2018. *The Pebble Project, Project Description.* Anchorage: The Pebble Limited Partnership.

Figures

Figure 1. Restoration Decision Flowchart



M4.0—RECLAMATION AND CLOSURE PLAN

THE PEBBLE PROJECT

RECLAMATION AND CLOSURE PLAN

JULY 25, 2019

Prepared By:

SRK Consulting (U.S.), Inc.
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ACRONYMS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADNR	Alaska Department of Natural Resources
ANCSA	Alaska Native Claims Settlement Act
ANFO	Ammonium nitrate and fuel oil
BLM	Bureau of Land Management
CSIA	Closure Social Impact Assessment
CWD	Contact- Water Dam
EPA	Environmental Protection Agency
HDPE	high- density polyethylene
IDF	Inflow Design Flood
LLDPE	linear low-density polyethylene
LOM	life of mine
ML/ARD	metal leaching/acid rock drainage
ML	metal leaching
MW	megawatt
NAG	non-acid generating
NEPA	National Environmental Policy Act
NFK	North Fork Koktuli
NPAG	non-potentially acid generating
OP	Open Pit
PAG	potentially acid generating
PAG/ML	potentially acid-generating/metal leaching
PLP	Pebble Limited Partnership
PLS	pure live seed
PMP	probable maximum precipitation
PMF	Probably Maximum Flood
RC	reverse circulation
RO	reverse osmosis
SAG	semi-autogenous grinding
SCP	Seepage Control Pond
SFK	South Fork Koktuli
SRCE	Standard Reclamation Cost Estimator Model
SRS	seepage recovery system
SWPPP	Storm Water Pollution Prevention Plan
TSF	Tailings Storage Facility
UTC	Upper Talarik Creek
WRF	waste rock facility
WMP	water management pond
WTP	water treatment plant

UNITS OF MEASURE

acre-ft	43,560 cubic feet or 325,851 gallons
amsl	above mean sea level
cfs	cubic feet per second
cm	centimeter
ft	foot/feet
GPM	gallons per minute
ha	hectares
kg	kilograms
km	kilometers
lb	pounds
m	meter
m^3	cubic meters
m^3/s	cubic meters per second
Mgal	million gallon
ML	million liters
mm	millimeters
Mm^3	million cubic meters
Mst	million short tons
Mt	million tonnes
Myd^3	million cubic yards
PSI	pounds per square inch
st	short tons
t	tonnes
yd^3	cubic yards

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Pebble Limited Partnership (PLP) is proposing to develop the Pebble Project (project), as an open-pit mine. The project is a copper-gold-molybdenum porphyry deposit (Pebble Deposit) located approximately 238 miles southwest of Anchorage, Alaska, and 17 miles northwest of the village of Iliamna. The project location is shown on (Figure 1-1).

The deposit will be mined by Open Pit methods, feeding an associated process plant with a planned average throughput of 180,000 tons per day (tpd), over an operating life of 20 years. The milling process produces two streams of tailings: a Bulk tailings stream and a pyritic tailings stream. The Bulk TSF (Bulk TSF) will manage non-potentially acid generating tailings (Bulk tailings); the Pyritic TSF (Pyritic TSF) will manage pyritic tailings, which are Potentially Acid Generating (PAG), as well as PAG waste rock from the mining activities.

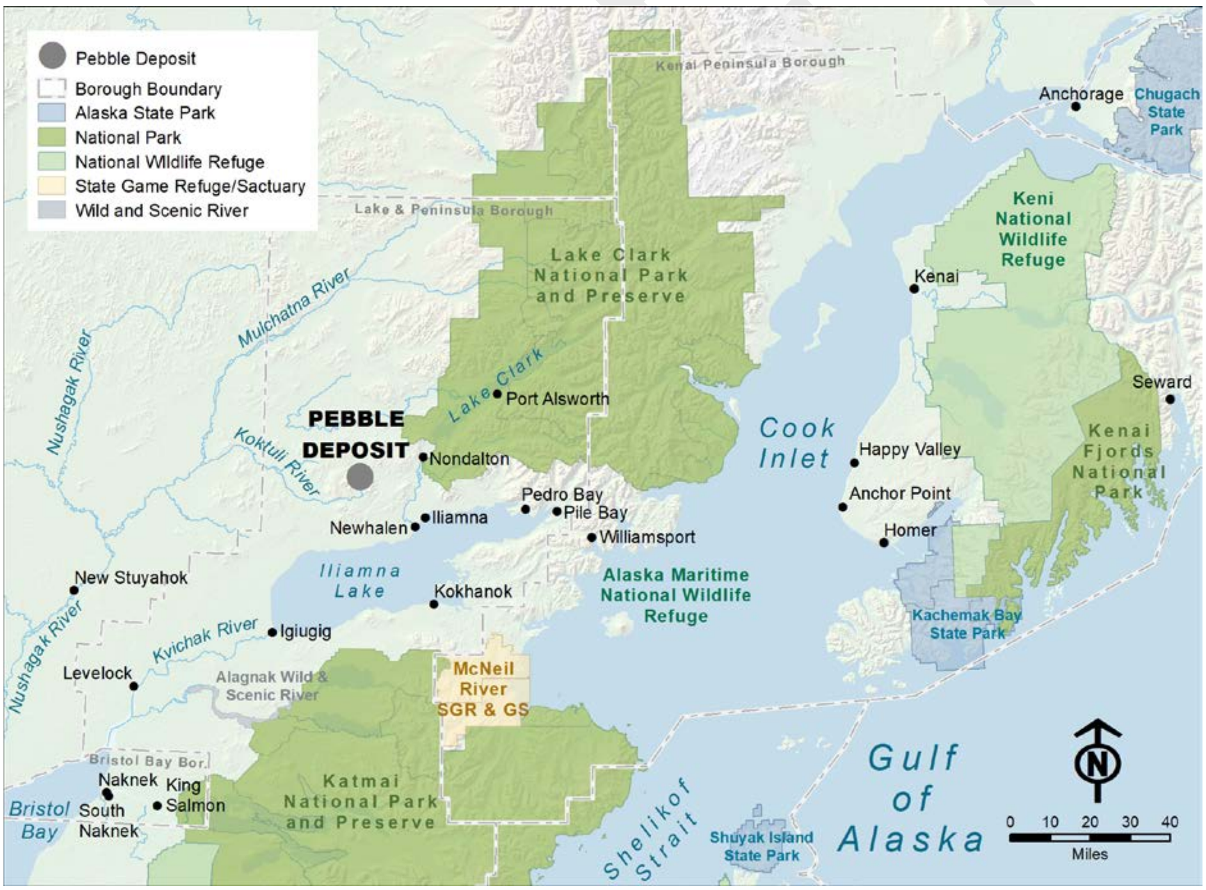


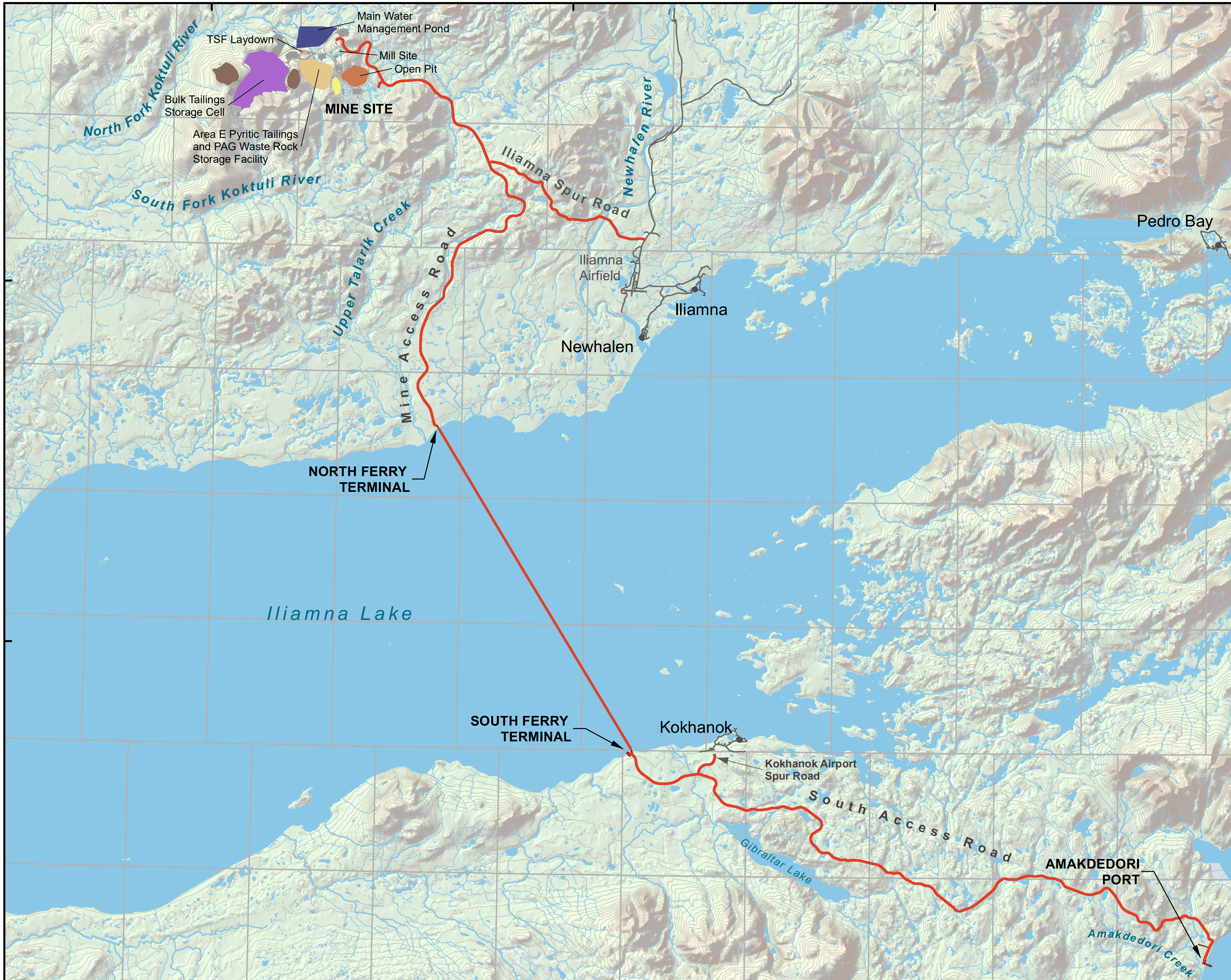
Figure 1-1: Regional Map

The project has four principal components: the mine site, the transportation corridor, the Amakdedori Port, and the natural gas pipeline corridor. The natural gas pipeline corridor is a separate action and is not addressed in this plan. This project also includes these major elements:

- Bulk TSF
- Pyritic TSF
- Open Pit
- Water Management Pond
- Overburden stockpiles
- Quarries
- Diversions and sediment ponds
- Mill and supporting facilities
- Access roads

The maximum footprint of the mine site area is shown on Figure 1-2.

Operation of the mine will begin with a 4-year construction period. Construction will occur on the four principal project components, with the focus shifting between these components depending on the stage of construction. Several temporary elements will be built during a pre-production phase to facilitate construction of the permanent facilities. These temporary facilities will be either repurposed or removed and reclaimed when construction is complete.

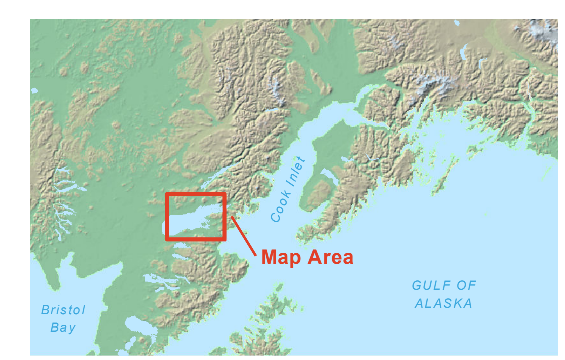


THE pebble PARTNERSHIP

FIGURE 1-2

Project Area

- Bulk Tailings Storage Cell
- Water Managment Pond
- TSF Laydown
- Area E Pyritic Tailings and PAG Waste Rock Storage Facility
- Open Pit
- Overburden Stockpile
- Mill Site Process Plant
- Quarry
- Port Site Features
- Transportation Corridor
- Local Roads
- Township Boundary



0 3 6 9 12 Miles

N

Scale 1:300,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: PLP_RP_ProjectArea.mxd	Date: 6/6/2019
Version: x	Author: HDR

Prior to commencing construction, the project's Reclamation and Closure Plan and associated financial assurance mechanisms will be approved by the Alaska Department of Natural Resources (ADNR) and the Alaska Department of Environmental Conservation (ADEC). The Reclamation and Closure Plan and financial assurance obligations will be updated on a 5-year cycle, in accordance with regulatory requirements, to address any changes in closure and post-closure requirements and cost obligations.

At the end of operations, mine facilities will be closed and reclaimed according to permit conditions. Closure is planned to be completed in phases: physical reclamation is scheduled for a period of 20 years; it will be followed by long-term post-closure monitoring and water management. Closure will include the following major actions:

- All production-related facilities will be decommissioned.
- Waste rock and tailings material will be removed from the Pyritic TSF and placed in the pit; the facility will be reclaimed by removing the liner, breaching and regrading the embankments, and covering the disturbed area with growth medium.
- The Bulk TSF will be covered with a low-permeability cover and will be capped with a layer of non-potentially acid-generating waste rock sourced from the embankments of Pyritic TSF and a layer of growth medium.
- The water management pond will be reclaimed by removing the liner, breaching and regrading the embankment, and covering the disturbed area with growth medium.
- The quarries will be reclaimed by sloping, covering with growth medium, and revegetating the disturbed area.

1.2 Environmental Setting

The proposed mine site is located at an elevation of approximately 1,000 ft amsl. Terrain in the mine site area features rolling hills and low mountains that are separated by wide shallow valleys that are blanketed with glacial deposits and drained by numerous streams and small shallow lakes. The deposit is located at the head of two drainages: South Fork Koktuli (SFK) River and Upper Talarik Creek (UTC). The SFK and UTC are tributaries of the North Fork Koktuli (NFK). The NFK drains southwest to the Mulchatna River and then into the Nushagak River. The UTC, which drains the eastern portion of the deposit area, flows directly into Lake Iliamna.

1.3 Purpose

The purpose of this Reclamation and Closure Plan (Plan) is to provide guidelines for implementing stabilization and reclamation procedures for the various facilities associated with the proposed project. These guidelines are based on the best available reclamation technologies and on State regulations for mine reclamation (as outlined in Section 1.4). PLP is committed to performing concurrent reclamation of portions of the site during operations whenever possible. The reclamation techniques outlined in this plan may be modified as actual reclamation data become available from field reclamation of individual facilities or from reclamation test plots.

Revisions to this Plan will be made to address changes in the design, construction, operations, and concurrent stabilization and reclamation of the facility.

This approach will accomplish the following objectives:

- Allow new design information to be incorporated as the project develops.
- Reflect changes in the operating plans and mining schedule.
- Account for the stabilization and reclamation of previous phases or of specific components of the facility.
- Incorporate new information and operating experience developed during the initial phases of the project.
- Allow new reclamation techniques to be incorporated as they are developed.

Table 1-1 provides a record of changes to this Plan.

Table 1-1: Record of Changes and Amendments

Date	Section(s) Revised or Amended

1.4 APPLICABLE REGULATIONS

The sections below outline and summarize the regulations that apply to the reclamation and closure of the project.

1.4.1 ALASKA RECLAMATION AND CLOSURE REQUIREMENTS

Reclamation and Closure of the proposed PLP project falls under the jurisdiction of the Alaska Department of Natural Resources (ADNR), Division of Mining, Land, and Water, and the Alaska Department of Environmental Conservation (ADEC).

1.4.1.1 Alaska Department of Natural Resources

Alaska Statute (AS) 27.19, the Reclamation Act, applies to state, federal, municipal, and private land and water subject to mining operations. This statute is administered by the commissioner of ADNR. The Reclamation Act states that "a mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition"; 11 AAC 97.240 further states: "a miner shall reclaim a mined area that has potential to generate acid rock drainage (acid mine drainage) in a manner that prevents the generation of acid rock drainage or prevents the offsite discharge of acid rock drainage."

An approved reclamation plan is required by the State mining regulations (11 AAC 97.300 – 97.350). The reclamation plan does not become effective until a performance bond is in place, except for certain small operations. The performance bond amount shall be set at a level not more than an amount reasonably necessary to ensure the faithful performance of the requirements of the reclamation plan. Alaska Administrative Code 11 AAC 97 Mining Reclamation applies to the approval of reclamation plans, reclamation bonding, and enforcement of reclamation requirements under AS 27.19 for locatable, leasable, and material mining operations on state, federal, municipal, and private land. Nothing in the Reclamation Act precludes a federal or state agency (including ADNR), acting under its own regulatory or proprietary authority, from establishing and enforcing additional requirements or higher standards for reclamation. The Reclamation Performance Standards are defined in 11 AAC 97.200.

An amendment to the State Dam Safety Regulation (11 AAC 93) in 2004 also has a financial assurance requirement:

> *"… the owner must provide a performance bond or other financial assurance adequate to provide sufficient money to pay for the costs of safely breaching the dam at the end of the dam's service life and restoring the stream channel and reservoir land to natural conditions, or for the costs of performing reclamation and post-closure monitoring and maintenance."*

1.4.1.2 Alaska Department of Environmental Conservation

ADEC Solid Waste Permit regulations (18 AAC 60.265) have comprehensive requirements for closure and reclamation planning, including provision for funding for long-term water treatment. Specifically, 18 AAC 60.265 states the following:

> *"...(ADEC) will require proof of financial responsibility to cover the cost of closing a landfill and, if monitoring is required, the cost of post closure monitoring, if the department determines proof of financial responsibility is necessary to protect the public health, safety, welfare, or the environment. Proof of financial responsibility under this section may be demonstrated by self-insurance, insurance, surety, or other guarantee approved by the department to assure compliance applicable closure standards and post closure monitoring requirements."*

2 APPLICANT INFORMATION

2.1 LAND STATUS

The Pebble Deposit is located on patented state land specifically designated for mineral exploration and development. The Pebble Deposit straddles portions of three management units described in the Alaska Department of Natural Resources (ADNR) 2005 *Bristol Bay Area Plan* (amended 2013). These management units, known as R06-23 (Pebble), R06-24 (Pebble Streams), and R10-02 (Pebble 2), total 110,080 acres and are designated for mineral extraction. This designation allows for mineral exploration and development with oversight from ADNR. The management intent for all three units also stresses the need to protect the anadromous fish streams in the upper Koktuli River corridor and to minimize or avoid effects from mining on habitat and recreational activities near the upper reaches of the Upper Talarik Creek (UTC).

The Pebble Deposit lies within a 417-square-mile claim block held by subsidiaries of PLP. All lands within the claim block are owned by the State of Alaska. Surface rights may be acquired from the state government once areas required for mine development have been determined and permits awarded. The transportation corridor crosses both state land and land patented under the Alaska Native Claims Settlement Act (ANCSA) belonging to the Alaska Peninsula Corporation and Iliamna Natives Limited..

The land ownership in the project area is shown on Figure 2-1.

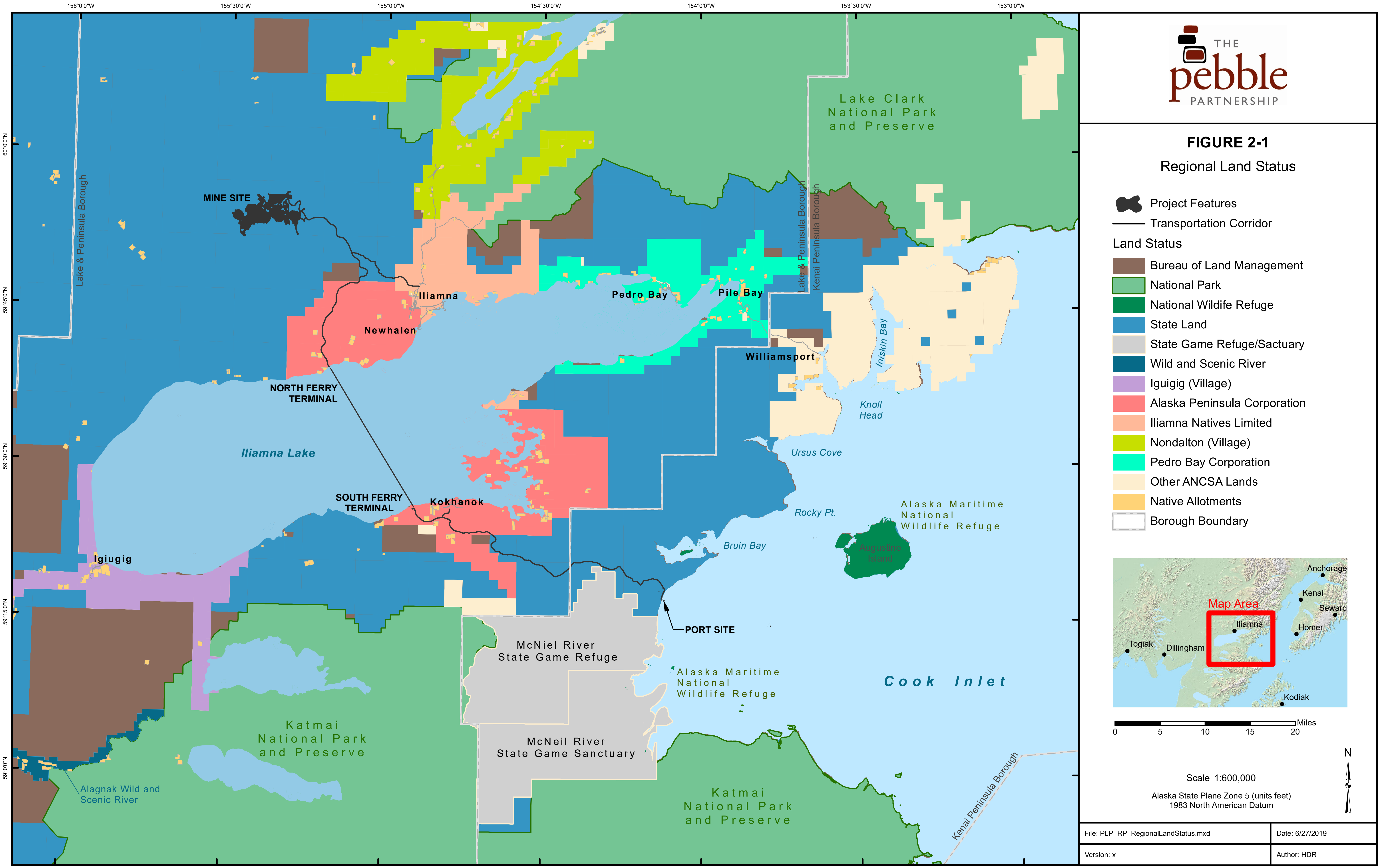


FIGURE 2-1
Regional Land Status

2.2 SURFACE AND MINERAL LEASE INFORMATION

Information on lease status for the proposed project is listed in Appendix A.

2.3 CORPORATION OFFICER COMPLETING APPLICATION

Name: TBD

Title:

Telephone:

Date:

2.4 DESIGNATED CONTACT PERSON

Name: James Fueg

Title: Vice President - Permitting

Telephone: (907) 339-2600

2.5 CORPORATE INFORMATION

Business Name: Pebble Limited Partnership

Address: 3201 C ST., Suite 505, Anchorage, AK 99503

Telephone: (907) 339-2600

General Manager: Tom Collier

2.6 ALASKA REGISTERED AGENT

Name: N/A

Address:

3 PROJECT DESCRIPTION

3.1 OPERATING PLAN

The proposed mine will be a conventional drill, blast, truck and shovel operation with a mining rate peaking at 90 million tons per year. The mining operations will be performed 24 hours per day and *365 days per year. The estimated life-of-mine quantity of mined material is shown in Table 3-1.*

Table 3-1: Mining Material Type and Volume

Mining Period	***Material Type***	***Quantity (M-tons)***
Pre-production	*Overburden*	*21.5*
	PAG Waste Rock	*11.6*
Production	*Overburden*	*68*
	Ore	*1,291*
	Non-PAG Waste Rock	*13*
	PAG Waste Rock	*39*

Source: (Pebble Limited Partnership, 2018)

The pre-production phase will consist of developing the site access roads and transportation and mine infrastructure. Once supporting infrastructure is developed, dewatering the pit area and mining of the non-economic materials that overlie the mineralized material will commence. Approximately 33 M-tons of material will be excavated during this phase. A plan of the mine site is shown on (Figure 3-1).

Mining will commence after completion of the construction phase and will continue for 20 years. Over the life of mine, approximately 1,291 Mt of ore, 13 Mt of Non-PAG waste rock, and 29 Mt of PAG waste rock will be mined.

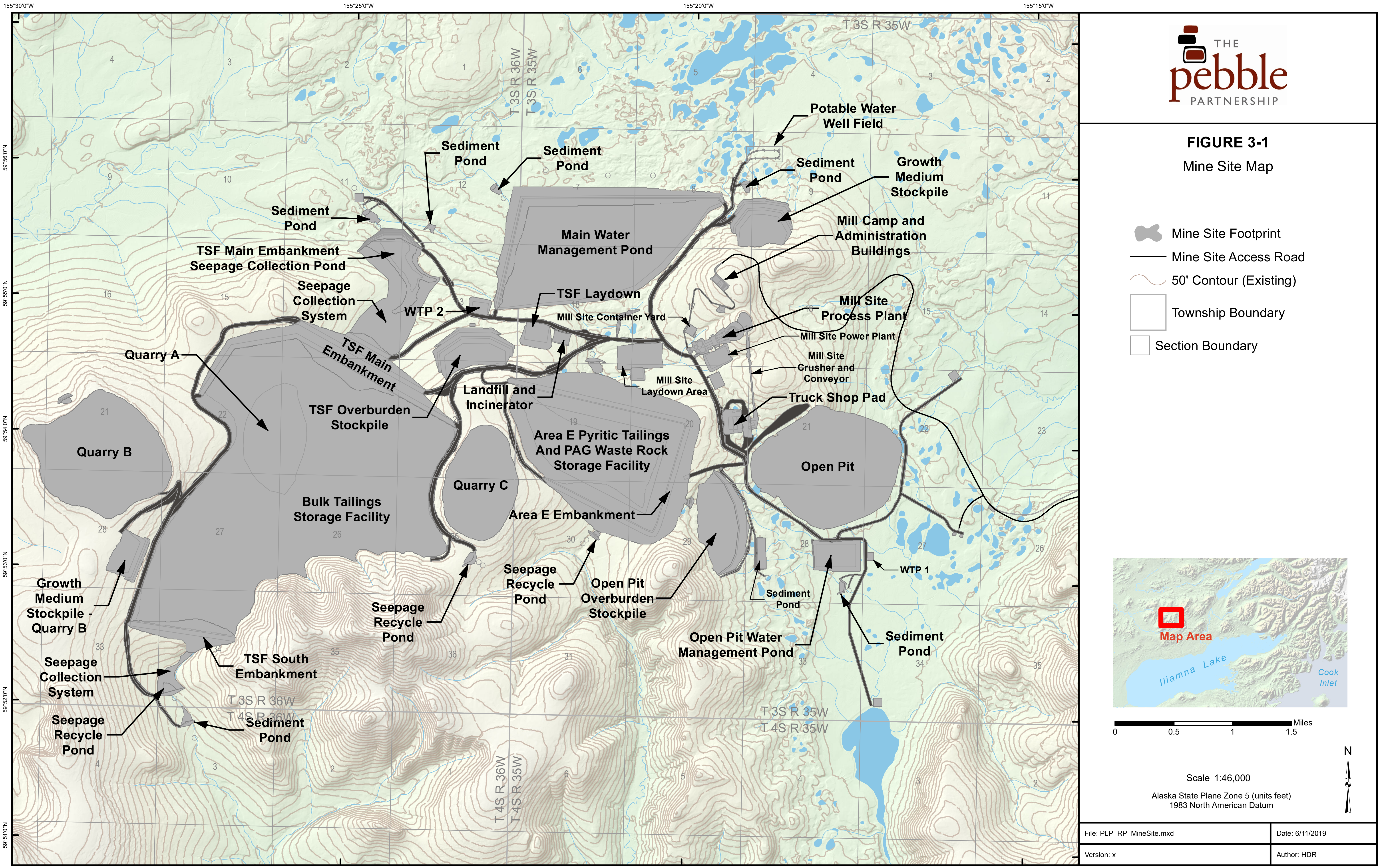


FIGURE 3-1
Mine Site Map

3.2 MINING

3.2.1 METHODS AND PHASING

The Pebble Mine will be a conventional drill, blast, truck and shovel operation with an average mining rate of 70 million tons per year. The Open Pit and mine facilities are shown on Figure 3-2.

The Open Pit will be developed in stages, with each stage expanding the area and deepening the previous stage. The final dimensions of the Open Pit will be approximately 6,800 feet long and 5,600 feet wide, with depths to 1,970 feet.

The production phase is planned to last for 20 years. Mineralized material will be mined and fed through the process plant at a rate of 180,000 tons/day. The Open Pit will be mined in a sequence of increasingly larger and deeper stages. A projected 1.45 billion tons of material will be mined during the Production Phase.

3.2.2 BLASTING

Most open-pit blasting will be conducted using emulsion blasting agents manufactured on site. In dry conditions, a blend of ammonium nitrate and fuel oil (ANFO) can be used as the blasting agent. However, most ammonium nitrate will be converted to an emulsion blasting agent because of its higher density and superior water resistance. Other explosive materials used at the site include high explosives boosters, packaged high explosives, and detonators. These will be stored in accordance with Mine Safety and Health Administration (MSHA) regulations.

3.3 WASTE ROCK AND OVERBURDEN STORAGE

Waste rock is defined as the mined material with a metal content below an economically recoverable level that is removed from the Open Pit, exposing the higher-grade production material. Waste rock will be sorted by its potential to generate acid. Non-potentially acid generating (Non-PAG) and non-metal leaching (ML) waste rock may be used for embankment construction. PAG and ML waste rock will be stored in the pyritic TSF until mine closure when it will be backhauled into the Open Pit. Quantities of mined material are outlined in *Table 3-1* above.

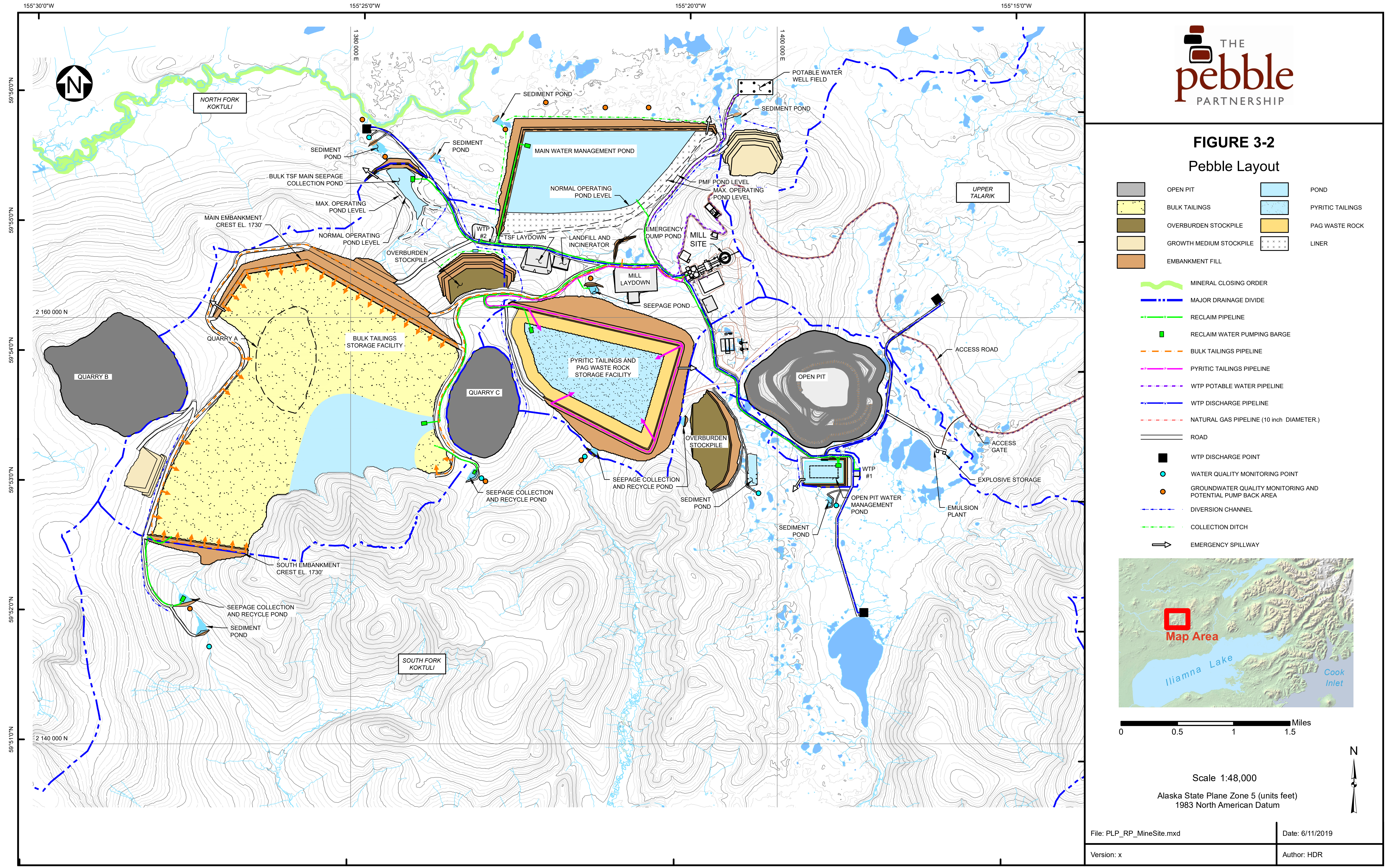


FIGURE 3-2

Pebble Layout

3.4 MINERAL PROCESSING

Mineral processing facilities will be located at the mine site. Blasted mineralized material from the Open Pit will be fed to a crushing plant to reduce the maximum particle size to approximately six inches. This crushed material will be conveyed to a coarse ore stockpile, which in turn will feed a grinding plant located in the process plant. In the grinding plant, semi-autogenous grinding (SAG) mills and ball mills further reduce the plant feed to the consistency of very fine sand. The next step is froth flotation, in which the copper and molybdenum minerals are separated from the unmineralized material to produce concentrates. Multiple stages of froth flotation are utilized. The concentrates are then filtered for shipment. Gravity concentrators will be placed at strategic locations in the milling procedure to recover free gold, which will be shipped off-site for refining.

Over the life of the project, approximately 1.3 billion tons of mineralized material will be fed to the process plant at a rate of 180,000 tons/day. On average, the process plant will produce approximately 613,000 tons of copper-gold concentrate per year containing approximately 318 million pounds of copper, 362,000 ounces of gold, and 1.8 million ounces of silver, and approximately 15,000 tons of molybdenum concentrate containing about 14 million pounds of molybdenum.

Processing mineralized material to recover copper, gold, and molybdenum will produce two types of tailings: Bulk flotation and pyritic. Bulk flotation tailings will be pumped to the Bulk tailings thickener, where flocculant will be added as necessary to help the settling process. Tailings thickener underflow, at approximately 55 percent solids, will be pumped to the Bulk TSF. The pyritic tailings will be thickened, mixed with water treatment plant (WTP) sludge, and pumped to the pyritic TSF. The overflow streams from each thickener will be returned to the process. Supernatant water in the Bulk and pyritic TSFs will be reclaimed to the Main WMP. Some of this water will be pumped to the process water tank for re-use in the process plant. Any surplus water will be treated in the WTP and discharged.

3.5 TAILINGS AND WATER MANAGEMENT FACILITIES

Separate TSFs will be constructed for the Bulk and pyritic tailings; they will be located primarily within the NFK watershed (Figure 3-2). Total TSF capacity will be sufficient to store the 20-year mine life tailings volume (1.3 billion tons). Approximately 88 percent (1,140 million tons) of the tailings will be Bulk tailings, and approximately 12 percent (155 million tons) will be pyritic tailings.

3.5.1 BULK TSF

The Bulk TSF, measuring approximately 2,796 acres, can manage approximately 1.1 billion tons of Bulk tailings solids. The material for the starter embankments will be sourced from a quarry located within the impoundment area. The Bulk TSF embankments will be raised progressively during the mine life. After the quarry within the impoundment is inundated with tailings, material will be sourced from two quarries immediately west and east of the impoundment.

The main embankment will be constructed using the centerline construction method. Downstream embankment slopes will be constructed and maintained at approximately 2.6H:1V including buttresses established at the downstream toe of the main embankment, with an embankment height measured from the lowest downstream slope elevation of 545 feet. The earthfill/rockfill embankment will include engineered filter zones and a crushed or processed aggregate drain at the topographic low point. This drain will provide a preferable seepage path from the tailings mass to downstream of the embankment toe. Additional underdrains running parallel to the embankment will allow for drainage of seepage collected along the embankment.

The south embankment will be constructed using the downstream construction method to facilitate lining of the upstream face, which is constructed at a 3H:1V slope. The downstream slope will be at 2.6H:1V. The embankment height measured from the lowest downstream slope will be 300 feet. The earthfill/rockfill embankment will include engineered filter zones and a grout curtain to reduce seepage below the embankment.

3.5.2 Pyritic Tailings and PAG Waste Rock Storage Facility

The pyritic TSF will be fully lined, will cover an area of approximately 1,071 acres, and will have three embankments: north, south, and east. The starter embankments will be constructed as part of the initial TSF construction. The pyritic TSF, which will also contain the PAG waste, will have a full water cover during operations.

PAG waste rock will be placed in a ring around the interior of the pyritic TSF. Pyritic tailings from the cleaner scavenger flotation circuit will be discharged into the pyritic TSF at subaqueous discharge points. The subaqueous discharge is necessary to prevent oxidation and potential acid generation.

The pyritic TSF embankment slopes will be constructed at 2.6H:1V. The final crest elevation will be 1,710 feet amsl. The north embankment height will be 425 feet, the south embankment height will be 305 feet, and the east embankment height will be 315 feet.

The embankments will be constructed using the downstream method with an overall downstream slope of 2.6H:1V. The embankments will be constructed using select borrow materials and include a liner bedding layer, overlain by a liner on the upstream slope and over the entire internal basin. Basin underdrains will collect and convey any seepage to the downstream seepage collection ponds.

3.5.3 Main Water Management Pond

The Main Water Management Pond (WMP) will provide water storage surge capacity for the mine site. The Main WMP (approximately 955 acres) will be a fully lined facility. The embankment will be constructed using quarried rockfill materials and founded on competent bedrock. The embankment will be approximately 190 ft high with an overall downstream slope of approximately 2H:1V and an upstream slope of 3H:1V to accommodate the liner (US ACE, 2019). In addition to the geomembrane liner, the embankment will include a filter/transition zone. The basin and upstream embankment face will include a layer of materials placed on top of the liner to provide ice protection during freezing conditions. The Main WMP will include an emergency spillway.

3.5.4 Open Pit Water Management Pond

The Open Pit WMP will provide water storage capacity for the Open Pit. The Open Pit WMP will be a fully lined facility with an emergency spillway.

3.5.5 BULK TSF SEEPAGE COLLECTION POND

The Bulk TSF Main seepage control pond (SCP) is the main seepage collection system for the Bulk TSF and will be used to manage seepage and runoff flows from Bulk TSF's main embankment. The Bulk TSF Main SCP has a maximum pond volume capacity of 3,000 acre-ft to manage the seepage and runoff from the Bulk TSF main embankment and will have an emergency spillway.

3.6 TRANSPORTATION INFRASTRUCTURE

The proposed road infrastructure is classified into three categories: main access roads, haul roads, and service roads.

3.6.1 MINE ACCESS ROADS

The main access road will be constructed as a private, all-weather, permanent gravel surface road with a 30 ft running surface, capable of supporting anticipated development and operational activities. It will run southward from the mine site to the north shore of Iliamna Lake (30 miles). Ferry terminals will be located on the north and south shores of the lake. From the south shore of the lake, the access road will run to the marine port site on Cook Inlet at Amakdedori (35 miles). Spur roads will connect to the villages of Iliamna, Newhalen, and Kokhanok (Figure 3-3 and Figure 3-4) to provide access to the airports and for crew transport.

The access roads will include nine bridges, seven of which will be single-span, two-lane bridges that range in length from approximately 90 to 170 feet. There will be one large (550 feet) multi-span, two-lane bridge across the Newhalen River and one large (455 feet) multi-span, two-lane bridge across the Gibraltar River. A natural gas pipeline and fiber-optic cable will be buried adjacent to the main access road.

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FIGURE 3-3
Transportation Facilities
North of Lake

Access Road and Material Site Footprints
Water Extraction Site
Bridge
Culvert
Mine Site and Ferry Terminal Features
Township Boundary
Stream
Lake

0 1 2 3 4 Miles

N

Scale 1:126,720

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: PLP_RP_MineAccessRoad_NorthFerry_Mine.mxd	Date: 5/30/2019
Version: x	Author: HDR

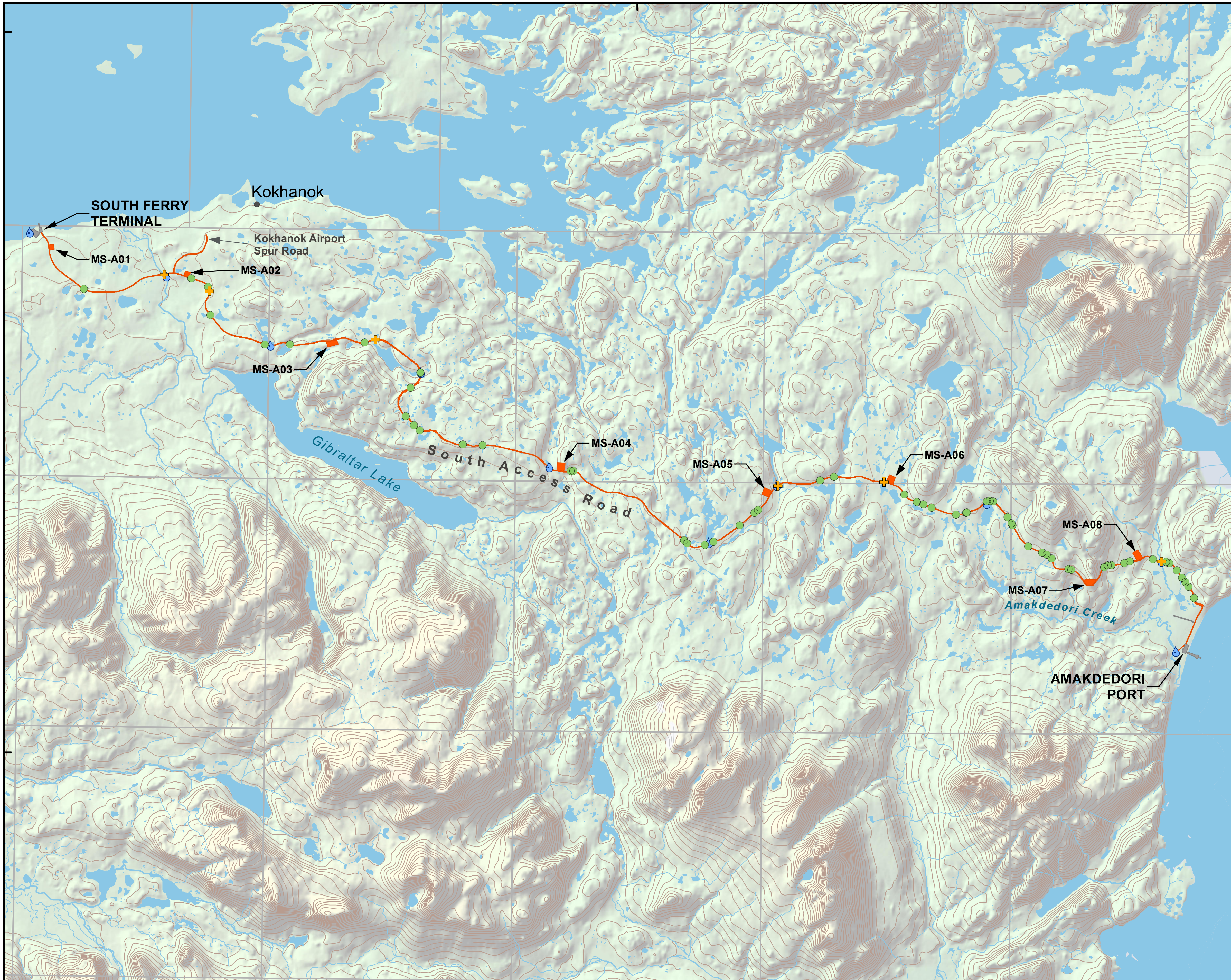

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FIGURE 3-4

Transportation Facilities

South of Lake

- Access Road and Material Site Footprints
- Water Extraction Site
- Bridge
- Culvert
- Port and Ferry Terminal Features
- Township Boundary
- Stream
- Lake

0 1.5 3 4.5 6 Miles

N

Scale 1:150,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File:	Date: 5/30/2019
Version: x	Author: HDR

3.6.2 HAUL ROADS

Gravel-surfaced haul roads will be located at the mine site and will connect the various project elements with the Open Pit. The running width of these roads will be 110 feet and will include a 10-foot-high earthen berms on both sides. These roads will be used by large haul vehicles for hauling mineralized material or waste material.

3.6.3 SERVICE ROADS

Service roads will provide on-site access to mine infrastructure: the emulsion plant, explosives magazine, WTPs and conveyor systems. The vehicles anticipated to use these roads will be light/medium-duty trucks and service vehicles. Approximately three miles of service roads will be constructed. The typical running width will be 30 ft but, in some cases, may be narrower depending on intended usage.

3.6.4 WATER EXTRACTION SITES

Water extraction from sources along the transportation corridor will be used to support project water needs during construction and operations. Water extraction sites may require turnouts or short road sections for access. The roads will be designed as all-season access gravel roads.

3.6.5 MATERIAL EXTRACTION SITES

Construction materials will be excavated from various locations along the transportation corridor. Material from these sites will be used for road and pipeline construction. Some sites will be located adjacent to the road and some might need to be accessed by short road sections. The roads will be designed as all-season access gravel roads.

3.6.6 ILIAMNA LAKE FERRY

A custom-designed ferry will transit Iliamna Lake between the North and South ferry terminals, carrying inbound supplies from the Amakdedori Port to the mine site and returning with copper-gold and molybdenum concentrates and other freight. (e.g., empty shipping containers, equipment to be rebuilt off-site, recyclable products, etc.). The North Ferry Terminal is shown on Figure 3-5 and the South ferry terminal is shown on Figure 3-6 .

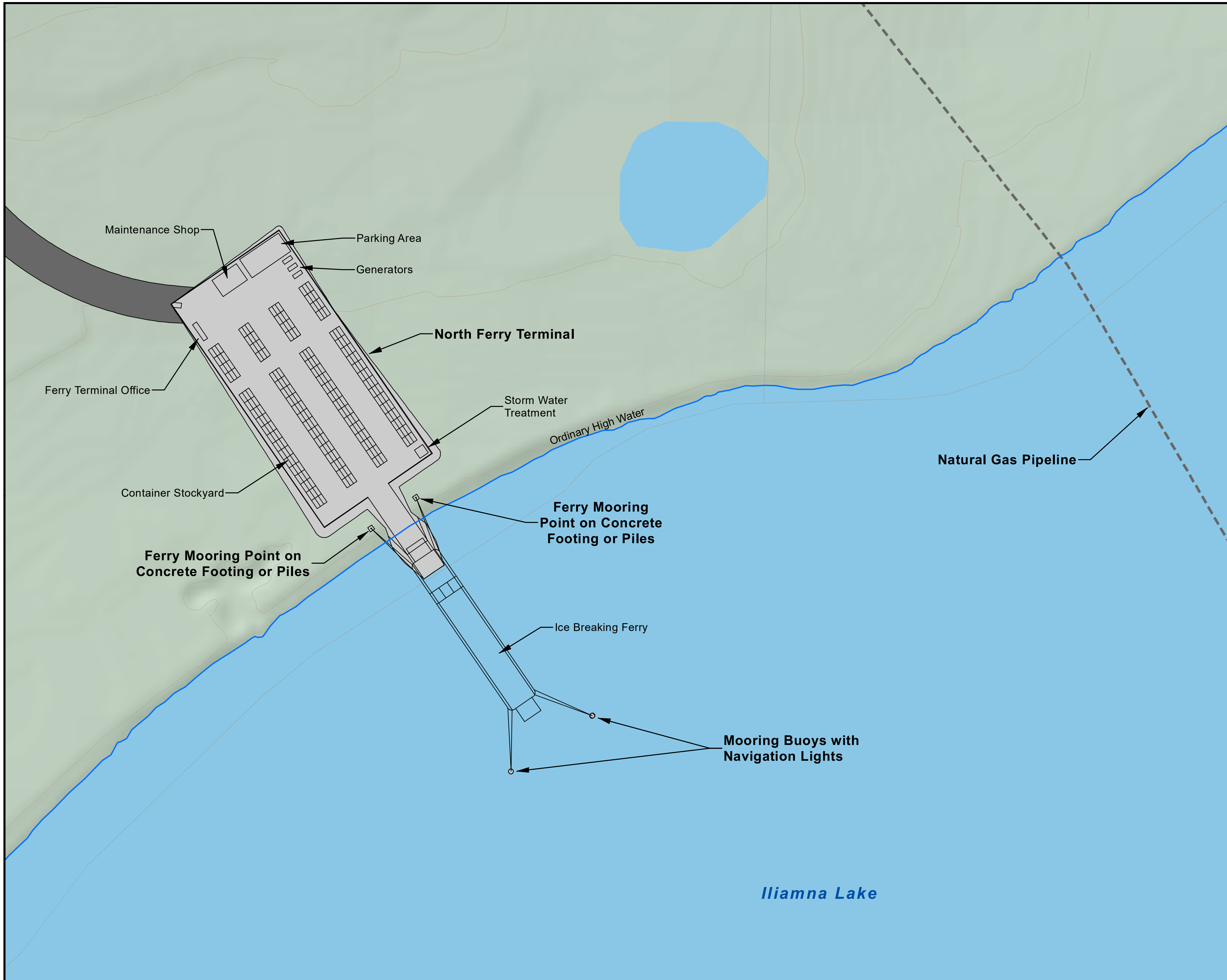

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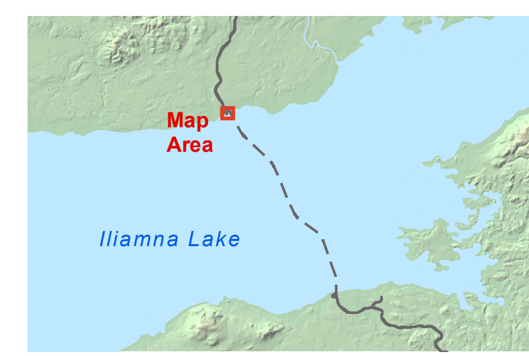
FIGURE 3-5 North Ferry Terminal

North Ferry Terminal Footprint
Transportation Corridor
Natural Gas Pipeline
Ordinary High Water



0 200 400 Feet

N

Scale 1:2,400

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: PLP_RP_NorthFerry.mxd	Date: 6/11/2019
Version: x	Author: HDR

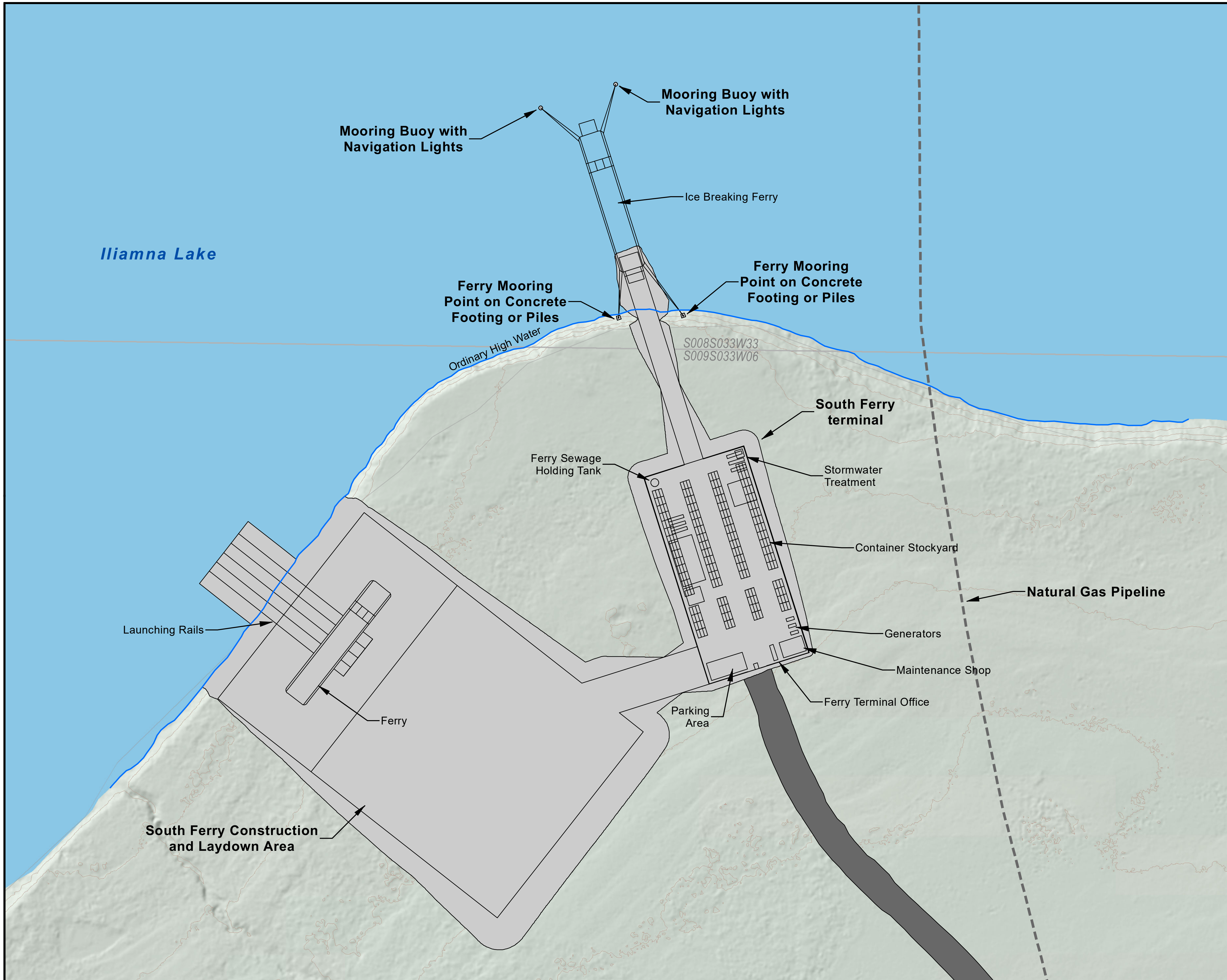
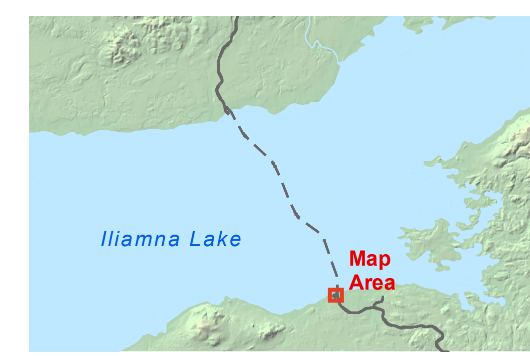


FIGURE 3-6

South Ferry Terminal

- South Ferry Terminal Footprint
- Transportation Corridor
- Natural Gas Pipeline
- Ordinary High Water



0 250 500 Feet

Scale 1:3,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

N

File: PLP_RP_SouthFerry.mxd	Date: 6/11/2019
Version: x	Author: HDR

The permanent facilities at the ferry terminals include container handling and storage facilities, office and maintenance buildings, and local power supply. Each ferry terminal facility will have space for a minimum of two days of storage of the average concentrate container traffic. The patio surface will be finished as semipermeable gravel. An access ramp will be built out from shore as a rock and aggregate causeway structure to provide approximately 40 feet of roadway surface width for trucks and forklifts to access the ferry.

3.7 Amakdedori Port and Lightering[1] Locations

A port will be constructed at Amakdedori on the west side of Cook Inlet. The port will be capable of accommodating tugs and barges that are used to lighter concentrate out to Handymax-sized carriers and marine linehaul tugs and barges bringing fuel and supplies to the port. The port facilities layout is shown on Figure 3-7.

The shore-based complex will be constructed on an engineered-fill pad at an elevation sufficient to address tidal surge from major storms and potential tsunamis. The marine component includes an earthen access causeway extending out to a marine jetty located in 15 feet of natural water depth. On one side will be a roll-on/roll-off barge access berth, and a separate berth will be located on the opposite side for the lightering barges. The jetty is expected to be constructed as a sheet pile cellular structure filled with granular material. A floating dock, on the jetty but separate from the cargo handling berths, will be provided for mooring the ice-breaking tugs.

[1] Lightering or lighterage: the transport or transfer of goods using a lighter (usually a flat-bottomed boat).

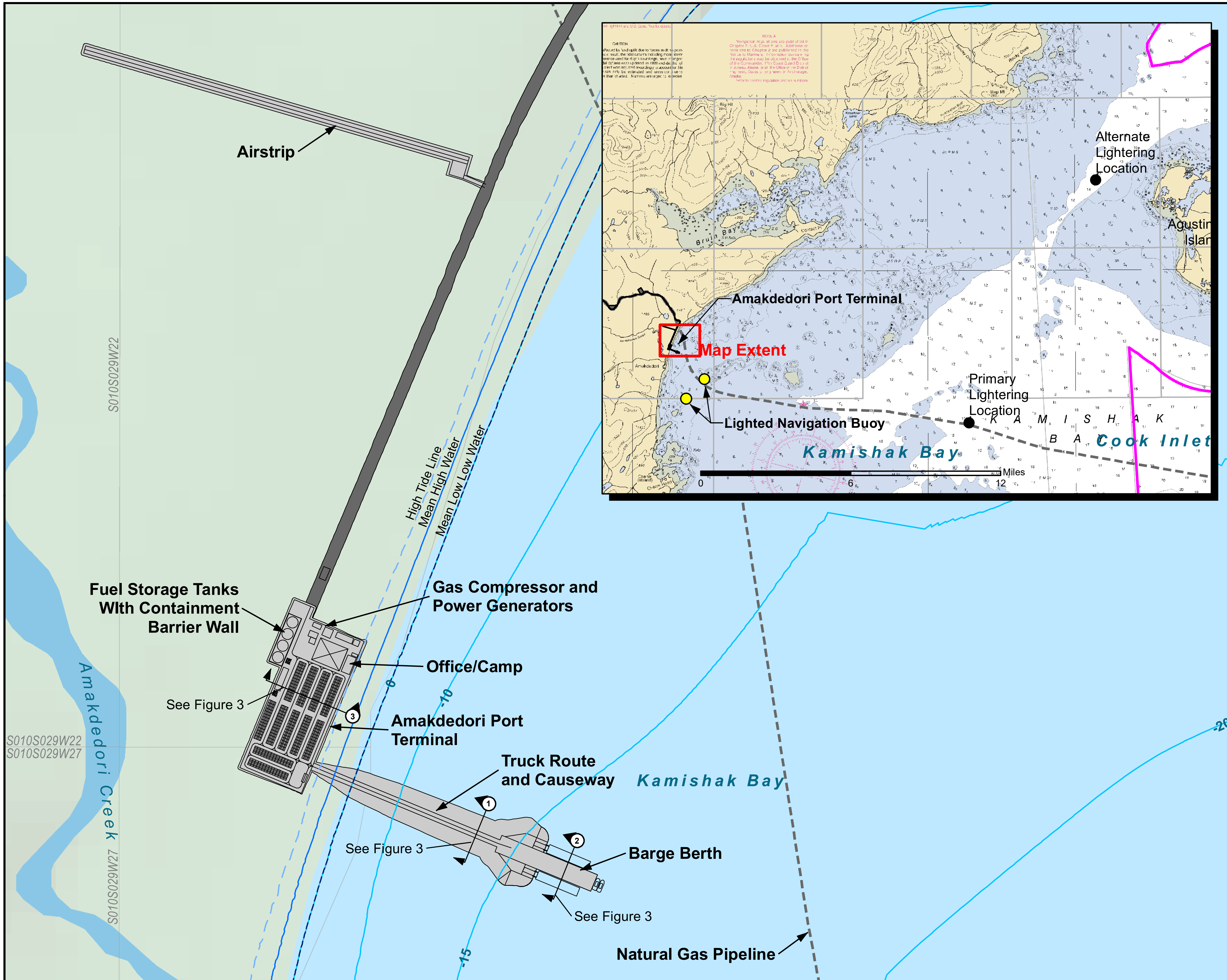


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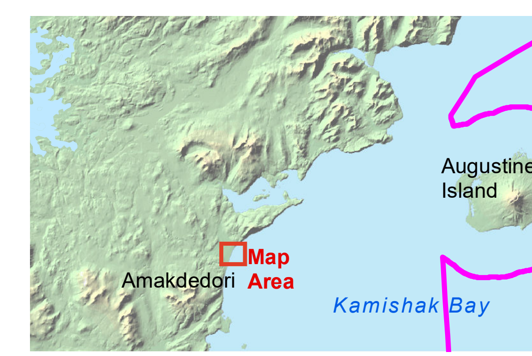
FIGURE 3-7

AMAKDEDORI PORT AND LIGHTERING LOCATIONS

- Amakdedori Port Site Footprint
- Primary / Alternate Lightering Locations
- Lighted Navigation Buoy
- Transportation Corridor
- Natural Gas Pipeline
- High Tide Line
- Mean High Water
- Mean Low Low Water (MLLW)
- Bathymetric Contours (Feet from MLLW)*
- State Seaward Boundary

*Offshore contours developed from Terrasond bathymetric survey dated August 20 to 27, 2017. Elevations surveyed to geodetic datum (GEOID 99) and are shifted to mean lower low water (MLLW) level based on limited field measured tidal data. Preliminary shift between geodetic and MLLW is +8.37' (0' geodetic = 8.37' MLLW)



0 500 1,000 Feet

N

NMFS Biological Assessment

Scale 1:8,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: PLP_RP_AmakdedoriPort.mxd	Date: 6/11/2019
Version: x	Author: HDR

3.8 QUARRIES

Rock needed for construction of the water management and tailings storage facilities will be excavated from the three quarries that are located within and adjacent to the Bulk TSF. The quarries will be operated as conventional drill/blast, truck/shovel operations, with operations coinciding with the demand for rock which is expected to occur throughout most of the year. Quarry operation will commence with construction of access to the sites and will proceed with removal and stockpiling of topsoil for later use as growth medium. Overburden and weathered bedrock will be removed and stockpiled or placed back into unused portions of the quarry. Mining on each bench will commence from the side away from the Bulk TSF and proceeds towards it; the benches will be mined on a slight gradient to ensure water drainage to collection ditches and sediment control ponds, thus facilitating release of precipitation to the environment.

3.9 STOCKPILES

Prior to construction of facilities requiring surface disturbance, growth medium and overburden will be salvaged from the footprint. The overburden will be segregated and stockpiled in a dedicated location southwest of the Open Pit. A berm built of non-mineralized rock will surround the overburden to contain the material and increase stability. Overburden materials deemed suitable will be used for construction. Fine- and coarse-grained soils suitable for plant growth will be stockpiled for later use as growth medium during reclamation. Growth medium stockpiles will be stored at various locations around the mine site and will be stabilized to minimize erosion potential.

3.10 INFRASTRUCTURE

Due to the remote location and the absence of existing infrastructure, the Project will be required to provide basic infrastructure, as well as the support facilities typically associated with mining operations. These facilities require reasonable access from the Pebble Deposit, and they have been situated foremost for stability and safety. Figure 3-2 shows the mine site layout.

3.10.1 POWER GENERATION AND DISTRIBUTION

The plant will have an installed nameplate capacity of 270 MW and will use high-efficiency combustion turbine generators operating in a combined-cycle configuration. The units will be fired by natural gas provided to the site via pipeline.

Emergency backup power for the mine site will be provided by both standby and prime-rated diesel generators connected into electrical equipment at areas where power is required to ensure personnel safety, avoid the release of contaminants to the environment, and allow for the managed shutdown and/or ongoing operation of process-related equipment.

3.10.2 BUILDINGS

3.10.2.1 Camp

The main construction camp will be built as a double-occupancy configuration to accommodate 2,700 workers. Approximately half of this facility will later be refurbished for 1,300 permanent single-occupancy rooms for the operations phase. The dormitory modules will be connected with field-constructed or prefabricated fire-rated egress corridors and will comply with all building and fire code requirements. The camp will include dormitories, kitchen and dining facilities, incinerator, recreation facilities, check-in and check-out areas, administrative offices, and first aid facilities. Covered corridors will be provided to connect the dormitories with the rest of the camp facility.

3.10.2.2 Truck Shop and Lubricant Storage Building

The truck shop complex at the mine site will consist of a structural steel pre-engineered building designed to accommodate facilities for repair, maintenance, and rebuilding of both open-pit mining equipment and light vehicles. The facility will house storage space for spare parts and consumables as well as offices for the mine supervisors, mine engineers, and planning staff. Change facilities for mine personnel will also be provided.

The lubricant storage area will house tanks for approximately one month’s supply of lubricants, coolants, and waste oil for the mining and plant-support equipment fleet. This building will be located approximately near the truck shop. TA separate bermed exterior storage facility will be provided for waste oil and spent coolants. The lubricant storage building will be furnished with loading/unloading arms and pumps.

3.10.2.3 Main Warehouse

The warehouse will be a rectangular, single-story, pre-engineered building on the north side of the process building.

3.10.2.4 Administration Building

The administration building at the mine site will be a two-story pre-engineered building located adjacent to the permanent camp. A total of 166 offices and cubicles will be provided for mine management and supervisory staff, as well as for human resources, accounting, procurement, information technology (IT), and safety staff. The building will be clad with insulated profiled steel and founded on spread footings on soil.

3.10.2.5 Process Administration

Administration offices for the process plant will be located within the process building and will include offices, conference rooms, a lunch room, open working areas, and washroom facilities.

3.10.2.6 Laboratories

Two laboratories will operate at the mine site during the production phase – a metallurgical laboratory to support process operations and an assay laboratory to provide operating data for the process plant and to assay mine blast hole samples.

3.10.2.7 Cold Storage Building

Cold storage buildings are required for short- and long-term storage of supplies requiring protection from the elements, but not requiring heated storage. Two buildings are required: one adjacent to the truck shop and one near the process plant maintenance facility. Both buildings will be unheated single-story, fabric-clad structures.

3.11 PROPOSED PROJECT DISTURBANCE

The acreage of surface disturbances associated with the proposed PLP project at premature closure and at the end of mine life is detailed by facility in Table 3-2 and depicted on Figure 3-1 and Figure 3-2.

Table 3-2 Proposed Surface Disturbance (Life of Mine)

Infrastructure[1]	Facility	Footprint (acres)
Mine Site	Open Pit	608
	Quarries	873
	Stockpiles	479
	Mineral Processing Facilities	113
	Bulk TSF	2,796
	Pyritic TSF	1,071
	Main Water Management Pond	955
	Water Management Ponds	66
	Sediment/Seepage Collection Systems	358
	Mine Site Infrastructure	87
	On-site Access and Haul Roads	613
	Mill Site Power Plant	22
	Waste Management Facilities	17
	Water Treatment Plants	27
	Mine Site Total	**8,086**
Transportation Corridor	Access Roads	892
	Ferry Terminals	27
	Material Sites	241
	Transportation Corridor Total	**1,161**
Amakdedori Port	Airstrip	6
	Shore-based Facilities	14
	Marine Facilities	11
	Amakdedori Port Total	**30**
Total Proposed Surface Disturbance		**9,277**

1. Acreage values are approximate at this time and will be updated when the final plan is submitted.

4 CLOSURE IMPLEMENTATION PLAN

4.1 GENERAL

PLP's core operating principles are governed by a commitment to conduct all mining operations, including reclamation and closure, in a manner that adheres to socially and environmentally responsible stewardship while maximizing benefits to state and local stakeholders. PLP has adopted a philosophy of "design for closure" in the development of the project that incorporates closure and long-term post-closure water management considerations into all aspects of the project design to ensure that all regulatory requirements, as well as private landowner obligations, are met at closure.

Considerations incorporated into the project design include the following elements:

- A separate fully lined pyritic TSF will allow potentially acid generating tailings and PAG/ML waste rock to be relocated into the Open Pit and stored subaqueously during closure, preventing acid mine generation from this material and allowing reclamation of the pyritic TSF footprint.
- Quarried and waste rock will be geochemically tested prior to being used in construction to avoid the potential for contaminated drainage during operations and post-closure.
- Topsoil and overburden will be salvaged during construction for use as growth medium during reclamation.
- TSF embankment slopes will be 2.6H:1V to provide long-term stability and facilitate the placement of growth medium.

The overall project footprint will be minimized to facilitate physical closure and post-closure water management, as prescribed by:

AS 27.19.020 Reclamation Standard:

> *"A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition."*

AS 27.19.030 (b)

> *"In reviewing a reclamation plan for state, federal, or municipal land under (a) of this section, the commissioner may consider, after consultation with the commissioners of environmental conservation and fish and game and with the concurrence of the miner and landowner, uses to which the land may be put after mining has been completed, including trails, lakes, recreation sites, fish and wildlife enhancement, commercial, and agriculture uses."* and,

11 AAC 97.200 (b)

> *"A miner shall reclaim an area disturbed by a mining operation so that the surface contours after reclamation is complete are conducive to natural revegetation or are consistent with an alternate post-mining land use approved under AS 27.19.030(b) on state, federal, or municipal land, or with the post-mining land use intended by the landowner on private land."*

Pebble will continue to adhere to the above goals in developing and implementing this Plan for the proposed PLP project. Therefore, the objectives of the Plan are listed as follows:

- Provide for public safety.
- Stabilize and protect surficial soil materials from wind and water erosion.
- Stabilize steep slopes through contouring and leveling to provide rounded land forms and suitable seedbeds.
- Establish a productive vegetative community based on the applicable land use plan, pertinent visual resources, and designated post-mining land uses.
- Implement water management to reduce contact with disturbed materials and adequate treatment of pit water.
- Implement design closure plans, to the extent feasible, that will address community concerns and be aligned with local community land-use and development objectives.

Attainment of these objectives will be measured by the success of concurrent reclamation of disturbed areas and will include long-term mine revegetation research and evaluation (Czapla & Wright, 2012). PLP will work with ADNR, Division of Agriculture/Plant Materials Center, and Alaska Department of Fish & Game (ADF&G) in the implementation and evaluation of both concurrent and long-term reclamation activities at the site.

The design and implementation of the mine reclamation and closure plans are important to the surrounding communities during mine closure. Measures to mitigate the potential socioeconomic effects associated with mine closure will be reviewed and discussed every five years during permit renewals throughout the mine life. To the extent feasible, the project's community development program will encourage development projects that are sustainable without ongoing support from the mine project. The goals will be to encourage development of local capacity from the start of the mine project and to engage the community throughout the mine life. Closure planning will also include regularly scheduled outreach to the communities within the area of mine influence to hear residents' concerns and objectives before and during the active closure period.

PLP considers reclamation to be a progressive process tied directly to the design, construction, operation, and closure of the project. Reclamation of the site will utilize best practicable, proven, and documented technology. The specifics of this technology are discussed in the following sections.

For the purposes of this Plan, the term "growth medium" refers to all native (in-place) soil material with the physical and chemical properties capable of germinating and sustaining vegetation growth with or without amendments and is interchangeable with the term's "topsoil" and "overburden"[2] in relation to the proposed PLP site. Overburden material suitable for use as growth medium is unconsolidated material that may consist of terrace gravels, colluvium, loess, and other non-organic material that lies between the topsoil horizon (where present) and bedrock.

The project will be reclaimed in two phases: Closure and Post-Closure. The following activities will be conducted during the Closure phase:

- Demolition of facilities
- Earth works (sloping, covers and haulage) to reclaim the various mine components
- Earthworks to remove or reconfigure stormwater management facilities
- Revegetation of disturbed ground
- Construction of facilities needed for post-closure

The following activities will be included in the Post Closure period:

- Operation of water treatment plant(s)
- Care and maintenance of water treatment plant(s)
- Care and maintenance of water management facilities
- Monitoring of revegetation, surface water and groundwater.

Additional details and a schedule of these activities are provided in Section 4.5.

4.2 Committed Mitigation Related to Reclamation

To comply with the National Environmental Policy Act (NEPA) during the federal permitting process, PLP committed to the incorporation of a number of environmental mitigation activities into the project. The proposed mitigation measures are outlined as follows (US ACE, 2019):

- Where feasible, mine facilities will be reclaimed in such a manner as to create new wetland areas and ponds.

[2] "Topsoil" is the upper, outermost layer of soil, usually the top 2 inches (5.1 cm) to 8 inches (20 cm). It has the highest concentration of organic matter and micro-organisms.

"Overburden" is the material that lies above bedrock. Overburden is also described as the soil and other material that lies above a specific geologic feature.

- Dry closure of the Bulk TSF will be implemented as to reduce both the likelihood and consequence of potential post-closure failure of the TSF.
- At closure, the pit lake will be maintained at a level that promotes hydraulic containment of pit water during closure, protecting site groundwater.
- The pit lake will be maintained at a level that will allow for an inward flow of groundwater while also providing for additional storage capacity; this will allow for potential treatment downtime, which may arise due to water treatment plant maintenance or other problems, without overtopping.

The reclamation activities in the Plan are designed to comply with these committed standards and the goals stated in Section 4.1. Additional mitigation measures are listed in Chapter 5 of the Draft Environmental Impact Statement.

4.3 LAND USE PRIOR TO OPERATIONS

The prevalent land uses in the project area are fish and wildlife habitat, subsistence, and low-intensity recreational activities, which do not require developed facilities. Land development in the area is generally limited to the locations in and around geographically isolated communities, fish processing facilities, and small fishing and hunting lodges. Developments include roads, airstrips, and docks.

Residential and commercial land use in the vicinity of the mine site is limited and includes the communities of Newhalen (population 230), Nondalton (population 144), and Iliamna (population 100), each located approximately 17 miles from the mine site. Use around the transportation corridor is also limited and includes the community of Kokhanok (population 173) located approximately 2 miles from the port access road. Many residents practice a lifestyle reliant on subsistence activities: sport and commercial hunting, fishing, wildlife viewing, and boating also occur in the area.

Iliamna Lake is used for recreational activities, sport fishing, and subsistence activities, including fishing and seal hunting. The lake is also heavily used for transportation by boat in open water or by snowmobile when there is sufficient ice cover.

The Amakdedori port site area is occasionally used for some subsistence activity and cultural education for nearby communities.

4.4 LAND USE DURING OPERATIONS

4.4.1 MINE SITE

Public access will be strictly controlled at the mine site; this will preclude traditional pre-mining land uses within the project area. During operations the predominant land uses will be mining and mineral resource extraction.

During closure and post-closure, site access will continue to be managed to preclude public access from areas undergoing closure activities. Land use will be closure-related: it will return to pre-mining land use for those areas reclaimed but not used to support care and maintenance activities.

4.4.2 Transportation Corridor

Public access to the roads comprising the transportation corridor will be controlled, which will preclude traditional pre-mining land use within the road network area. Land use during operations will be transportation/industrial. Land use for surrounding areas will not be changed.

During closure and post-closure, the transportation corridor will be required for access to the site. Land use designation as transportation/industrial will need to be maintained. Some areas not needed to support closure activities may be reclaimed and released back to the pre-mining land use designations.

4.4.3 Ferry Terminals and Ports

Public access to the ferry terminals and Amakdedori Port facility will be controlled and will preclude traditional pre-mining land use within the areas occupied by the facility. Land use during operations and closure will be transportation/industrial.

All, or a portion of, the facilities will be needed to support long-term care and maintenance activities at the site. If a facility is not needed, it may be otherwise used to support the community. In that case the land use designation will remain transportation/industrial. If a facility is not needed, it will be demolished and the land reclaimed and land use will return to the pre-mining land use. For the purpose of this plan, it is assumed the Amakdedori port facility will be removed, except for facilities that will be needed to support the post-closure activities, which could then be served by smaller and lighter barges. The North and South Ferry Terminals will also likely be partially removed; only facilities that will be needed to support post-closure activities will remain.

4.5 Reclamation Activities

The estimated schedule for reclamation of the project is shown in Table 4-1.

Once mining activities have concluded, all or portions of a facility's reclamation activities will be scheduled as soon as it is practical and safe.

The project closure has been broken down into three closure phases (Phase 1-3) and one post-closure phase (Phase 4). Approximate timelines have been assigned to each of the phases and are based on the results of the water balance and water-quality modeling discussed in the Operations Water Management Plan (Knight Piésold Consulting, 2018a). The main activities occurring during each phase, as shown in Table 4-1, are described below and illustrated on Figure 4-1 to Figure 4-5. Details of the reclamation procedures for each activity are presented in sections 4.17 and 4.18.

Table 4-1 Construction, Reclamation and Closure Timeline

ID Task Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Phase 1 - Reclamation of Quarries and Bulk TSF, Backfilling of Open Pit																																																				
Reclamation of Quarry B																																																				
Sloping and Grading																																																				
Growth Media																																																				
Reclamation of Quarry C																																																				
Sloping and Grading																																																				
Growth Media																																																				
Processing Schedule																																																				
Pit Backfill (PAG waste rock and Pyritic Tailings)																																																				
Reclamation of Bulk TSF																																																				
Sloping and Grading																																																				
Growth Media																																																				
Process Fuild Stabilization																																																				
Pump Bulk TSF S. & E water to Bulf TSF Main Seepage SCP																																																				
Pump water from Bulk TSF Main SCP to the Main WMP																																																				
Main WMP surplus water treatment at WTP #2																																																				
Open Pit Surface water treatment at WTP #3																																																				
Other Reclamation																																																				
Reclamation of Open Pit Water Management Pond (As not needed)																																																				
Reclamation of Mill Site, Laydowns, and Haul Roads (As not needed)																																																				
Phase 2 - Reclamation of Pyritic TSF and Main WMP, No Water Treatment																																																				
Decomissioning of Open Pit Clean Water Diversion Channel																																																				
Grading																																																				
Growth Media																																																				
Reclamation of Pyritic TSF/Seepage Collection Ponds																																																				
Decontamination & Equiment Removal																																																				
Grading																																																				
Growth Media																																																				
Structural Reclamation																																																				
Decontamination & Equiment Removal																																																				
Demolition and Reclamation of Main WMP																																																				
Demolition and Reclamation of WTP #2																																																				
Process Fluid Stabilization																																																				
Surplus Water Management (Bulk TSF to Open Pit)																																																				
Pump Bulk TSF S. & E. SCP to the Bulk TSF Main SCP																																																				
Pump Bult TSF Main SCP water to Open Pit)																																																				
Phase 3 - On-Going Treatment Surplus Water withing the Open Pit																																																				
Pump Surplus Water to Open Pit																																																				
Pump Water from Bulk TSF S. & E. SCP to Bulk TSF Main SCP																																																				
Pump Water from Bult TSF Main SCP to the Open Pit																																																				
Maintain water level in Open Pit (Surplus water treatment at WTP #3)																																																				
Release treated water from WTP #3																																																				
Phase 4 - Post-Closure (Long Term Conditions)																																																				
Surface Water Management (Runoff from reclaimed Bulk TSF to NFK Catchment)																																																				
Maintain water level in Open Pit (Surplus water treatment at WTP #3)																																																				
Pump water from BUL TSF S. & E. SCPs to the Bulk TSF Main SCP																																																				
Pump Bulk TSF Main SCP flow to WTP #3																																																				
Freshwater diversion decomissioning and reclamation																																																				
Release treated water from WTP #3																																																				

4.5.1 Phase 1 Closure Activities

Phase 1 closure activities include the reclamation of quarries and of the Bulk TSF and backfilling of the Open Pit with backhauled PAG waste rock and tailings. Phase 1 is scheduled to be completed in closure year 15. Details of the reclamation procedures for each activity are presented in sections 4.17 and 4.18.

The main reclamation activities and water management operations for Phase 1 are as follows (Figure 4-1 and Figure 4-2):

- Re-designate the Operational WTP #1 as WTP #3 for closure and post-closure.
- Reclaim quarries B and C.
- Remove and reclaim the sediment pond north of Quarry B.
- Start transfer of PAG waste rock and Pyritic tailings to the Open Pit.
- Pump surplus water from the Bulk TSF to the Main WMP throughout Phase 1.
- Begin reclamation of the Bulk TSF in approximately Year 10 with regrading and capping of the surface.
- Pump water from the Bulk TSF south and east seepage collection and recycle ponds to the Bulk TSF Main Seepage Collection Pond (SCP).
- Pump water in the Bulk TSF Main SCP to the Main WMP.
- Pump surface runoff from the Pyritic TSF embankment and water collected within the seepage collection ponds to the Main WMP.
- Treat surplus water from the Main WMP at WTP #2 and release to the downstream environment once it meets discharge criteria.
- Pump surplus water from the Open Pit at WTP #3 to maintain a place to actively dump PAG waste rock in dry conditions.
- Release treated water from WTP#3 to the downstream environment once it meets discharge criteria.
- Decommission and reclaim the Open Pit Water Management Pond and allow surface runoff to flow to the downstream environment.
- Reclaim those mining facilities not needed for future care and maintenance activities, including the mill site, laydowns, and haul roads.

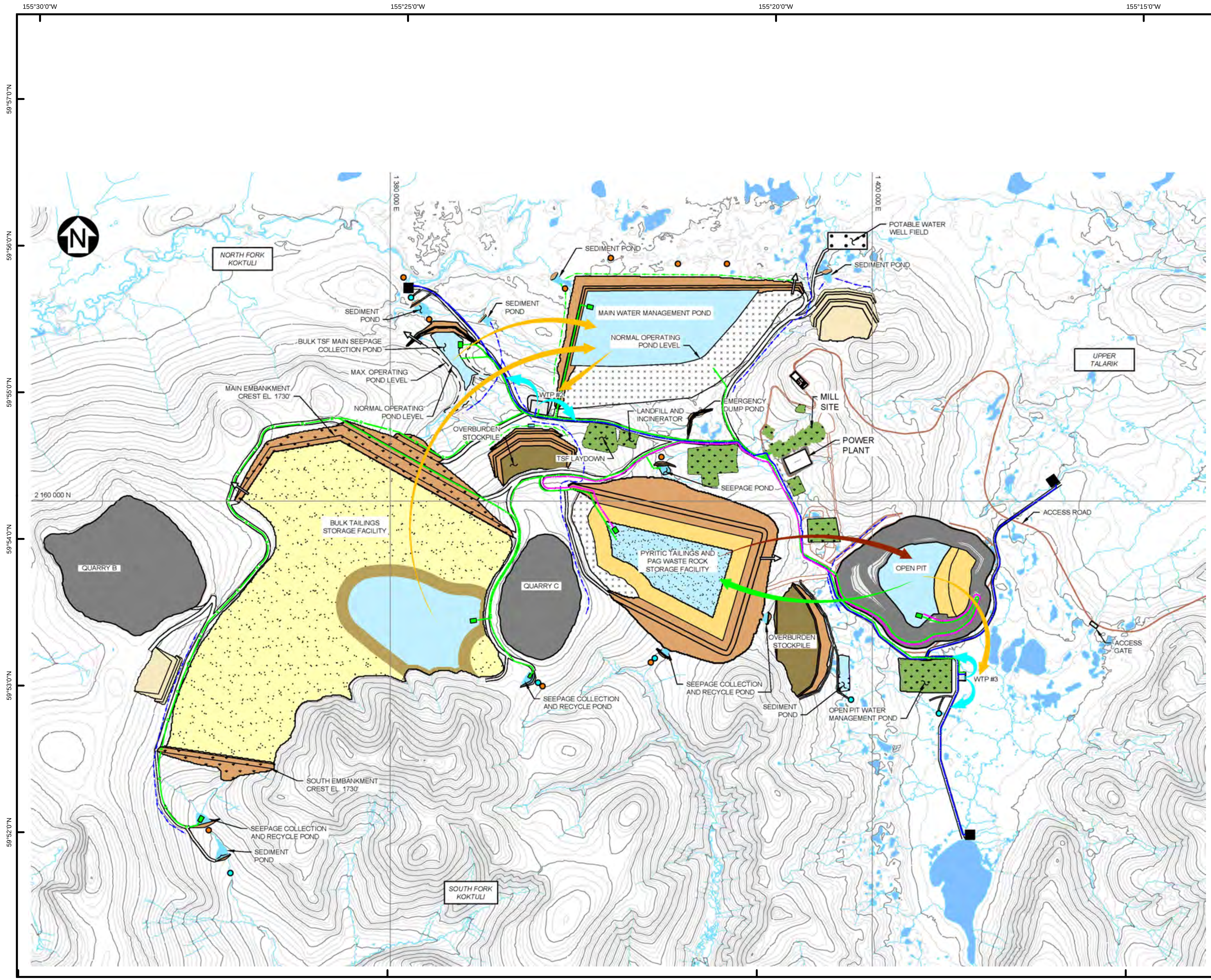


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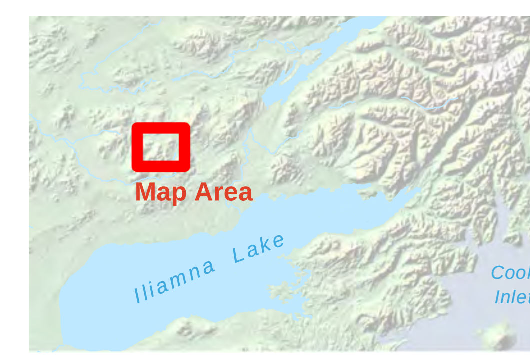
FIGURE 4-1

General Arrangment
Closure Phase 1 - Year 9

LEGEND:

- OPEN PIT
- BULK TAILINGS
- OVERBURDEN STOCKPILE
- GROWTH MEDIUM STOCKPILE
- REVEGETATED EMBANKMENT FACE
- REVEGETATED MILL SITE/STOCKPILE & LAYDOWN AREAS
- EMBANKMENT FILL
- SEASONAL POND AREA
- POND
- PYRITIC TAILINGS
- PAG WASTE ROCK
- LINER
- MINERAL CLOSING ORDER
- RECLAIM PIPELINE
- RECLAIM WATER PUMPING BARGE
- PYRITIC TAILINGS PIPELINE
- WTP DISCHARGE PIPELINE
- ROAD
- WTP DISCHARGE POINT
- WATER QUALITY MONITORING POINT
- GROUNDWATER QUALITY MONITORING AND POTENTIAL PUMP BACK AREA
- DIVERSION CHANNEL
- COLLECTION DITCH
- EMERGENCY SPILLWAY
- TAILINGS WATER
- RECLAIM WATER
- CONTACT WATER
- TREATED WATER



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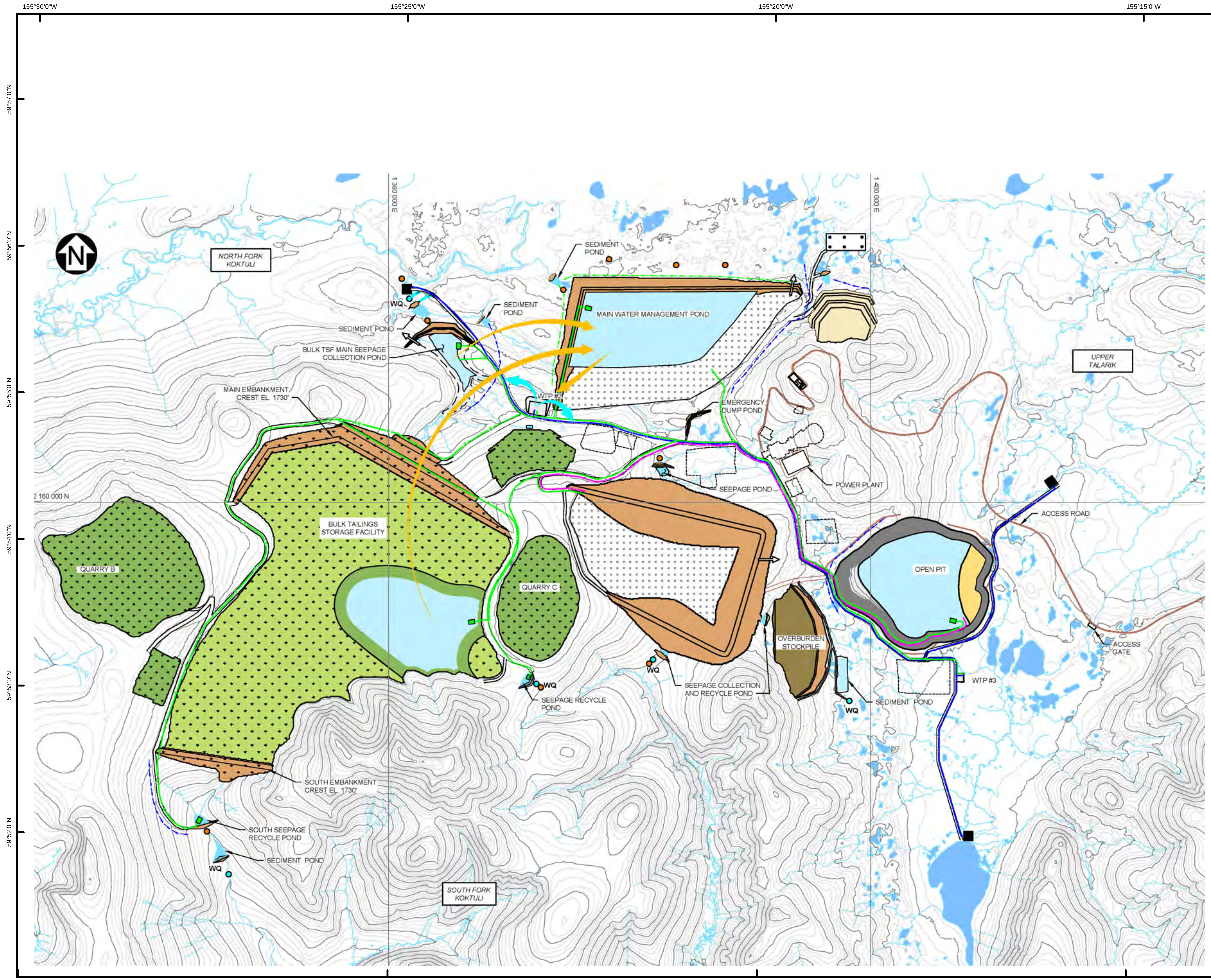
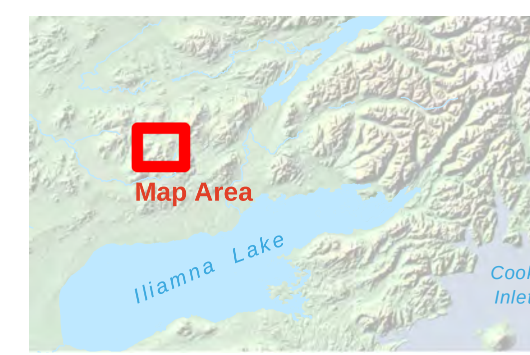


FIGURE 4-2

General Arrangement
Closure End of Phase 1

LEGEND:

- OPEN PIT
- REVEGETATED EMBANKMENT FACE
- ACTIVE RECLAMATION
- GROWTH MEDIUM STOCKPILE
- REVEGETATED BEACH
- SEASONAL WETLAND
- REVEGETATED MILL SITE/STOCKPILE & LAYDOWN AREAS
- POND
- PYRITIC TAILINGS
- PAG WASTEROCK
- LINER
- MINERAL CLOSING ORDER
- RECLAIM PIPELINE
- RECLAIM WATER PUMPING BARGE
- WTP DISCHARGE PIPELINE
- WTP DISCHARGE POINT
- WQ WATER QUALITY MONITORING POINT
- GROUNDWATER QUALITY MONITORING AND POTENTIAL PUMP BACK AREA
- CLEAN (NON-CONTACT) WATER DIVERSION
- CONTACT WATER DIVERSION
- EMERGENCY SPILLWAY
- PYRITIC TAILINGS PIPELINE
- RECLAIMED FACILITY OUTLINE
- CONTACT WATER
- TREATED WATER



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4.5.2 PHASE 2 CLOSURE ACTIVITIES

Phase 2 closure activities include reclamation of the Pyritic TSF and Main Water Management Pond (WMP). Phase 2 closure activities will occur from closure year 16 through to complete filling of the pit (approximately year 20). The main activities occurring during the phase, as shown in Table 4-1, are described below and illustrated on Figure 4-3. Details of the reclamation procedures for each activity are presented in sections 4.17 and 4.18.

The main reclamation activities and water management operations for Phase 2 are as follows (Figure 4-3):

- Decommission WTP #2.
- Decommission the open-pit clean-water diversion channel and allow surface water to drain naturally into the pit.
- Complete backhauling of tailings and PAG Waste Rock from the Pyritic TSF to the Open Pit; reclaim the TSF by removing the liner, removing or remediating impacted soils, and covering the disturbed area with growth medium, and implementing the revegetation program.
- Reclaim the Pyritic TSF seepage collection ponds by covering the disturbed area with growth medium and implementing the revegetation program.
- Send surface water runoff from the Pyritic TSF and seepage ponds to the downstream environment without further treatment (once runoff from the reclaimed area meets discharge criteria).
- Reclaim the Main WMP by removing the liner, removing or remediating impacted soils, and covering the disturbed area with growth medium, and revegetating. Send surface water runoff to the downstream environment without further treatment (once runoff meets discharge criteria).
- Pump surplus water from the Bulk TSF supernatant pond to the Open Pit.
- Pump water from the Bulk TSF south and east seepage collection and recycle ponds to the Bulk TSF Main SCP.
- Pump water from Bulk TSF Main SCP to the Open Pit.
- Decommission and reclaim WTP #2 once it has been demonstrated that surface water runoff from the reclaimed Pyritic TSF and Main WMP surfaces will meet discharge criteria.
- Allow the Open Pit to fill to the Maximum Management Level (MM Level) of 890 ft amsl.
- Monitor revegetation and release areas that meet regulatory standards.
- Monitoring surface and groundwater as required.

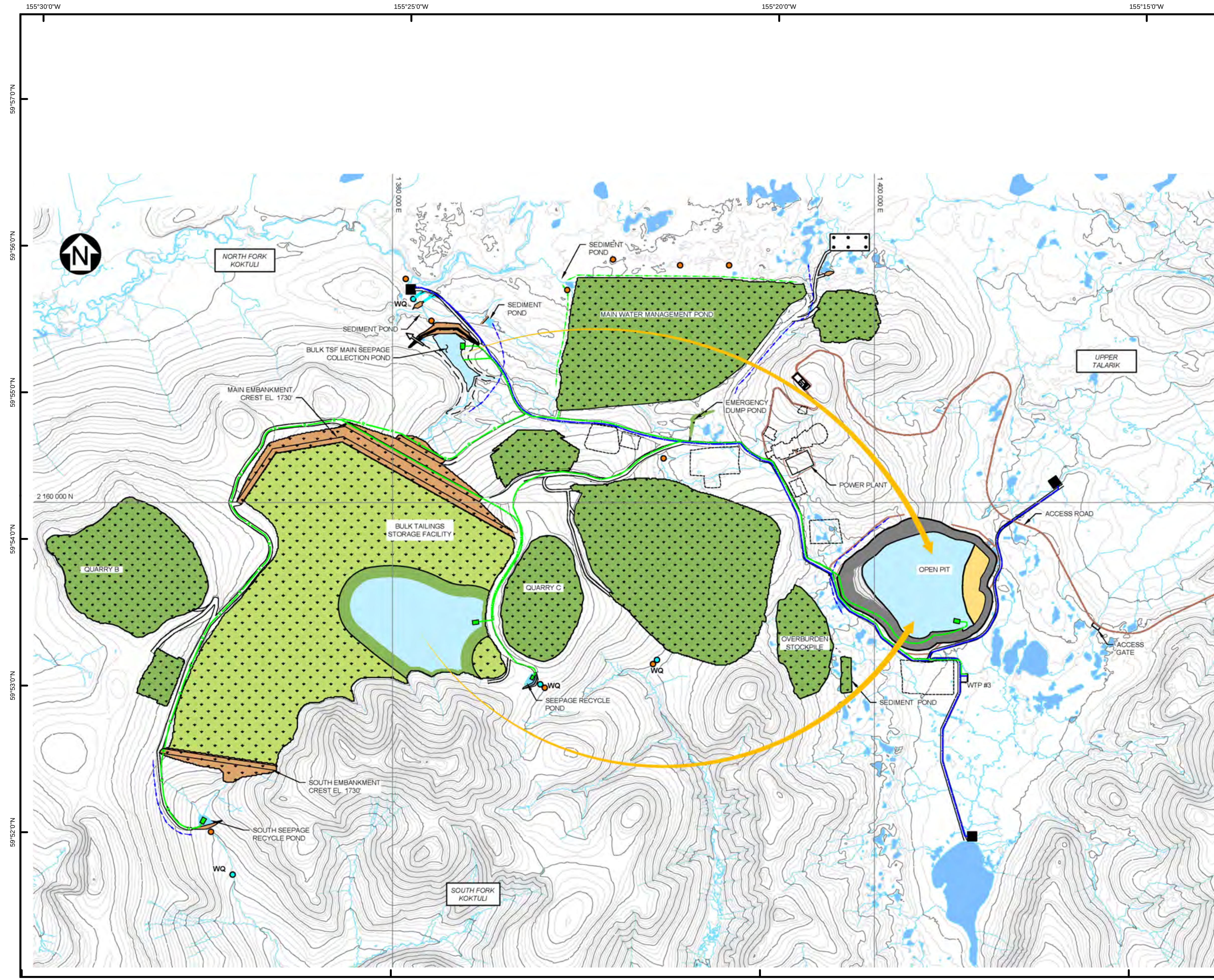

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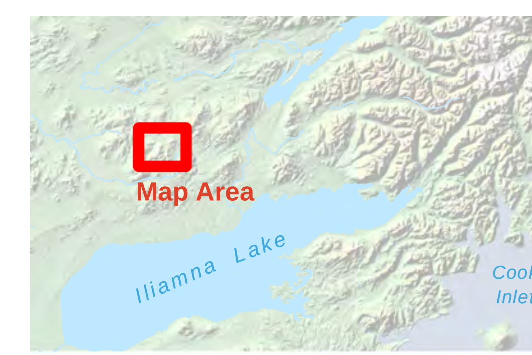
FIGURE 4-3

General Arrangement Closure End of Phase 2

LEGEND:

- OPEN PIT
- REVEGETATED EMBANKMENT FACE
- ACTIVE RECLAMATION
- GROWTH MEDIUM STOCKPILE
- REVEGETATED BEACH
- SEASONAL WETLAND
- REVEGETATED MILL SITE/STOCKPILE & LAYDOWN AREAS
- POND
- PYRITIC TAILINGS
- PAG WASTEROCK
- LINER
- MINERAL CLOSING ORDER
- RECLAIM PIPELINE
- RECLAIM WATER PUMPING BARGE
- WTP DISCHARGE PIPELINE
- WTP DISCHARGE POINT
- WQ WATER QUALITY MONITORING POINT
- GROUNDWATER QUALITY MONITORING AND POTENTIAL PUMP BACK AREA
- CLEAN (NON-CONTACT) WATER DIVERSION
- CONTACT WATER DIVERSION
- EMERGENCY SPILLWAY
- PYRITIC TAILINGS PIPELINE
- RECLAIMED FACILITY OUTLINE
- CONTACT WATER



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4.5.3 PHASE 3 CLOSURE ACTIVITIES

Phase 3 closure activities focus on the ongoing treatment of surplus water within the Open Pit and occur from closure year 20 through complete closure in year 50. The main activities occurring during the phase are shown in Table 4-1 and illustrated on Figure 4-4. Details of the reclamation procedures for each activity are presented in sections 4.17 and 4.18.

The main reclamation activities and water management operations for Phase 3 are as follows:

- Continue to pump surplus water from the Bulk TSF to the Open Pit.
- Pump water from the Bulk TSF south and east seepage collection and recycle ponds to the Bulk TSF Main SCP.
- Pump water from the Bulk TSF Main SCP to the Open Pit.
- Maintain water levels within the Open Pit below the MM Level by treating surplus water from the Open Pit at WTP #3.
- Release treated water from WTP#3 to the downstream environment once it meets discharge criteria.
- Monitor revegetation and release areas that meet regulatory standards.
- Monitoring surface and groundwater as required.

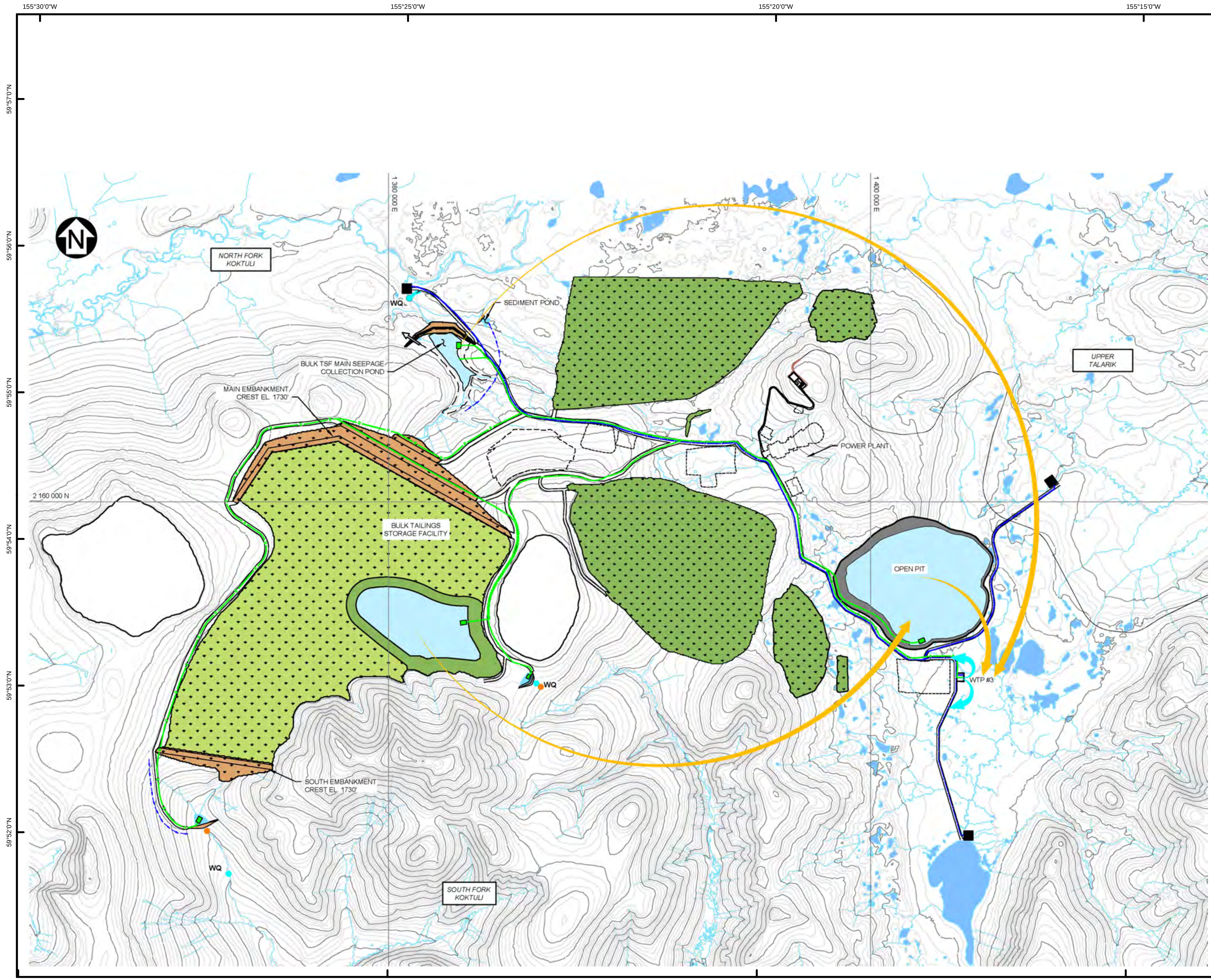
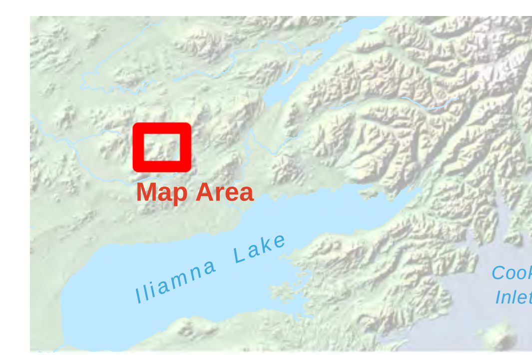


FIGURE 4-4

General Arrangement
Closure Phase 3

LEGEND:

- OPEN PIT
- REVEGETATED EMBANKMENT FACE
- REVEGETATED BEACH
- SEASONAL WETLAND
- REVEGETATED MILL SITE/STOCKPILE & LAYDOWN AREAS
- POND
- MINERAL CLOSING ORDER
- RECLAIM PIPELINE
- RECLAIM WATER PUMPING BARGE
- WTP DISCHARGE PIPELINE
- WTP DISCHARGE POINT
- WQ WATER QUALITY MONITORING POINT
- GROUNDWATER QUALITY MONITORING AND POTENTIAL PUMP BACK AREA
- CLEAN (NON-CONTACT) WATER DIVERSION
- EMERGENCY SPILLWAY
- RECLAIMED FACILITY OUTLINE
- CONTACT WATER
- TREATED WATER



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4.5.4 PHASE 4 POST-CLOSURE ACTIVITIES

Phase 4 post-closure activities focus on the long-term post-closure conditions following complete closure in closure year 50 and are shown on Figure 4-5. The main activities occurring during the phase, as shown in Table 4-1, are described below and illustrated on Figure 4-5. Details of the reclamation procedures for each activity are presented in sections 4.17 and 4.18.

The main reclamation activities and water management operations for Phase 4 are as follows:

- Direct discharge of surface water runoff from the reclaimed Bulk TSF to the NFK catchment once monitoring shows it meets discharge criteria.
- Maintain the water level within the Open Pit below the MM Level by treating surplus water from the Open Pit at WTP #3.
- Pump water from the Bulk TSF south and east seepage collection and recycle ponds to the Bulk TSF Main SCP.
- Pump water from the Bulk TSF Main SCP to WTP#3.
- Decommission and reclaim all remaining freshwater diversions, except for the Bulk TSF Main SCP diversion and the Bulk TSF South Seepage Collection and Recycle Pond.
- Release treated water from WTP #3 to the downstream environment once discharge criteria have been met.

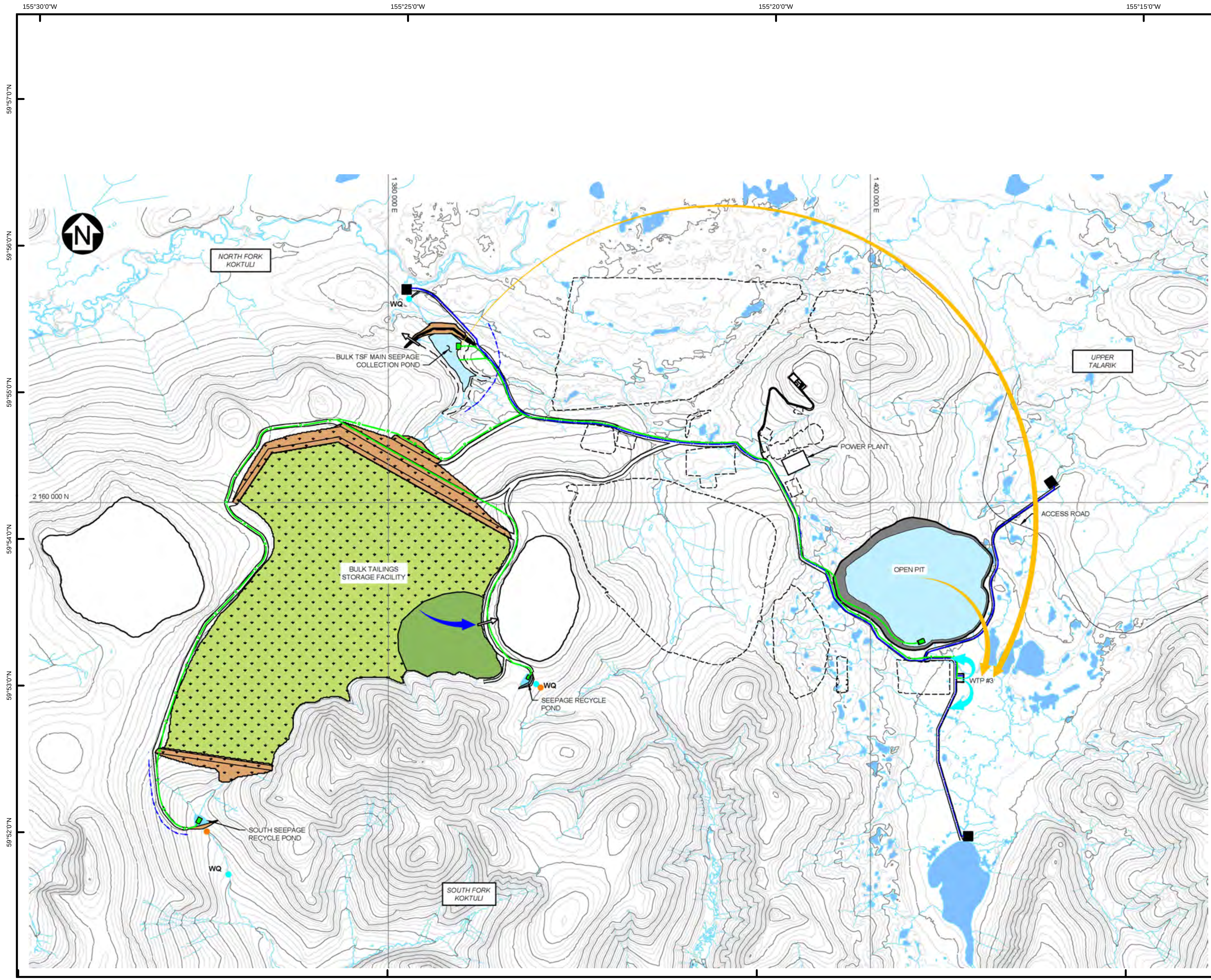
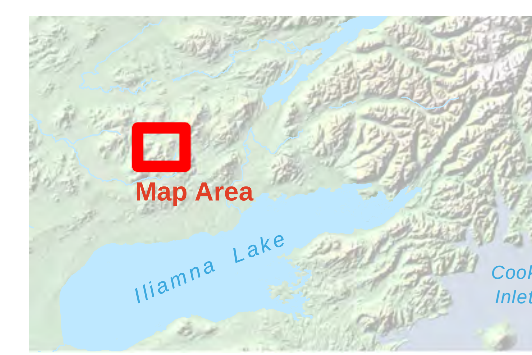


FIGURE 4-5

General Arrangement Post Closure Phase 4

LEGEND:

- OPEN PIT
- REVEGETATED EMBANKMENT FACE
- REVEGETATED BEACH
- SEASONAL WETLAND
- REVEGETATED MILL SITE/STOCKPILE & LAYDOWN AREAS
- POND
- WTP DISCHARGE PIPELINE
- RECLAIM PIPELINE
- WQ WATER QUALITY MONITORING POINT
- GROUNDWATER QUALITY MONITORING AND POTENTIAL PUMP BACK AREA
- WTP DISCHARGE POINT
- EMERGENCY SPILLWAY
- RECLAIMED FACILITY OUTLINE
- CONTACT WATER
- TREATED WATER
- CLEAN WATER



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4.6 Reclamation During and Directly After Construction

Areas disturbed during construction that are not subject to re-disturbance during operations will be reclaimed. Construction access roads, water extraction sites, and material borrow sites along the access road and in the immediate area of the mine that will not be needed for operations will be reclaimed. Generally, sites will be regraded to smooth them out and blend with surrounding topography, covered with growth medium and revegetated. Procedures for these closure actions are described in Section 4.17.

4.7 Concurrent Reclamation

Concurrent reclamation will be carried out at the same time as continuing mining and processing activities or in other areas to the extent practicable and safe. This reclamation will be implemented in areas of the mine that will not be re-disturbed and are no longer needed. Concurrent reclamation procedures are similar to final reclamation procedures as described in Section 4.17.

4.8 Interim Reclamation

Interim reclamation will be implemented on lands disturbed during the course of operations which, although not at final reclamation contours, will not be re-disturbed for a significant period. These will therefore require interim stabilization. Growth Medium will not be applied to these areas; the surface of the area will be roughened and revegetated. Where needed a surface mulch or erosion control fabric may be applied.

4.9 Temporary Closure

“Temporary Closure” means the cessation of the mining and process plant operations for a period of not more than three years. If conditions require temporary closure to extend beyond three years, final reclamation activities will be required to begin, unless an extension of temporary closure is requested by PLP and approved by ADNR. Temporary closure scenarios, which could require modifications to the Plan of Operations management plans, Reclamation and Closure Plan, and/or state or federal permits, will be coordinated with the appropriate federal and state agencies for approval.

- PLP will notify the appropriate agencies within three days of the first day of the temporary closure or of any unanticipated suspension or cessation of operations that is expected to last ninety days or more. The notice will state the nature and reason for the temporary closure, the anticipated duration of the temporary closure, and any event that will be reasonably anticipated to result in either the resumption or abandonment of operations.

- Project operations must resume for not less than ninety consecutive days in order to terminate the temporary closure status.

- PLP will maintain the project area in a safe and secure condition during a temporary closure and not allow the project area to be degraded or eroded during, or as a result of, the temporary closure.
- All water collection and treatment, monitoring, and reporting required by the reclamation plan for the temporary cessation of operations will continue unless otherwise agreed to by the agencies.
- While the mine operation is inactive, environmental monitoring programs will continue to be implemented. The need for implementation of interim reclamation activities or final reclamation on components of the mine will be addressed on the basis of environmental monitoring results and consultation with the appropriate agencies.

4.10 Final Reclamation and Closure

After PLP has completed operations at the mine site, final reclamation and closure can be initiated. When a facility is no longer needed for mine operations, reclamation then will be initiated as soon as practical. It is assumed that at the final stage of operations, a significant amount of site-specific reclamation experience and performance data will have been incorporated into periodic reclamation plan updates.

4.11 Post-Closure

Many reclamation tasks will be completed over the Closure period after cessation of processing. Following the Closure phase, the site will be inspected, monitored, and maintained in a fashion that helps achieve the long-term goals set out in this Reclamation and Closure Plan. PLP has determined that long-term post-closure water pumping during tailings consolidation, and water treatment after the pit lake fills, will be required.

Specific water management practices are estimated based on current predictions of closure conditions. Monitoring data collected during operations (e.g., water quality, groundwater pumping) as well as operating experience and advances in treatment technology, among other relevant factors, will be used to develop a definitive closure water management plan prior to the completion of closure activities. Water management practices may be further refined based on information obtained during post-closure monitoring.

4.12 Reclamation and Closure Plan Submission and Approval

PLP will continue to submit an updated Reclamation and Closure Plan as required to remain up to date with operations, regulatory changes, and issues identified during the regular five-year third-party Environmental Compliance Audits. Each updated and revised Plan will contain sufficient detail to allow for calculation of estimated closure costs including post-closure maintenance and monitoring.

More frequent Plan revisions may be required by the agencies if substantial increases in the disturbed area have occurred since the last update, or if specific portions of the Plan are shown to be inconsistent with performance goals or changes to the designated post-mining land use. Updated plans and revisions may be routinely submitted and authorized through Plan amendments. Updated financial assurance is only required if the reclamation cost estimate within any calendar year will be exceeded.

The Annual Report required by ADNR and ADEC will contain a description of concurrent reclamation that has occurred and of reclamation projects anticipated for the following year.

The Plan and other environmental management plans will be maintained in accordance with agency requirements. These documents describe the sites monitored, the data collected, and the monitoring frequency and the duration of activities during operations, closure, and post-closure.

4.13 Reclamation/Closure Cost Calculation and Bond Release

Prior to commencing construction, the project Reclamation and Closure Plan approval and associated financial assurance mechanisms will need to be in place. The Reclamation and Closure Plan and financial assurance obligations will be updated on a 5-year cycle, in accordance with State of Alaska regulatory requirements, to address any changes in closure and post-closure requirements and cost obligations.

A detailed reclamation and closure cost model will be developed to address all costs required for both the physical closure of the project and the funding of long-term post-closure monitoring, water treatment, and site maintenance. The estimate will include the costs of the following elements:

- Closure planning and design and mobilization of third-party equipment to site
- Detailed estimates of equipment and labor requirements for physical closure
- Capital, sustaining capital, and operating costs for water treatment and other long-term post-closure operations
- Appropriate indirect costs and contingencies developed following ADNR guidance

4.14 Public Safety

Public safety is a principal concern in closure and reclamation of mining operations. Signs will be posted to provide additional warning of potentially hazardous areas. Final signage and placement will be coordinated with the State of Alaska and the private landowners, as appropriate. Transportation facilities that are needed to support closure and post-closure activities will be maintained.

Public access to the site and transportation facilities will be controlled during all phases of closure including the long-term post-closure activities. The Open Pit will be reclaimed to prevent public access as described in Section **Error! Reference source not found.**.

4.15 Closure and Social Impact Assessment

Prior to closure, PLP will develop a Closure Social Impact Assessment (CSIA). The CSIA is not a regulatory requirement but will describe potential positive and negative social impacts as a result of mine closure and will provide information to assist in sustaining improvements made in the communities, such as identifying alternative uses for the skills and infrastructures developed during operations.

4.16 Reclamation Constraints

Revegetation activities are limited by the time of year during which they can be effectively implemented. The highest revegetation success rates occur where proper seedbed preparation results in a microclimate conducive to germination.

The equipment will need to access the Bulk TSF surface in order to regrade or place cover. Access may be limited by seasonal conditions and by the need to allow the surface to consolidate.

Equipment access and ability to load and haul PAG waste rock may also be delayed in order to allow sufficient draining of the waste rock.

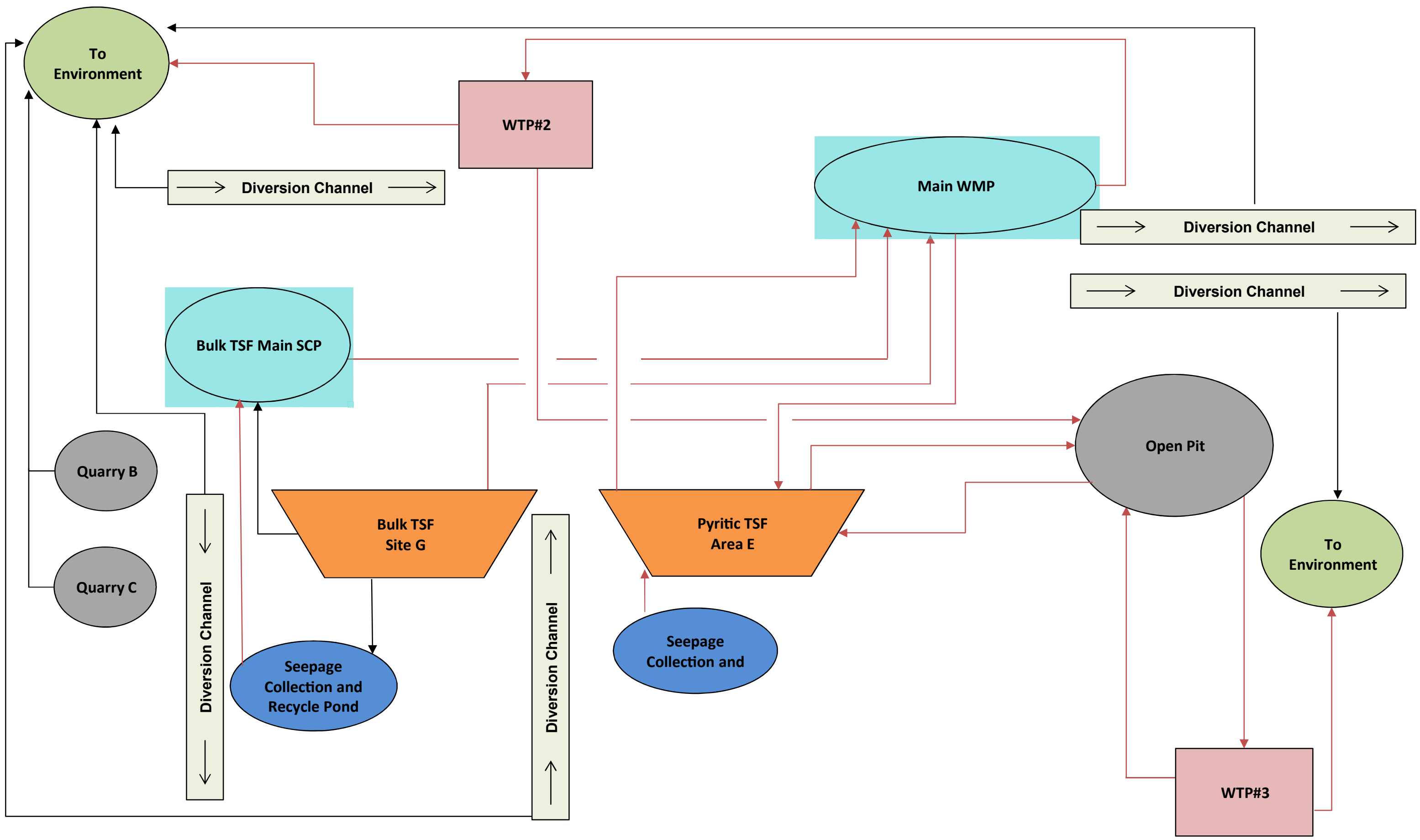
4.17 General Reclamation Procedures

The implementation by mining operations of common measures preventing unnecessary and undue degradation of land and water resources is well documented and proven. These time-tested techniques are incorporated throughout the proposed Pebble management plans and will be used during project implementation (e.g., concurrent reclamation) as well as for final reclamation and closure. However, given the length of the mine life, Pebble will evaluate new and innovative reclamation technologies as they are developed at the site, or around the world.

In preparation for interim, concurrent, and final reclamation, any organic materials will be stripped and stockpiled.

4.17.1 Closure Water Management Scenario

This section describes the water management closure scenario. Water management is broken into 4 phases which correspond to the closure schedule discussed in Section 4.5. Water management scenarios are presented in flowcharts illustrated in Figure 4-6 through Figure 4-9 and are discussed in the sections below.



NOTES:

1. BULK TSF BEACHES UNDERGO CAPPING BEGINNING IN CLOSURE YEAR 10.

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FIGURE 4 - 6

Water Balance Flow Schematic Closure - Phase 1

LEGEND:

RUNOFF, GROUNDWATER, AND SEEPAGE PATHWAY

PUMPED FLOW

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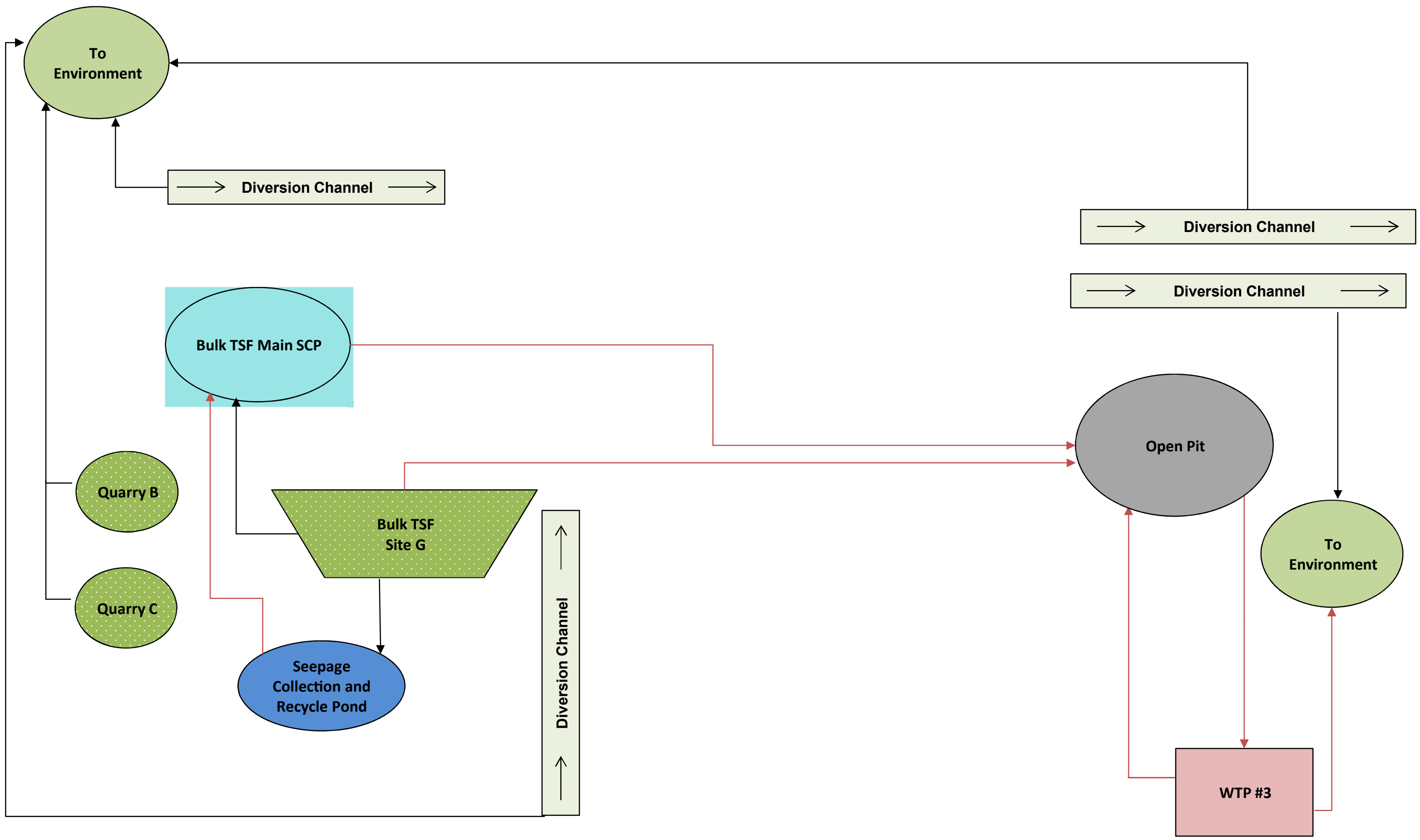

NOTES:

1. WTP#3 REPLACES WTP#1 FOR CLOSURE PHASES.

FIGURE 4 - 7

Water Balance
Flow Schematic
Closure - Phase 2

LEGEND:

RUNOFF, GROUNDWATER, AND SEEPAGE PATHWAY

PUMPED FLOW

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Version:	Author:

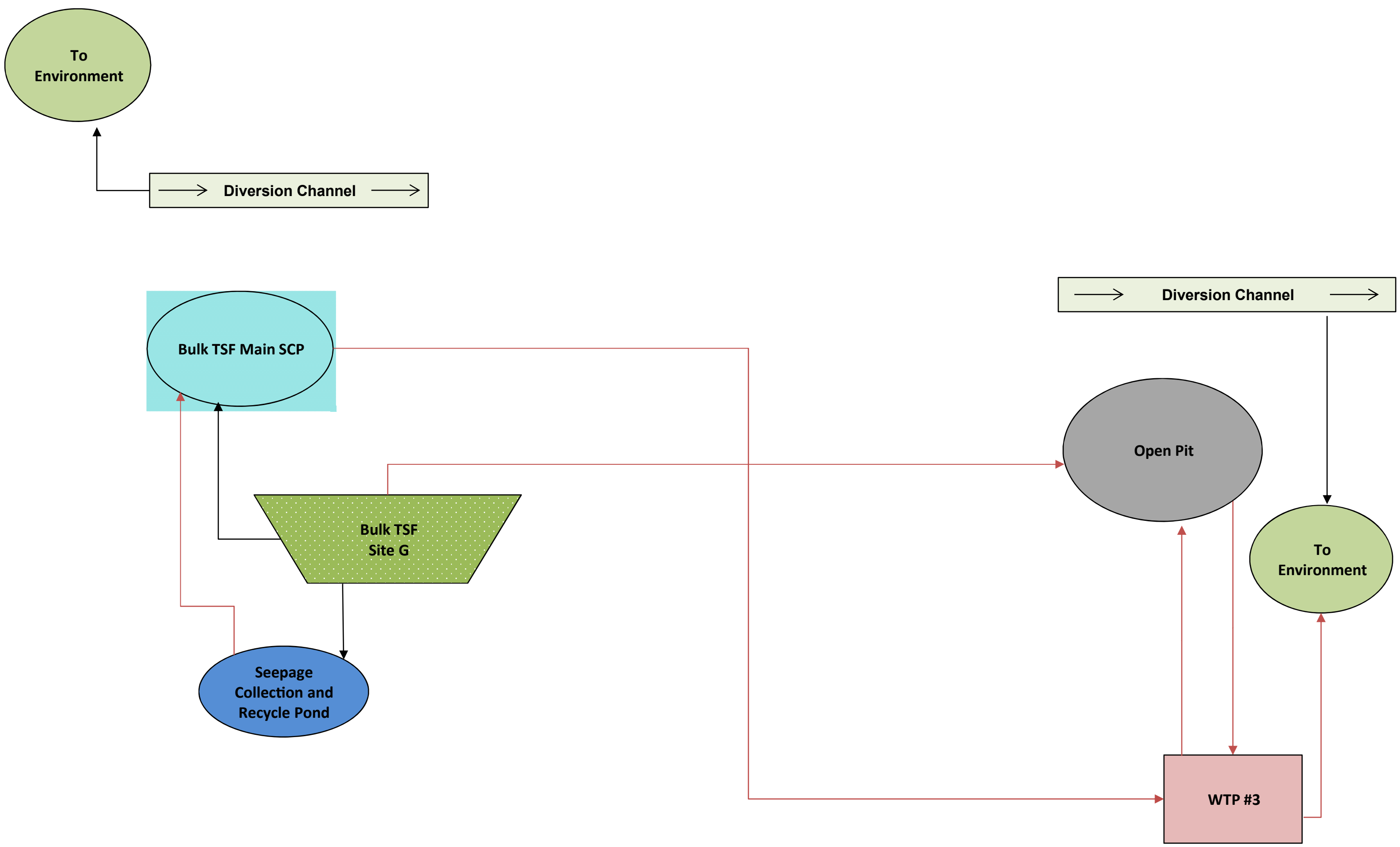

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FIGURE 4 - 8

Water Balance
Flow Schematic
Closure - Phase 3

LEGEND:

RUNOFF, GROUNDWATER, AND SEEPAGE PATHWAY

PUMPED FLOW

	Date: 6/25/2019
Version:	Author:

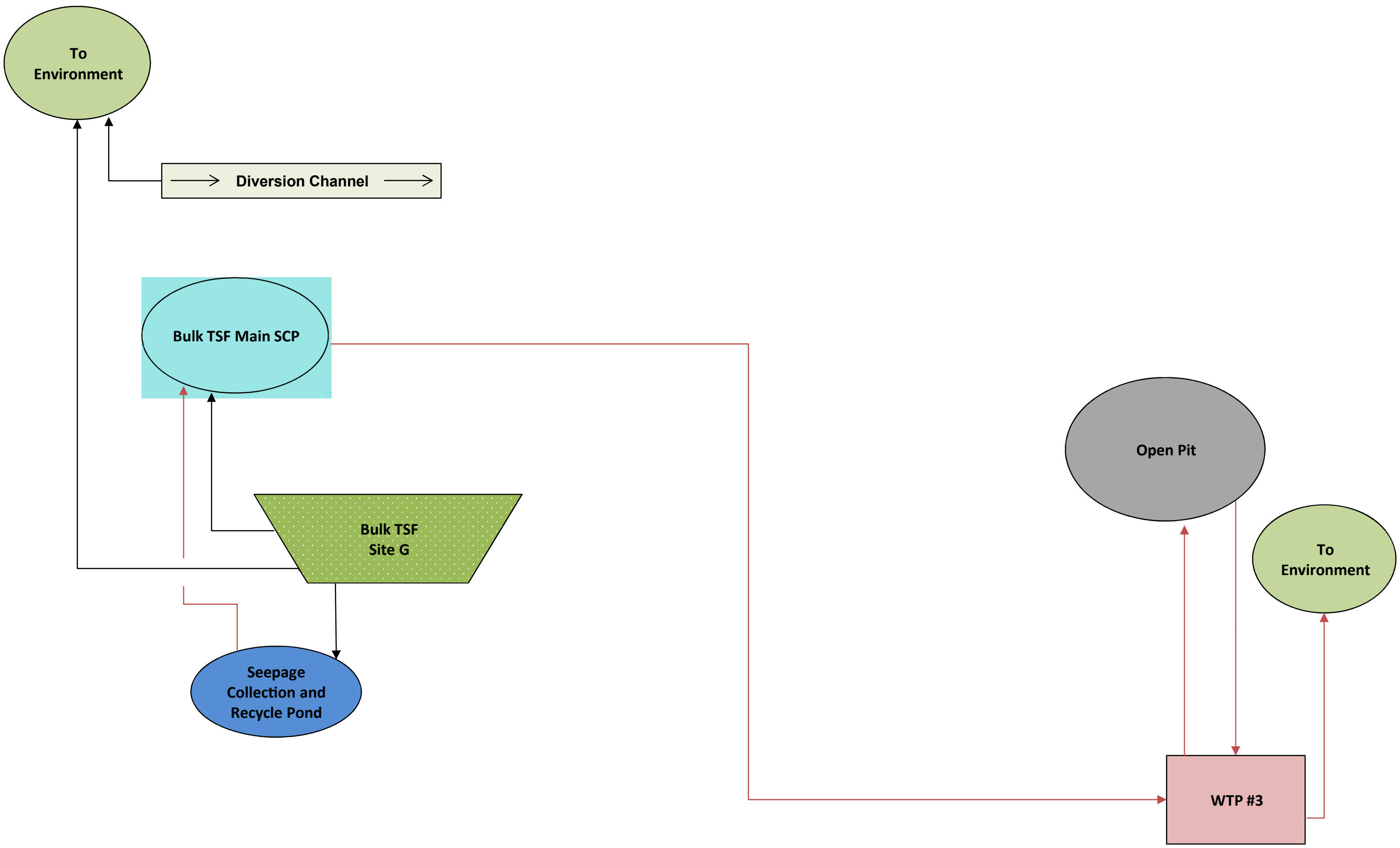

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FIGURE 4 - 9

Water Balance Flow Schematic Closure - Phase 4

LEGEND:

RUNOFF, GROUNDWATER, AND SEEPAGE PATHWAY

PUMPED FLOW

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Version:	Author:

4.17.1.1 General

The Operations Water Management Plan (Knight Piesold Consulting, 2018b) provides the characterization of the groundwater and surface water runoff within the project mine site footprint. A brief description of the waters that will be managed at closure is provided as follows:

- **Fresh water:** water that has not come into direct contact with un-reclaimed areas or is otherwise not mine-impacted, and therefore may be discharged to the environment without treatment in the water treatment plants. These flows are expected to have similar runoff patterns to the pre-mine and operations hydrographs, with high flows occurring during the spring snowmelt season and fall rainy season, and low flows occurring during the late summer period. Minimal flows are expected during the winter when precipitation will mostly fall as snow.

- **Stormwater:** runoff from un-reclaimed areas that only requires treatment for sediment in order to meet discharge water quality standards prior to discharge to the environment. Stormwater is defined under EPA discharge regulation 40 CFR 122.26 (b) (13) as “Stormwater runoff, snowmelt runoff, and surface runoff and drainage.” Stormwater will be discharged under general Alaska Pollutant Discharge Elimination System (APDES) Stormwater Permits.

- **Mine-impacted water:** water impacted by the former mining operation that requires treatment at the water treatment plants to meet discharge water quality standards prior to discharge to the environment. Mine-impacted water is anticipated to include, but may not be limited to, water in the Bulk TSF, the Pyritic TSF, the Main WMP, the Open Pit WMP, and the Open Pit.

The water management plan for the above-defined water sources and for each phase of closure is described in the following sections.

4.17.1.2 Freshwater Diversion Channels

Diversion channels diverting fresh water from operations are proposed to collect and convey surface water runoff from undisturbed ground and discharge it directly to downstream waterways. The diversion channels will be maintained while the facilities are being reclaimed. Once a facility has been reclaimed and surface water runoff has met the required closure criteria, the associated diversion channels will be decommissioned so that the drainage pathways are returned, as much as possible, to pre-project conditions.

Two diversion channels will likely remain for the post-closure phase: the Bulk TSF closure channel on the southwest side of the facility and the Bulk TSF Main Seepage Collection Pond closure channel on the southeast side of the facility. The channels are shown on Figure 4-5.

4.17.1.3 Bulk TSF

Active reclamation of the Bulk TSF will begin in Year 10 of closure during Phase 1. Surplus water collected in the TSF supernatant pond will be pumped to the Main WMP during Phase 1 of closure, and to the Open Pit during Phases 2 and 3. Specific physical reclamation procedures are discussed in Section 4.17.

Seepage water will be collected in the South and East Seepage Collection Recycle Ponds (SCRP) and the Bulk TSF Main SCP. The flows from the South and East SCRPs will be pumped to the Bulk TSF Main SCP, and then will be pumped to the Main WMP during Phase 1, to the Open Pit during Phase 2 while the Open Pit is filling, and then directly to WTP#3 during Phases 3 and 4.

The Bulk TSF will be deemed fully reclaimed once the supernatant pond water meets discharge water quality criteria, which will correspond to the start of Phase 4 for the purpose of the closure water management plan. As the tailings mass consolidates, water that was previously trapped within the interstitial spaces of the tailings solids is assumed to be released to the supernatant pond. The water quality of the supernatant pond will be monitored, and once it meets discharge water quality criteria, water will be discharged from the Bulk TSF through an operating spillway to the downstream NFK catchment. The spillway will be constructed to pass the probable maximum flood (PMF) estimated for the facility.

Water that infiltrates the low permeability cover over the Bulk tailings beach will report as seepage from the Bulk TSF and will be collected in the Bulk TSF Main SCP and the South and East SCRPs. The seepage flows will be monitored for water quality and the ponds will remain active until the seepage water-quality levels are acceptable for discharge. The water-quality modeling results discussed in (Knight Piésold Consulting, 2018a), indicate that under the current assumptions, the seepage from the Bulk TSF will not meet discharge water-quality criteria and therefore will have to be subject to long-term management and treatment.

4.17.1.4 Pyritic Tailings and PAG Waste Rock Storage Facility

PAG waste rock and pyritic tailings from the Pyritic TSF will be transferred to the Open Pit during Phase 1 of closure. The PAG waste rock will be progressively placed within the Open Pit in controlled lifts; placement will start one year prior to any deposition of pyritic tailings. Additional PAG waste rock will be transferred as it becomes exposed within the Pyritic TSF, while the pyritic tailings will be re-slurried and transferred to the Open Pit. Water stored within the Pyritic TSF—including the supernatant pond accumulated during operations, water trapped within the tailings voids, direct pond precipitation, and surface runoff during the closure phase—will be used to re-slurry the tailings. Additional water will be reclaimed from the Open Pit to support the re-slurring activities, as required.

Seepage collection and recycle ponds located downstream to the north, south, and east of the Pyritic TSF will remain active while the pyritic tailings and PAG waste rock are transferred to the Open Pit. Seepage flows to the south and east will be pumped back to the TSF, as required, and seepage flows to the north will be pumped to the Main WMP. These ponds will be removed and the areas reclaimed during Phase 2.

During the later years of Phase 1, select embankment materials will be used as reclamation materials for the Bulk TSF. After the removal of the pyritic tailings and PAG waste rock, the remaining Pyritic TSF embankment materials will be breached, the liner and impacted materials will be removed, and the surface will be regraded and capped with a growth medium. Surface water runoff will then be discharged to the downstream NFK catchment.

4.17.1.5 Main Water Management Pond

The Main WMP will provide water storage surge capacity for the mine site during Phase 1 of closure. The Main WMP will manage water pumped from the Bulk TSF supernatant pond, water from the Bulk TSF SCP, and runoff from the Pyritic TSF main embankment. Surplus water in the Main WMP will be treated for release at WTP #2. Once the Main WMP is reclaimed, the embankments will be breached, the liner and impacted materials will be removed, and the surface will be regraded and capped with a growth medium. Surface water runoff will then be discharged downstream in the NFK catchment.

4.17.1.6 Open Pit

Water quality predictions for the pit lake during closure were predicted by Lorax Environmental and reported in an October 31, 2018, Technical Memorandum (Lorax Environmental, 2018). The pit lake predictions were completed for Closure Years 16–131 (115-year model period). The model was run assuming water elevation in the pit was maintained at 890 ft (amsl) by pumping.

The pit lake water surface will be maintained at or below the MM level of 890 ft amsl. The MM level is designed to allow freeboard to contain the Probable Maximum Flood (PMF) without encroaching on the Not to Exceed Level (NTE Level) of 900 ft amsl.

Surplus water from the Open Pit will be pumped and treated to maintain the water surface elevation below the MM Level for the long term.

This water management strategy will ensure the pit lake will act as a sink for nearby groundwater, thereby mitigating the potential for contaminant release along subsurface pathways.

Model results are summarized below:

- At its maximum level, the lake encompasses a surface area of approximately 198 ha, is 163 m deep, and occupies a total water volume of 232 million m^3 (not including backfilled tailings and waste rock).
- The input of higher-density flows to the pit bottom (e.g., WTP sludge, WTP brine) promotes the development of strong stratification in the lower water column. The salinity gradient (pycnocline) migrates upwards over time as these dense inflows progressively fill the pit from the bottom up.
- Salinity stratification in the pit lake is largely governed by the concentrations of sulfate, calcium, magnesium, and chloride.
- Pit lake surface water temperatures show strong seasonal variability, with values ranging from 2°C to 15°C. The temperatures in the surface layer illustrate seasonal mixing to depths of 10–15 m. At deeper depths, waters remain near the temperature of maximum density (4°C), except at the pit bottom, where the input of WTP sludge and brine sustains temperatures of approximately 8°C.
- There will be near-surface stratification, with oxygenated waters extending to a depth of 15 m on a seasonal basis. Waters in the lake surface will not mix appreciably below a depth of approximately 15 m.

- Below 15 m, dissolved oxygen values progressively decrease in response to their isolation from atmospheric influences. However, the fully oxygenated conditions of the bottom water inputs (e.g., WTP sludge and WTP brine) will sustain oxic conditions in lake bottom waters in the lowermost 40 m of the water column.

- Parameters showing predictions that exceed discharge limits include hardness and several trace elements (Al, As, Cd, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, and Zn).

- Surface waters will show presence of neutral to slightly basic pH values for all time steps.

The Open Pit WMP and its associated sediment pond will be removed, and the areas will be reclaimed during Phase 1 of closure. While the PAG waste rock and pyritic tailings are being transferred to the Open Pit during Phase 1, partial dewatering of the Open Pit will occur to allow for controlled placement and management of the PAG waste rock while keeping a water cover over the pyritic tailings. Water from the Open Pit will be pumped to the Pyritic TSF to support the re-slurry of the pyritic tailings, as required.

After completion of the transfer of the PAG waste rock and pyritic tailings from the Pyritic TSF to the Open Pit during Phase 1, dewatering of the Open Pit will cease and the pit will be allowed to fill with surface water runoff and groundwater inflows. Surplus water from the Bulk TSF Main SCP and Bulk TSF supernatant pond will be pumped to the Open Pit during this filling stage (Phase 2), and the Open Pit Fresh Water Diversion Channel will be decommissioned to reduce the time to fill the pit.

Once the Open Pit has reached the MM Level of 890 ft amsl, signifying the start of Phase 3 (approximately 20 years into closure, based on the water balance model results), Open Pit surplus water will be treated at WTP#3 and released to the downstream environment.

In Phase 3, the surplus water from the Bulk TSF Main SCP will be pumped directly to WTP#3 for treatment. Surplus water from the Bulk TSF supernatant pond will be released to the environment when the water no longer requires treatment to meet discharge standards. Throughout closure, the water level within the Open Pit will be maintained at or below the MM Level, thereby facilitating the discharge of shallow groundwater into the pit. Surplus water from the Open Pit will require long-term treatment at WTP#3 followed by release.

4.17.1.7 Quarries B and C

Quarry locations B and C will be actively reclaimed during Phase 1 of closure. The reclaimed quarries will be sloped to promote fresh water runoff away from the Bulk TSF. This fresh water will be directed to the downstream environment. During Phase 2, after the Pyritic TSF and diversion channels are reclaimed, the freshwater runoff will flow directly towards NFK.

4.17.1.8 Water Treatment

Water treatment during closure will be broken into closure phases as outlined in Section 4.5. Each phase is discussed below.

Closure Phase 1

Water Treatment Plant #2 and #3 will operate during Phase 1. Surplus water collected in the Main WMP will be routed to WTP #2 (as continued from operations water management) and released to the downstream environment after treatment. The water treatment plants will be utilized as described in the project description (Pebble Limited Partnership, 2018) and will be designed with a modular approach using multiple identical treatment trains operating in parallel to be able to adjust to variable flows.

Water pumped from the Open Pit (to control the water level during placement of Pyritic Tails) will be pumped to WTP #3 and released to the downstream environment after treatment. Key treatment steps will occur in the following sequence:

1. Dissolved metals will be oxidized, followed by co-precipitation with iron. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Some of the clarifier solids will be recycled back to the first reaction tank and the rest will be wasted to a sludge thickener.

2. The clarified water will flow into a second set of reaction tanks to precipitate metal sulfides and to complete precipitation of chromium and molybdenum.

3. Ultrafiltration (UF) membranes will be used to filter precipitated metals and protect downstream high-pressure membranes. Reject will be sent to the sludge thickener.

4. Nanofiltration (NF) membranes will provide additional removal of metals as well as removal of total dissolved solids (TDS) and sulfate. Permeate from the NF membranes will be habitat-conditioned and discharged to the environment.

5. NF membrane reject will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the closure water balance, sulfate must be precipitated from the NF membrane reject before disposal in the Open Pit. Sulfate from the NF membrane reject will be precipitated as calcium sulfate with a lime softening process and separated with a clarifier. Some of the clarifier solids will be recycled back to the lime softening reaction tank and the rest will be wasted to the sludge thickener.

6. Decant from the calcium sulfate precipitation clarifier will still contain high levels of TDS and dissolved sulfate. This clarifier decant water will be filtered with UF membranes followed by Reverse Osmosis (RO) membranes. The UF membranes are to protect the RO membranes from carryover clarifier solids. Reject from UF membranes will be sent to the sludge thickener. RO membrane permeate will be habitat-conditioned and will be discharged to the environment.

7. RO membrane reject water with high TDS and dissolved sulfate, will be further processed with a second identical stage of calcium sulfate precipitation by lime softening, clarification, UF membranes, and RO membranes. Some of the second stage clarifier solids are recycled back to the second stage lime softening reaction tank and the rest is wasted to the sludge thickener. Reject from second stage UF membranes is sent to the sludge thickener. Permeate from the second stage RO membranes will be habitat-conditioned and will be discharged to the environment. Highly concentrated brine reject from the second stage of RO membranes will be disposed of in the Open Pit.

8. Decant from the sludge thickener will be returned to the head of the WTP for reprocessing. Thickened sludge will be disposed of in the Open Pit.

A diagram of the water treatment process for WTP#3 is shown on Figure 4-10. Brine and sludge from both plants will be returned to the Open Pit. A schematic of the treatment flows is shown on Figure 4-6.

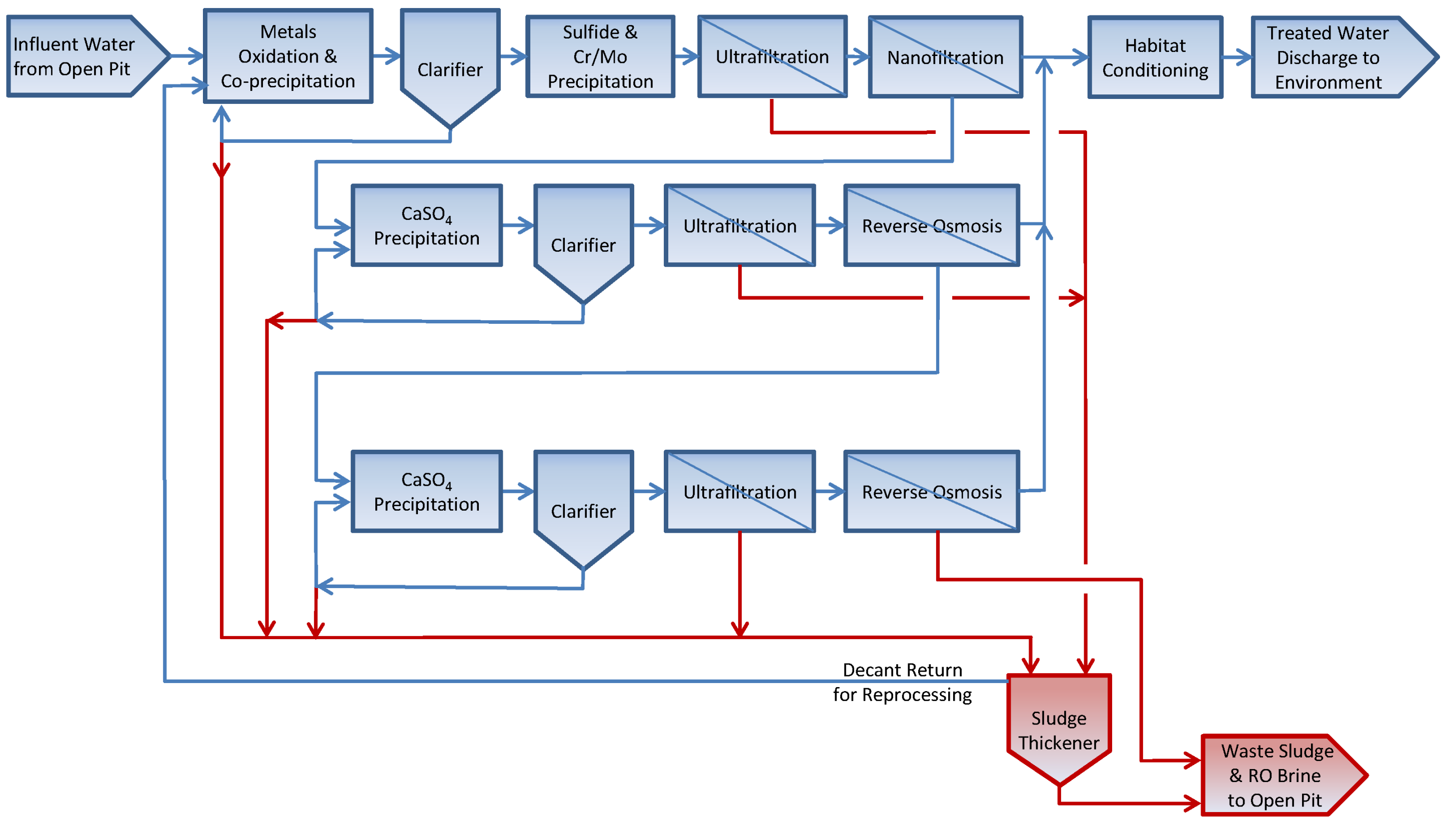

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FIGURE 4-10

Closure Phase 1
WTP#3 Process Flowsheet

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Version:	Author:

Closure Phase 2

Water Treatment Plant #2 will be decommissioned once reclamation of the Main WMP is complete. During this phase, as the pit fills, no water treatment is planned. If water is needed to maintain flows in the downstream environment, water from the pit will be treated through WTP#3. A schematic of the treatment flows is shown on Figure 4-7. The treatment process will be the same as described in the section below that discusses phase 3 and 4 treatment of water pumped from the pit.

Closure Phase 3 and 4

There will be two sources of water requiring treatment during Phase 3 and 4, water routed from the Bulk TSF Main SCP and water pumped from the pit to maintain the MM water level (see Figure 4-5). Water from the Bulk TSF Main SCP will be directed to WTP #3 but will be treated in a separate water treatment system. Water pumped from the pit will be treated in WTP#3, a process flow sheet is shown on Figure 4-10.

Figure 4-11 provides a process flowsheet of the Bulk TSF Main SCP treatment process. Key treatment steps for the Bulk TSF Main SCP flow will occur in the following sequence:

1. Dissolved metals will be oxidized, followed by co-precipitation with iron. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Some of the clarifier solids will be recycled back to the first reaction tank and the rest will be wasted to a sludge thickener.

2. The clarified water will flow into a second set of reaction tanks to precipitate metal sulfides and to complete precipitation of chromium and molybdenum.

3. Ultrafiltration (UF) membranes will be used to filter precipitated metals and protect downstream high-pressure membranes. Reject from UF membranes will be sent to the sludge thickener.

4. Nanofiltration (NF) membranes will provide additional metals removal as well as removal of TDS and sulfate. Permeate from the NF membranes will be habitat-conditioned and will be discharged to the environment.

5. NF membrane reject will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the closure water balance, sulfate must be precipitated from the NF membrane reject before disposal in the Open Pit. Sulfate from the NF membrane reject will be precipitated as calcium sulfate with a lime softening process and separated with a clarifier. Some of the clarifier solids will be recycled back to the lime softening reaction tank and the rest will be wasted to the sludge thickener.

6. Decant from the calcium sulfate precipitation clarifier will still contain high levels of TDS and dissolved sulfate. This clarifier decant water will be filtered with UF membranes followed by Reverse Osmosis (RO) membranes. The UF membranes are to protect the RO membranes from carryover clarifier solids. Reject from UF membranes will be sent to the

sludge thickener. RO membrane permeate will be habitat-conditioned and will be discharged to the environment.

7. RO membrane reject water with high TDS and dissolved sulfate, will be further processed with a second identical stage of calcium sulfate precipitation by lime softening, clarification, UF membranes, and RO membranes. Some of the second-stage clarifier solids will be recycled back to the second-stage lime-softening reaction tank, and the rest will be wasted to the sludge thickener. Reject from second-stage UF membranes will be sent to the sludge thickener. Permeate from the second-stage RO membranes will be habitat-conditioned and will be discharged to the environment. Highly concentrated brine reject from the second stage of RO membranes will be disposed of in the Open Pit.

8. Decant from the sludge thickener will be returned to the head of the WTP for reprocessing. Thickened sludge will be disposed of in the Open Pit.

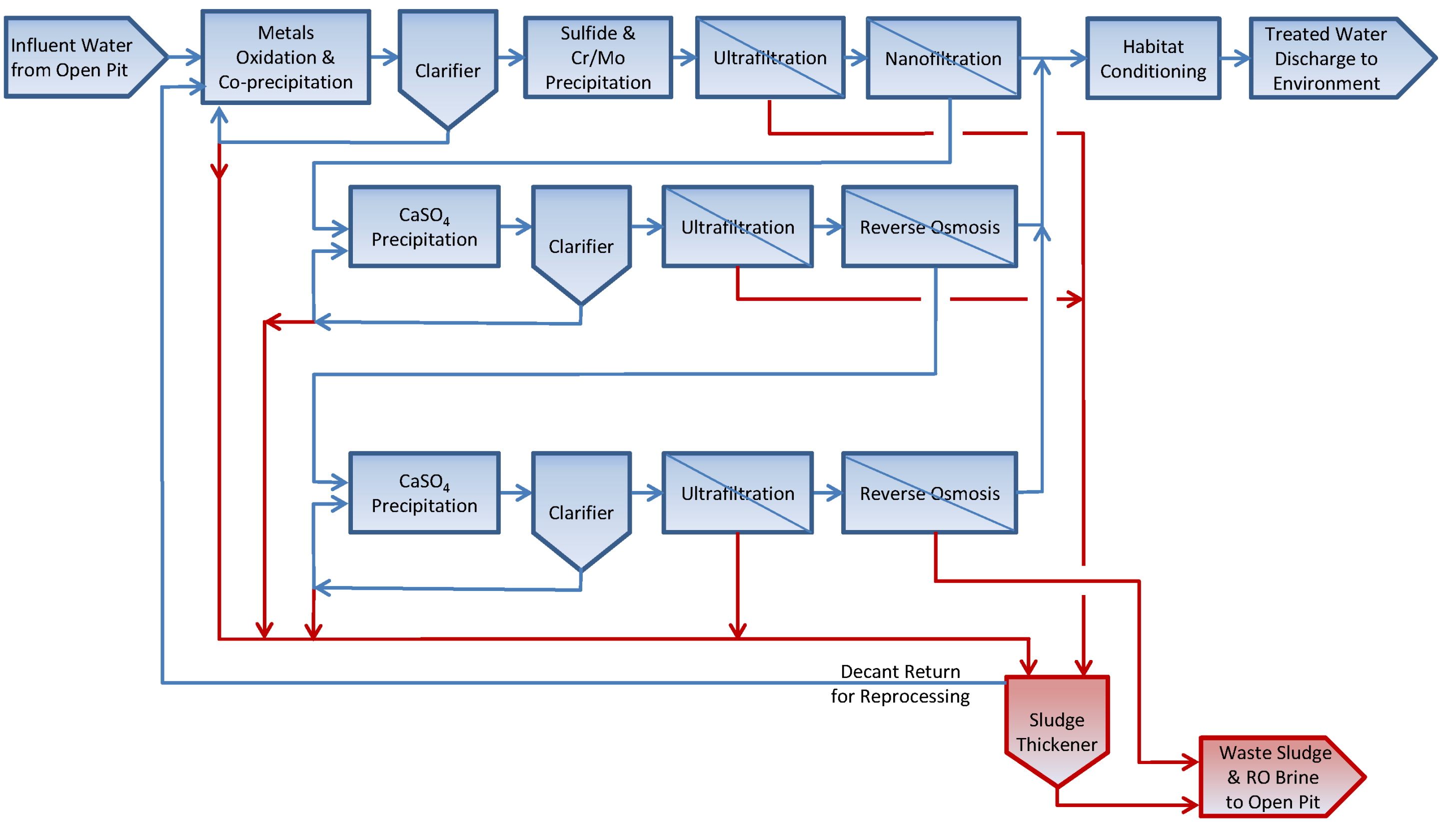

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FIGURE 4-11

Seepage Collection Pond WTP (Closure Phases 3 & 4) Process Flowsheet

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Water from the pit will be pumped as needed to the WTP #3 to maintain water levels at or below the MM Level. This water will be treated in a separate dedicated treatment train. Figure 4-12 shows a process flowsheet and key treatment steps will occur in the following sequence:

1. Dissolved metals will be oxidized, followed by co-precipitation with iron. Flocculators/clarifiers will be used to separate out the co-precipitated solids.
2. The clarified water will flow into a second set of reaction tanks to precipitate metal sulfides and to complete precipitation of remaining metals. Clarifier solids will be sent to a sludge thickener.
3. Water from the sulfide reaction tanks will be filtered with pressure sand filters followed by ultrafiltration (UF) membranes to remove precipitated metals. Permeate from the UF membranes will be habitat-conditioned and discharged to the environment. Backwash from the sand filters and UF membranes will be sent to the sludge thickener.
4. A portion of the sludge from the sludge thickener is recycled to the first reaction tank. The balance of the sludge is wasted back to the Open Pit. Decant water from the sludge thickener is sent back to the head of the WTP for reprocessing.

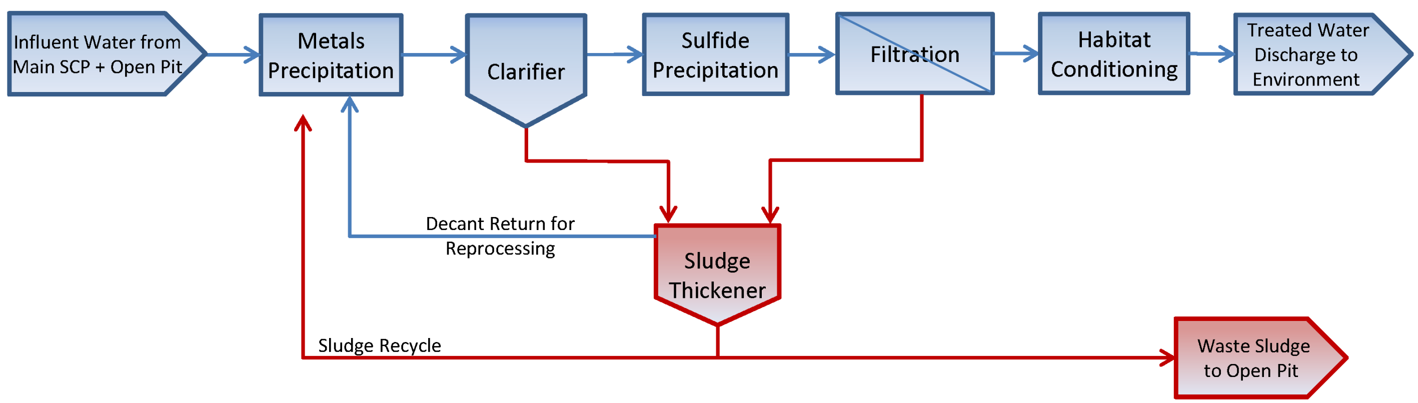

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FIGURE 4-12

Open Pit WTP
(Closure Phases 3 & 4)
Process Flowsheet

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Water from both treatment trains will be released to the downstream environment. Brine and sludge from both plants will be returned to the Open Pit. A schematic of the treatment flows is shown on Figure 4-8 and Figure 4-9.

4.17.2 Drill Hole Plugging

Mineral exploration and development drill holes, monitoring, and production wells will be abandoned in accordance with ADEC regulations (18 AAC 80.015) in a manner to prevent the transmission of water from one vertical level within the wells to another (e.g., cross-aquifer contamination). Abandonment procedures generally include removal and disposal of pumps and piping, removal of casing where possible, plugging of the wells with an approved sealing material at total depth, removal of the collar, minor grading around the well sites and seeding and mulching to revegetate the immediate area near the wells and service roads.

Bentonite or cement grout will be forced into the perforated screened interval and into the remainder of the well casings to decommission the wells in a way that protects the groundwater resources.

4.17.3 Earthwork

Some reclamation activities will require considerable earthwork. The Bulk TSF and Main Water Management Pond, will require grading, contouring, and growth medium placement. The Pyritic TSF will require transport of tailings and embankment materials to the Open Pit. Building pads and laydown yards will require grading to blend with nearby topography. Generally, slopes will be constructed to 3H:1V overall, or shallower where feasible. Roads will be graded to approximate their pre-mining topography.

Industry-standard heavy equipment will be used to perform earthwork. The anticipated equipment list will include the following or their equivalents:

- Bulldozers
- Loaders
- Haul Trucks
- Graders
- Excavators

Other equipment may be substituted for, or included with, this general equipment list. Equipment needs and uses during implementation of the plan will remain dynamic, as specific conditions require.

4.17.3.1 Slopes

Slope grading will be performed by bulldozers. If steep slopes are left after reclamation of building pads or if stockpiled reclamation materials are not used, they will be smoothed to blend with surrounding topography. The top of slopes will be pushed down until the overall slope is 3H:1V. Crests of slopes will be rounded to prevent sharp changes in slope. Interim benches may be left on taller slopes to limit erosion. Once the grading is completed, growth medium or overburden will be placed on the slopes.

4.17.3.2 Reclamation Cover

Growth medium will be transported using haul trucks and dumped at the crest of the slopes or on flat areas requiring cover. Bulldozers will be used to push the material down the slope or spread across flat areas and deposit it at the specified thickness. Once growth medium application is complete, the slope will be scarified on contour to create a varied surface to promote revegetation success and limit erosion.

4.17.3.3 Tailings Grading

Grading of tailings will be performed by bulldozers. Smaller bulldozer models will likely be chosen for this activity and they will possibly include “mud or flotation” tracks to allow operations on the tailings surface. The low permeable cover will be placed before placing growth medium. Cover materials will be transported and placed as described in Section 4.17.3.2.

Cover will be dumped at the edge of the tailings embankment and pushed over the tailings surface with bulldozers. As the cover advances across the tailings surface, trucks will be able to traverse the advancing cover to the edge before dumping. In some cases, a temporary haul road of thicker cover or rock cover may be required to support the weight of the haul truck. If this is the case, the bulldozer will grade these roads out across the tailing surface once they are not needed. Alternately, smaller haul trucks with lighter ground pressure may be used.

4.17.3.4 Road Reclamation

The roads that will be removed will be ripped to reduce compaction. Roads with significant cut or fill will be graded to blend into the surrounding topography to generally reestablish the existing drainage patterns. This will be accomplished by bulldozer on slopes shallower than 2.5H:1V, or by excavators on slopes steeper than 2.5H:1V.

Generally, roads were cut into existing native materials that are suitable for revegetation, and growth medium application is not required. If growth medium is required in select areas, it will be hauled and placed in stages as the road reclamation advances. Erosion control features will be implemented as appropriate on roads that will be reclaimed. Reclaimed roads that could experience continued unauthorized use after reclamation will be blocked with earth or rock berms to eliminate vehicle access.

4.17.3.5 Building Pads and Laydown Yards

Grading of building pads or laydown yards will be done with bulldozers. The surface will be graded to create a more natural shape and to blend with the existing topography. If the surface is compacted, it will be ripped with a bulldozer. Growth medium will be placed over the graded surface using a bulldozer if the stockpile is nearby or using haul trucks and loaders if longer-distance hauling is needed.

4.17.4 REVEGETATION AND GROWTH MEDIUM PLACEMENT

Growth medium (topsoil and overburden) will be stockpiled in anticipation of future use in reclamation. From initial development to anticipated cessation of mining, an estimated 75 million cubic yards (Myd^3) overburden and 20 Myd^3 of growth medium will be available for use during reclamation. The total estimated volume required to meet reclamation cover quantities for closure will be approximately 35 Myd^3.

Non-Potentially acid generating (non-PAG) waste rock will also be required for closure of the Bulk TSF. An estimated 33 Myd^3 will be required and will be sourced from the Pyritic TSF or from embankments of water management structures.

If the growth medium becomes compacted during storage in the stockpile, it will be tilled prior to placement to regain pre-disturbance Bulk densities.

The growth medium will be dumped and spread using a minimum of passes to limit compaction. Controlled bulldozer tracking may be performed during placement of the growth medium to roughen the surface, lightly compact the soil, increase water retention, and prevent erosion.

Based on experience with reclamation of exploration disturbances on the site and at other mine sites in Alaska, a minimum of 6 to 12 inches of growth medium will be applied to those sites requiring additional growth medium to establish a vegetative cover by seeding, and to promote natural re-invasion by native species. However, application depth may vary depending on the facility, volume of existing growth medium at the site, and if applicable, engineered cover design. For example, areas that contain mixed overburden and high levels of fines will require less growth medium than rockier areas. Roads and building sites may require little, if any, growth medium; each site will be individually evaluated on a site-specific basis. Growth medium will be applied by scraper or dump truck and spread by a bulldozer or grader.

4.17.5 SEEDBED PREPARATION

Mine and mine-related disturbances typically result in compacted surfaces that are unsuitable for revegetation. Thus, preparation of a seedbed suitable for plant germination and growth may be the most critical task in any successful land reclamation project. Growth medium (whether applied or in situ) and the underlying subsurface must be prepared in such a manner as to retain moisture and allow adequate root development and penetration in those areas where infiltration and surface water retention are desired. Reclamation of the waste rock facility (WRF) will require only surficial scarification of the growth medium cover to facilitate plant growth and minimize infiltration.

The method of primary seedbed preparation at Pebble will be ripping or scarifying (depending on the area) using a bulldozer or blade-type tractor. If necessary, ripping with two or three shanks will occur along contours of sloped areas. Highly compacted areas such as equipment lots and roads will be ripped in a linear fashion. If needed, the surface of growth medium will be scarified after application just prior to seeding. A broken, roughened surface will serve to trap moisture, reduce wind shear, minimize surface erosion by increasing infiltration, and create microhabitats conducive to seed germination and development.

4.17.6 Soil Amendments

Past exploration reclamation sites, vegetation test plots, and/or concurrent reclaimed sites will be evaluated to determine the revegetation potential of applied growth medium. PLP may conduct nutrient analyses of the soil materials that will be used for growth medium. It is not currently projected that fertilizer will be required or desirable for establishing a permanent perennial cover. However, for reclamation cost-estimating purposes, it is assumed that some level of soil amendment will be required during reclamation. In the event that future nutrient testing indicates a need for soil amendments, the procedures described below will be employed.

Prepared seedbeds will be amended prior to, after, or during (when a hydro-seeder is used) the seeding operation. Specific soil amendment requirements will depend on the quality of growth medium used for a particular area. Growth medium will be tested for standard soil agricultural constituents, including organic matter, nitrogen (N), phosphorus (P), and potassium (K).

Application of soil amendments could produce mixed results and must be managed carefully. Soil amendments may increase the establishment and growth of undesirable colonizing species and dormant ruderal species present in the growth medium.

Based on results at other locations within Interior Alaska, the general recommended rate of fertilizer application will be on the order of 100 to 500 lb (45 to 227 kg) of a fertilizer mix of 20% Nitrogen, 20% phosphorus and 10% Potassium per acre.

The selection of final products and their application rates will be determined from information acquired during concurrent reclamation and revegetation test plots. Mine revegetation research and monitoring will be conducted in cooperation with ADNR-Plant Material Center and *A Revegetation Manual for Alaska* (Wright S. J., 2008).

4.17.7 Seed and Seeding

The general reclamation seed mixes proposed for use are listed in Table 4-2 and Table 4-3. The seed mixes consist of native species that have been used extensively in other Alaska reclamation activities. Only certified weed-free seed mixes will be used.

Table 4-2: Proposed Reclamation Seed Mix – (Hydric) Wetland

Common Name	Scientific Name	Percentage of Mix
‘Egan’ American sloughgrass	Beckmannia syzigachne	45%
‘Norcoast’ Bering Hairgrass	Deschampsia beringénsis	40%
‘Arctared’ Red Fescue	Festuca rubra	10%
‘Alyeska’ Polargrass	Artagrostis latifolia	5%

Table 4-3: Proposed Reclamation Seed Mix – (Mesic) Upland

Common Name	Scientific Name	Percentage of Mix
‘Arctared’ Red Fescue	Festuca rubra	40%
‘Norcoast’ Bering Hairgrass	Deschampsia beringénsis	40%
‘Wainwright’ slender wheatgrass	Elymus trachycaulus	10%
‘Gruening’ Alpine Bluegrass	Poa alpina	10%

Note: ‘Nortran’ Tufted Hairgrass (Deschampsia caespitosa) may be substituted for ‘Norcoast’ Bering Hairgrass.

To use any seed mix, a degree of flexibility is necessary depending on seed availability and site-specific conditions; the mix may be modified. The mix may change over time to include forbs and woody species, depending on factors such as internal and external research results, changes in technology, changes in land management philosophy, and commercial availability. Native species will be the preferred mix, unless information developed by the ADNR Plant Materials Center and on-site test plots indicates other, more desirable species meet the post-mining land use criteria. Seeding will be done via drill seeding, broadcast seeding via ground or aerial application, and hydro-seeding.

The preferred method for reclamation will be broadcast seeding. Broadcast seeding will be used on terrain considered too steep or too rocky for seed drill equipment. Hydro-seeding may be employed around the edge of the pit where safety is a primary consideration. The application rate for hydric or wetlands seeding using the presently proposed seed mix will be 9 to 15 lb of pure live seed (PLS) per acre. Approximately 9 to 15 lb of PLS per acre will be applied for mesic or upland areas depending on surface contours, grade, aspect, and rockiness of the specific site.

In addition to seeding, upon completion of seedbed preparation, select areas will be left unseeded in order to evaluate the potential for natural recolonization of the site. If these areas do not meet the revegetation criteria discussed in the following sections, they will be seeded using the methods described above.

4.17.8 Control of Invasive Species

Because of the remoteness of the site it is unlikely there is a local source of invasive weed species. During vegetation establishment, seeded areas will be monitored for noxious weeds and, if necessary, weed control practices will be implemented to limit the growth and spread of noxious weeds. The control program will include the use of tested and certified “weed-free” seeds before planting.

4.17.9 Revegetation Timing

Generally, seeding will be implemented after spring break-up and until early summer to allow the seed to take advantage of the summer moisture period, with seeding done as soon as possible following seedbed preparation. Mine revegetation test plot research and experience with concurrent reclamation will be used to determine the most productive planting time, and to evaluate the potential for dormant seeding of the same plant material to be used in spring/summer seeded plots.

4.17.10 Revegetation Cover Criterion

A vegetative cover criterion of at least 70% of the surface, used at other interior Alaska hard rock mines since 1994, will be achieved prior to requesting bond release[3]. Experience in Alaska has shown this goal will likely be reached within the first 5 years. Areas reclaimed concurrently with mining will also be required to meet the criteria prior to PLP requesting bond release.

The reclamation goal of at least 30% vegetative cover over a three-year period is an interim action-level criterion, which will indicate whether additional reclamation action will need to be taken to establish a viable vegetative cover and a continuing natural succession of plant species. Further action could include reseeding the area, additional application of soil amendments, and/or incorporation of additional growth medium on a particular site or facility. PLP will be responsible for determining the cause and resolution of substandard revegetation cover.

ADNR, ADF&G, and PLP will determine performance criteria for vegetation success.

4.18 Area-Specific Reclamation

This chapter describes specific reclamation actions to be performed to reclaim project components.

4.18.1 Facilities Not Reclaimed

Some facilities at the mine site will not be reclaimed because they will be needed to support ongoing closure activities. The Facilities not reclaimed will include the following facilities:

- Bulk TSF SCP Stormwater Channel
- Bulk TSF South Stormwater Channel
- South Seepage Recycle Pond
- Bulk TSF Main SCP
- Bulk TSF East Seepage Recycle Pond
- Water Treatment Plant #3
- Power Plant
- Camp (portions)
- Access Roads and Mine Site small vehicle roads

[3] Alaska Reclamation Performance Standard (11 AAC 97.200) also defines successful revegetation as revegetation that occurs “within 5-years after reclamation is completed without the need for fertilization or re-seeding.”

- Some or all of Truck Shop and associated offices and infrastructure

Generally, mine infrastructure that will not be reclaimed will be associated with support of the post-closure care and maintenance program. Within two years of closure, a final plan for permanent closure and closure care and maintenance plan will be developed and include details on infrastructure that will remain.

4.18.2 OPEN PIT

During active mining, reclamation activity in and around the Open Pit will be limited to controlling erosion on the haul roads to prevent undue degradation to adjacent undisturbed area. Upon final mine closure, haul roads in the pit (above the MM water level) will be smoothed of all berms except those necessary for erosion control and public safety.

Safety berms around the perimeter of the pit will be created during operations to comply with regulations; however, if additional berms around the perimeter are needed they will be constructed as described in Section 4.17.3 The safety berms will be constructed far enough from the highwalls to prevent them from damage in the event of highwall failure.

If the haul road access to the pit is not needed for post-closure monitoring, it will be ripped and a berm will be constructed across the entrance. Any access roads to the pit which are needed during post-closure will have fences and signage to prevent unauthorized access.

4.18.3 TAILINGS STORAGE FACILITIES

4.18.3.1 Pyritic TSF

PAG waste rock and pyritic tailings will be transferred from the Pyritic TSF to the Open Pit. The PAG waste rock will be progressively placed in controlled lifts during Phase 1 of closure. Waste rock will be removed from the TSF in sequence with the tailings removal in order to prevent release of any tailings to the environment. The liner under the waste rock includes an overliner of screened material to prevent puncture of the liner during placement and removal of the waste rock. Care will be taken not to damage the overliner and liner during removal operations. Haul trucks and loaders will be operated in a controlled manner and the operation will be monitored and procedures adjusted if needed.

The pyritic tailings in the Pyritic TSF will be re-slurried and pumped to the Open Pit for subaqueous disposal. This will likely be accomplished using barge-mounted pumping systems floating on the Pyritic TSF pond surface. Water will be sourced from the Main WMP or from the pit dewatering program. The pond location will be adjusted as tailings are removed and sequenced with the removal of waste rock discussed above.

Tailings will be pumped to the pit via pipes laid on the ground surface and along the haul road. If the pipe will cross over a bench it will be properly supported with anchors to keep it from moving or falling. The outlet will be placed under the existing pit lake water level to maintain isolation from the air and prevent acid generation. The pipe outlet location will be controlled to not cause erosion of the pit highwalls.

Upon completion of the removal of tailings and waste rock, the overliner, HDPE pipe, and any impacted soils will be removed and disposed of in the on-site landfill or in the Open Pit. Soils below the TSF will be tested for any contact-water-related impacts, and, if needed, will be remediated or removed and disposed of in the pit.

Backhauling of the PAG waste rock will end approximately 14 years into closure and the pyritic tailings transfer will end approximately 15 years into closure. As the tailings and waste rock removal proceed and embankment sections are not needed to maintain containment, select Non-Pag materials from the Pyritic TSF embankments will be used as reclamation cover for the Bulk TSF beach surface. After completion of the Bulk TSF reclamation, the remaining Pyritic TSF embankment materials will be breached and regraded, and the footprint of the Pyritic TSF will be reclaimed. The remaining embankment will be regraded to a minimum slope of 3H:1V and the remaining area will be graded to blend with surrounding topography. The reclaimed area will be covered with growth medium as described in Section 4.17.4.

Partial dewatering of the Open Pit will occur while the PAG waste rock and pyritic tailings are being transferred from the Pyritic TSF to the Open Pit. The water level in the Open Pit will be maintained to allow for controlled placement and management of the PAG waste rock while keeping a water cover over the pyritic tailings. Dewatering of the Open Pit will cease at the end of Phase 1, once the transfer of materials has been completed.

4.18.3.2 Bulk TSF

A preliminary estimate of tailings consolidation following the end of operations has been carried out to estimate the potential post-closure settlement of the tailings mass. The tailings are expected to remain partially consolidated during operations and for a period of time after closure until all excess pore water pressures have dissipated. Consolidation of the tailings deposit will increase more rapidly once tailings deposition ceases at closure, and the self-weight consolidation continues. Those tailings closest to the embankments and tailings spigot discharge points are expected to consolidate faster since the sandier tailings forming the beach areas drain better than the more distal tailings (due to material segregation of the deposited tailings). These tailings are likely to be nearly fully consolidated at the end of operations. The actual time taken for complete consolidation of the tailings will be dependent on the in situ consolidation characteristics of the tailings material (coarse and fine-grained components) and basin drainage (foundation permeability) conditions.

The estimated tailings surface settlements following ending of tailings discharge (end of operations) are of the order of 6 to 10 feet in the finer-grained tailings. The majority of this consolidation settlement is likely to occur within a few years following the end of operations. However, some longer-term surface settlement may occur for 1 to 2 decades in areas of deeper fine tailings. Total surface settlements in the deeper zones of finer-grained tailings may be as much as 10 to 15 feet. Tailings surface settlements in the coarser beach tailings are likely to be minimal (1 to 2 feet or less).

Active reclamation of the Bulk TSF will begin in Year 10 of closure during Phase 1. Surplus water collected in the TSF supernatant pond will be pumped to the Main WMP during Phase 1 of closure, and to the Open Pit in Phases 2 and 3.

Seepage water will be collected in the South and East Seepage Collection Recycle Ponds (SCRP) and the Bulk TSF Main SCP. The flows from the South and East SCRPs will be pumped to the Bulk TSF

Main SCP, and then will be pumped to the Main WMP during Phase 1, to the Open Pit during Phase 2 while the Open Pit is filling, and then directly to WTP#3 during Phases 3 and 4.

The Bulk TSF tailings beach will be regraded prior to placement of any reclamation materials as to manage the location of a seasonal pond during long-term closure. The tailings surface will be regraded by changing the tailings beaching sequence during the final years of operation to move the low point (supernatant pond) to the location needed to align with the closure spillway. This will create the configuration shown on Figure 4-13

The conceptual cover design includes placement of a layer of non-PAG rock salvaged from the pyritic TSF embankments to act as a capillary break, followed by placement of a low permeability layer of natural glacial till followed by a protective over layer of non-PAG rock, and then a layer of growth medium.

Seepage and tailings consolidation will be monitored during operations and if data suggest that an artificial liner or other types of cover may be more effective, these will be evaluated for use.

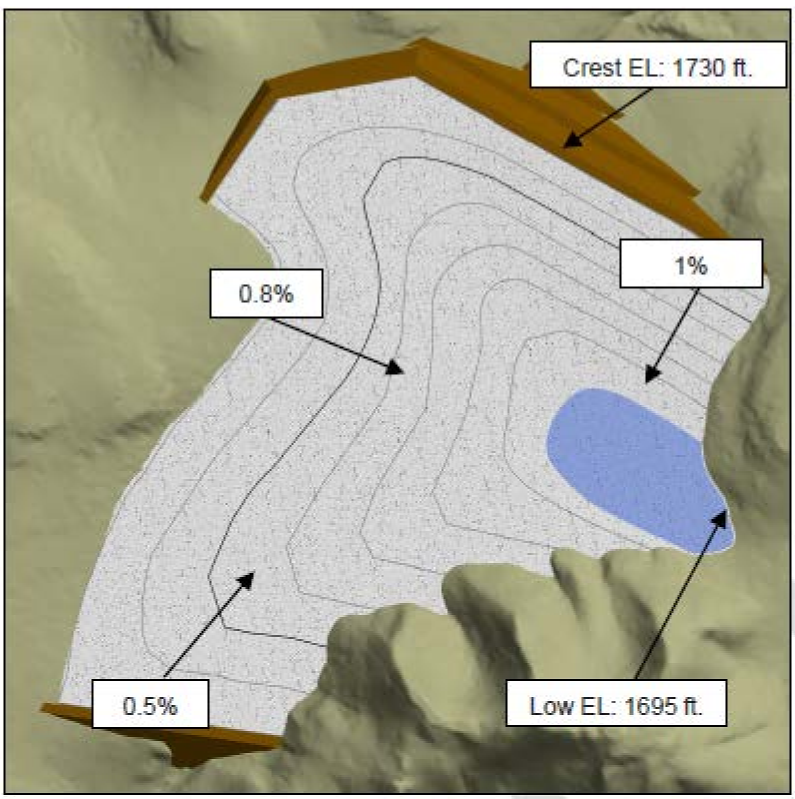

Figure 4-13: Bulk TSF Closure Beach Layout

The cover materials will be placed using standard haul trucks and loaders. The materials will be placed as described in Section 4.17.3.2 .

The Bulk TSF will be deemed fully reclaimed once the supernatant pond water meets discharge water-quality criteria, which corresponds to the start of Phase 4 for the purposes of the water management plan for closure. As the tailings mass consolidates, water that was previously trapped within the interstitial spaces of the tailings solids is assumed to be released to the supernatant pond. The water quality of the supernatant pond will be monitored, and once it meets discharge water-quality criteria, surplus water from precipitation events will be discharged from the Bulk TSF through an operating spillway to the downstream NFK catchment. The spillway will be constructed to pass the PMF estimated for the facility.

Water that infiltrates the low-permeability cover over the Bulk tailings beach will report as seepage from the Bulk TSF and will be collected in the Bulk TSF Main SCP and the South and East SCRPs. The seepage flows will be monitored for water quality and the ponds will remain active until the seepage water quality levels are acceptable for discharge. The water-quality modeling results presented in this report indicate that, under the current assumptions, the seepage from the Bulk TSF will not meet discharge water-quality criteria and therefore will have to be subject to long-term management and treatment.

Bulk TSF Closure Spillway

The Bulk TSF includes an overflow spillway designed for the long-term closure of the facility. The proposed location for the emergency overflow spillway is on the east side of the Bulk TSF; the spillway is to be excavated through Quarry C to allow flow to discharge in the North Fork Koktuli (NFK) basin. The proposed spillway location, identified on Figure 4-14 was selected as the quarry can be graded and shaped during operations, and the Bulk TSF will be regraded and reclaimed (as described above) to manage any seasonal ponding on the east side of the facility. The channel will be graded to maintain a minimum slope of 1% to discharge flow freely and not backflow into the TSF.

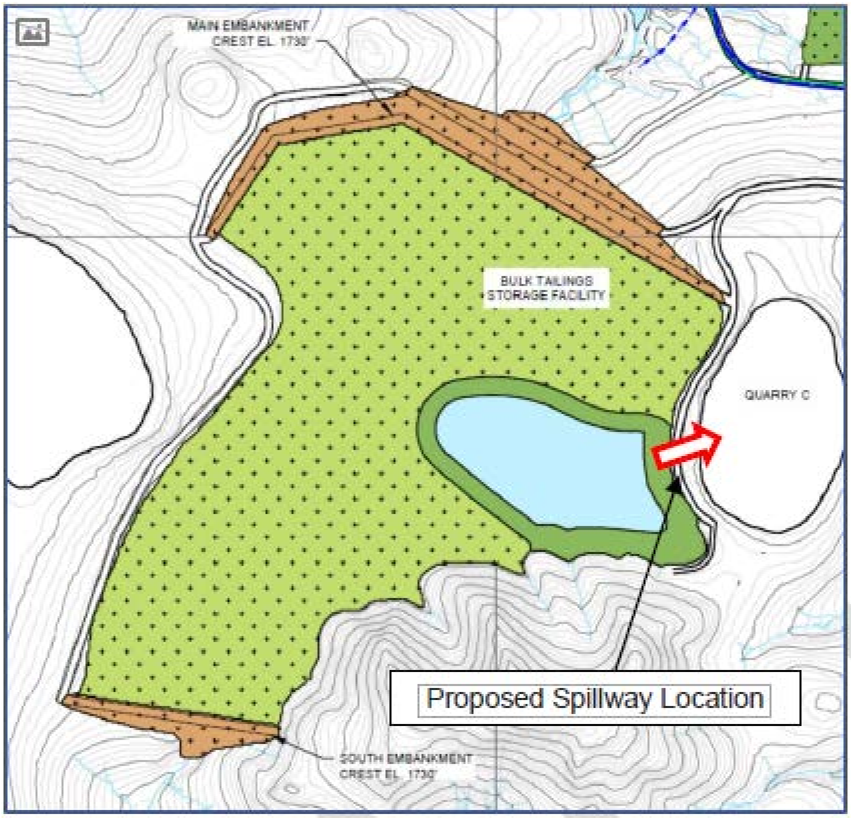

Figure 4-14: Emergency Spillway Location

The spillway sizing will be based on the spring freshet probable maximum precipitation (PMP) and the ten-year snowmelt volume; it will be factored to include an allowance for climate change effects on the design storm event. The spillway's invert elevation and cross section will control the maximum seasonal pond elevation and maintain a minimum beach length of 2,000 ft; a freeboard of 2 ft is kept within the subsequent spillway channel.

4.18.4 Water Management Facilities

The following subsections describe the reclamation of those water management facilities that will not be needed for the post-closure (Phase 4) period.

4.18.4.1 Main Water Management Pond

During Phase 1 (Closure Year 15), the Main WMP will continue to receive surplus water from the Bulk TSF and related seepage collection ponds as well as from the Pyritic TSF and its related seepage collection ponds. In Phase 2, the backhaul of Pyritic TSF tailings and waste rock will be completed and the surface will be reclaimed. Water previously reporting the Main WMP will be routed to the Open Pit Lake and the Main WMP will be reclaimed. The embankment materials may be used for the Bulk TSF reclamation or may be graded to a minimum Slope of 3H:1V using the methods described in Section 4.17.3.2.

The MWP will be reclaimed by removing any sediment from the bottom using an excavator and then transporting it and placing it in the Open Pit, below the MM Level. The liner will be cleaned, removed, and disposed of in the on-site landfill or in the Open Pit.

Soils below the MWP will be tested for any contact-water-related impacts and, if needed, will be remediated or removed and disposed of in the pit. The embankment material will be used as cover on the Bulk TSF or as other reclamation material. Any remaining embankment will be graded to blend with the surrounding topography.

The footprint of the facility will be covered with 6 to 12 inches of growth medium and seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.4.2 Open Pit Water Management Pond

When no longer required, the Open Pit WMP will be reclaimed by removing any sediment from the bottom using an excavator and transporting and placing it in the Open Pit below the MM Level. The liner will be cleaned, removed, and disposed of in the on-site landfill or in the Open Pit.

Soils below the WMP will be tested for any contact-water-related impacts, and, if needed, will be remediated or removed and disposed of in the pit. The embankment will be graded to blend with the surrounding topography.

4.18.4.3 Pyritic TSF Seepage Collection Ponds

In Phase 2, the Pyritic TSF tails and waste rock backhaul will be completed and the surface will be reclaimed. When this is complete, the North Pyritic TSF Seepage Pond and the South Pyritic Tails Seepage Collection and Recycle pond will be reclaimed.

The ponds will be reclaimed by removing any sludge from the bottom using an excavator and transporting it to the Open Pit to be placed below the maximum management water level. The embankments will be used as cover on the Bulk TSF or as other reclamation material. Any remaining embankment material will be graded to blend with the surrounding topography. Any impacted soils will be transported and placed into the Open Pit. The footprint of the facility will be covered with 6 to 12 inches of growth medium and seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.4.4 Bulk TSF Seepage Collection Ponds

The three Bulk TSF Seepage Collection Ponds will remain in operation for the Post-Closure Care and Maintenance period (Phase 4) and will not be reclaimed.

4.18.4.5 Stormwater Diversions and Sediment Ponds

At the end of Phase 2, when reclamation of the Main WMP and Pyritic TSF is complete, the Main WMP and Open Pit stormwater diversion channels will be decommissioned. Stormwater channels and related settling ponds will be reclaimed by grading the adjacent berms into the channel and blending them with the surrounding topography.

The stormwater channels and settling ponds will likely be constructed by excavating the topsoil to use as the adjacent berms to create the channel or pond. Reclaiming them using these berms will likely support revegetation without placing additional growth medium. If sections are constructed with rockfill or in rocky material, growth medium may be applied as described in Section 4.17.4.

The footprint of the facility will be seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.5 ACCESS AND MINE ROADS

Both PLP's corporate standards and state regulatory standards require most proposed mine site roads be reclaimed. However, the access road to the mine site will be required for annual delivery of Bulk reagents for the WTP, replacement parts, provisions for the crew, and for long-term monitoring of the project site. The road will remain into the foreseeable future following mine closure.

Although many of the mine roads (i.e., access roads, haul roads, construction roads, etc.) differ somewhat in width and construction, reclamation will essentially be the same for all mine roads. Culverts and bridges will be removed, natural drainage areas restored or stabilized, and roadbeds will be graded where necessary to provide adequate drainage. Water bars (to divert run-on and run-off and control erosion) and berms (to restrict human access) will be incorporated where necessary and as approved by ADNR. Reclamation of these features will include development of a streambank-stabilization protocol that will consider the variability of stream crossings, as well as more site-specific options as identified in the State of Alaska publication titled Streambank Revegetation and Protection – A Guide for Alaska (Walter J. &., 2005).

On-site roads not required for long-term monitoring will be ripped, as necessary, to eliminate the effects of compaction, recontoured to blend with the original topography, covered with a layer of growth medium, and reseeded to meet the general reclamation standards. Berms, side-cast material, and road drainage ditches will be reclaimed in this process. Paved road and parking surfaces will be ripped and buried in-place in road ditches and depressions prior to regrading.

The footprint of the roads will be covered with 6 to 12 inches of growth medium and seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.6 FERRY TERMINALS AND AMAKDEDORI PORT FACILITY

Some of the facilities at the North and South Ferry Terminals and the Amakdedori Port will be required to support the post-closure care and maintenance period and will not be reclaimed until they are no longer needed to support water treatment operations.

The facilities will be reconfigured to support a smaller operation and some buildings, areas, or port infrastructure may not be needed. If facilities are not needed, they will be decommissioned as described in Section 4.18.9.

Paved areas will be ripped and the pavement disposed offsite. Compacted areas will be ripped prior to placing 6 to 12 inches of growth medium and seeding the area, as described in Sections 4.17.4 and 4.17.5.

Port equipment (mobile equipment, containers, etc.) will be transported to the nearest large port and sold or placed in an approved landfill. The ice-breaking ferry will be decommissioned and placed in an approved landfill; smaller equipment will be utilized to support post-closure operations.

4.18.7 QUARRIES

Quarry A will be inundated with development of the Bulk TSF. Quarries B and C will be reclaimed at the end of Phase 1 by sloping and blending them with the surrounding topography. In some cases, steep slopes and benches might remain in some areas of the highwall.

The bottom and sloped areas steeper than 2H:1V will be covered with three feet of growth medium and will be seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.8 STOCKPILES

As growth medium and overburden stockpiles are exhausted or no longer needed, the remaining materials (if any) will be sloped to a maximum slope of 3H:1V. The footprints will be covered with growth medium reserved for that purpose, which will be spread using a bulldozer. The disturbed footprint will then be seeded with the reclamation seed mix as described in Section. 4.17.4 and 4.17.5.

4.18.9 BUILDINGS AND EQUIPMENT SITES

Buildings and facility components of the site will be decommissioned; materials, equipment, and buildings will be removed. Equipment and piping not needed for the reclamation and post-closure monitoring activities under this plan will be salvaged. If there is not sufficient economic value in the materials, they will be disposed of on-site in an approved manner. Process components (those that are in direct contact with process reagents) will be rinsed with fresh water during decommissioning. This rinsate will be collected and treated at the WTP.

Remaining structures on the site and foundations will be reduced to rubble and disposed of in a manner approved by ADEC. Once the buildings have been demolished, the foundations will be broken up to prevent them from being an impermeable impediment to natural percolation of meteoric waters. Following equipment and structure removal, sites will be graded slightly for proper drainage, ripped and scarified, seeded, and mulched if necessary. A thickness of approximately 6 to 12 inches of growth medium will be placed over the debris to ensure it remains below the surface into the foreseeable future.

The intake for the primary crusher will be demolished to original grade; the subsurface portion will be backfilled with inert construction debris or inert waste rock.

4.18.10 YARD AREAS

Yard areas (parking, building , and laydown yards) will be constructed in relatively flat areas. Any remaining equipment or parts will be removed and either disposed of on-site in the landfill or transported offsite for sale or recycling.

The footprint of the facilities will be graded to blend with the surrounding topography. Following grading, 6 to 12 inches of growth medium will be placed and the area seeded with the reclamation seed mix as described in Sections 4.17.4 and 4.17.5.

4.18.11 Wells and Well Closure

After mining ceases, wells not needed for post-closure monitoring will require abandonment. This issue will be revisited periodically, as additional operating data becomes available and during development of final process component closure plans. Final process component closure and monitoring plans will require approval from ADEC.

Production and dewatering wells will be abandoned once they are not needed to support dewatering activities (Phase 2).

Wells and drill holes will be abandoned as described in Section 4.17.2.

4.18.12 Electrical Power Facilities

When the large electrical power requirements are no longer necessary, substations, overhead power lines, and associated facilities will be removed from the site, unless it is agreed upon by the landowner to keep them.

The mine site power plant, substation and some of the power distribution infrastructure will likely be required to support post-closure activities. These will remain in place until no longer needed or may be reconfigured for a lower capacity to match power requirements during Closure and Post Closure.

Power lines and transformers not needed will be removed by dismantling them. Material with economic value will be transported from the mine site for recycling or sale. Power poles and other materials with no salvage value will be placed in the on-site landfill.

4.18.13 Fuel Storage Facility

Some fuel storage will be needed to support the post-closure program at the Amakdedori Port and at the mine site. Fuel tanks not needed will be drained, rinsed and dismantled, foundations demolished, and materials disposed of in the on-site landfill. Rinsate water will be sent to an oil/water separator for treatment prior to discharge.

4.18.14 Waste Disposal

Non-hazardous demolition debris will be placed in the inert solid waste landfills located at the mine site or used to fill subsurface voids exposed during the demolition of surface facilities. The resulting surface of any voids filled with construction debris will be shaped to reduce ponding, covered with approximately 6 to 12 inches of growth medium, and revegetated as described in Section 4.17.7.

Hazardous and toxic materials, such as reagents, petroleum products, acids, and solvents, will be transferred off-site by licensed transporters and either returned to the vendor or disposed of at licensed treatment, storage and disposal facilities. Hydrocarbon-contaminated soils will be treated on-site or removed from the site for offsite treatment and/or disposal.

4.18.15 Sediment Control

Each of the reclaimed components will be able to withstand design storm events (e.g., 100-year, 24-hour storm events). It is critical to successful closure that runoff is directed away from any potential areas of erosion (e.g., cut banks) and that runoff is quickly conveyed from the facility without posing a risk to the long-term stability of the cover and to the structure itself. Similarly, drainage control from the tailings cover is critical to the long-term establishment of a vegetative cover and drainage channels of the closed TSF. The technical specifications for the management of storm water runoff following closure of the site will be developed as part of the updated Stormwater Pollution Prevention Plan (SWPPP) for closure.

4.18.16 Monitoring and Maintenance

Once physical reclamation has begun, temporary diversions and sedimentation control systems will be monitored on a routine basis (weekly when weather conditions allow) by PLP personnel. These systems will be cleaned, repaired, and modified as necessary.

Long-term or permanent diversions and the safety fencing and signage will be monitored and maintained as needed until the reclamation bond has been released.

Success of reclamation will be monitored in two ways:

- Physical reclamation, such as earthwork and growth medium application, will be checked periodically for excess erosion problems and immediately following major rain storms. Remedial action to correct instability will be taken as soon as feasible following detection of substantial erosion or loss of growth medium.

- Vegetation success will be monitored qualitatively by visual inspection on an ongoing basis by PLP and ADNR personnel, and quantitatively once per year. A consulting professional will conduct quantitative analysis at the end of the growing season (end of August).

ADNR, ADF&G, and PLP will determine performance criteria for vegetation success. PLP will seek release of the reclamation surety on a facility-by-facility basis (as per 11 AAC 97.435), when quantitative data indicate the established criteria have been met.

Site-wide monitoring systems will remain in place until PLP demonstrates to ADNR and/or ADEC that they are no longer necessary.

5 APPLICANT STATEMENT OF RESPONSIBILITY

PLP recognizes its responsibility in the use of public (state) lands and accepts that responsibility in agreeing to reclaim the proposed PLP project site. This acknowledgement includes but is not necessarily limited to conformance with applicable statutes and regulations implemented by ADNR and ADEC (Section 1.1). PLP will meet the requirements of its reclamation plan and return the site to a safe and stable condition consistent with the approved post-mining land use. PLP will meet required local, state, and federal regulations regarding reclamation of any surface area affected by the mining and processing operations. Reclamation activities and post-reclamation maintenance of remaining structures are PLP’s responsibility.

In the event that a new operator/landowner assumes control of the proposed PLP project, at that time, the new operator or landowner will agree to assume responsibility for the reclamation and maintenance of any affected land and structures that are the subject of this Plan or existing permits. The new operator/landowner will request transfer of all applicable state and federal permits. The new operator/landowner will provide evidence that a surety is filed with ADNR that will cover reclamation of disturbed lands, including privately owned and state land, as well as post-reclamation maintenance of remaining structures.

6 ACKNOWLEDGMENTS

A. It is understood that should the nature of the operation change, a modified or supplemental plan of operations and reclamation may be required.

B. It is understood that approval of this Plan does not constitute:

1. Certification of ownership to any person named herein; and
2. Recognition of the validity of any mining claim herein.

C. It is understood that a bond equivalent to the estimated cost of performing the agreed upon reclamation measures will be required before this Plan can be approved. Bonding and any bond reduction amounts will be set on a site-specific basis by ADNR and ADEC in coordination with the cooperating agencies.

D. It is understood that any information provided with this Plan or provided in the future, that is marked “Confidential” will be treated by the agency in accordance with that agency's laws, rules, and regulations.

E. PLP will conduct an environmental closure audit to determine if any previously unknown environmental liabilities exist as a direct or indirect result of the PLP project.

PLP has reviewed and agrees to comply with all conditions in the Reclamation and Closure Plan. PLP understands the bond will not be released until ADNR and ADEC give written approval of the reclamation work.

Pebble Limited Project

By: ____

Title: ____

Signature ____

Date: ____

7 REFERENCES

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Appendix A
Reclamation Plan Land Status

Appendix A
Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 552871	Pebble East Claims Corp.	SOUTH PEBBLE 113	8S005S036W08	160
ADL 552872	Pebble East Claims Corp.	SOUTH PEBBLE 114	8S005S036W08	160
ADL 552873	Pebble East Claims Corp.	SOUTH PEBBLE 115	8S005S036W09	160
ADL 552874	Pebble East Claims Corp.	SOUTH PEBBLE 116	8S005S036W16	160
ADL 552875	Pebble East Claims Corp.	SOUTH PEBBLE 117	8S005S036W16	160
ADL 552876	Pebble East Claims Corp.	SOUTH PEBBLE 118	8S005S036W17	160
ADL 552877	Pebble East Claims Corp.	SOUTH PEBBLE 119	8S005S036W17	160
ADL 552878	Pebble East Claims Corp.	SOUTH PEBBLE 120	8S005S036W18	160
ADL 552879	Pebble East Claims Corp.	SOUTH PEBBLE 121	8S005S036W18	160
ADL 552880	Pebble East Claims Corp.	SOUTH PEBBLE 122	8S005S036W18	160
ADL 552881	Pebble East Claims Corp.	SOUTH PEBBLE 123	8S005S036W18	160
ADL 552882	Pebble East Claims Corp.	SOUTH PEBBLE 124	8S005S036W17	160
ADL 552883	Pebble East Claims Corp.	SOUTH PEBBLE 125	8S005S036W17	160
ADL 552884	Pebble East Claims Corp.	SOUTH PEBBLE 126	8S005S036W16	160
ADL 552885	Pebble East Claims Corp.	SOUTH PEBBLE 127	8S005S036W16	160
ADL 552909	Pebble East Claims Corp.	SOUTH PEBBLE 151	8S005S036W25	160
ADL 552911	Pebble East Claims Corp.	SOUTH PEBBLE 153	8S005S036W24	160
ADL 552912	Pebble East Claims Corp.	SOUTH PEBBLE 154	8S005S036W24	160
ADL 552913	Pebble East Claims Corp.	SOUTH PEBBLE 155	8S005S036W24	160
ADL 552914	Pebble East Claims Corp.	SOUTH PEBBLE 156	8S005S036W24	160
ADL 552915	Pebble East Claims Corp.	SOUTH PEBBLE 157	8S005S036W13	160
ADL 552916	Pebble East Claims Corp.	SOUTH PEBBLE 158	8S005S036W13	160
ADL 552931	Pebble East Claims Corp.	KAK 1	8S004S037W12	160
ADL 552932	Pebble East Claims Corp.	KAK 2	8S004S037W12	160
ADL 552933	Pebble East Claims Corp.	KAK 3	8S004S037W11	160
ADL 552934	Pebble East Claims Corp.	KAK 4	8S004S037W11	160
ADL 552935	Pebble East Claims Corp.	KAK 5	8S004S037W11	160
ADL 552936	Pebble East Claims Corp.	KAK 6	8S004S037W11	160
ADL 552937	Pebble East Claims Corp.	KAK 7	8S004S037W12	160
ADL 552938	Pebble East Claims Corp.	KAK 8	8S004S037W12	160
ADL 552939	Pebble East Claims Corp.	KAK 9	8S004S037W01	160
ADL 552940	Pebble East Claims Corp.	KAK 10	8S004S037W01	160
ADL 552941	Pebble East Claims Corp.	KAK 11	8S004S037W02	160
ADL 552942	Pebble East Claims Corp.	KAK 12	8S004S037W02	160
ADL 552943	Pebble East Claims Corp.	KAK 13	8S004S037W03	160
ADL 552944	Pebble East Claims Corp.	KAK 14	8S004S037W03	160
ADL 552945	Pebble East Claims Corp.	KAK 15	8S004S037W03	160
ADL 552946	Pebble East Claims Corp.	KAK 16	8S004S037W03	160
ADL 552947	Pebble East Claims Corp.	KAK 17	8S004S037W02	160
ADL 552948	Pebble East Claims Corp.	KAK 18	8S004S037W02	160
ADL 552949	Pebble East Claims Corp.	KAK 19	8S004S037W01	160
ADL 552950	Pebble East Claims Corp.	KAK 20	8S004S037W01	160
ADL 552951	Pebble East Claims Corp.	KAK 21	8S003S036W31	160
ADL 552952	Pebble East Claims Corp.	KAK 22	8S003S036W31	160
ADL 552953	Pebble East Claims Corp.	KAK 23	8S003S037W36	160
ADL 552954	Pebble East Claims Corp.	KAK 24	8S003S037W36	160
ADL 552955	Pebble East Claims Corp.	KAK 25	8S003S037W35	160
ADL 552956	Pebble East Claims Corp.	KAK 26	8S003S037W35	160
ADL 552957	Pebble East Claims Corp.	KAK 27	8S003S037W34	160
ADL 552958	Pebble East Claims Corp.	KAK 28	8S003S037W34	160
ADL 552959	Pebble East Claims Corp.	KAK 29	8S003S037W34	160
ADL 552960	Pebble East Claims Corp.	KAK 30	8S003S037W34	160
ADL 552961	Pebble East Claims Corp.	KAK 31	8S003S037W35	160
ADL 552962	Pebble East Claims Corp.	KAK 32	8S003S037W35	160

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 552963	Pebble East Claims Corp.	KAK 33	8S003S037W36	160
ADL 552964	Pebble East Claims Corp.	KAK 34	8S003S037W36	160
ADL 552965	Pebble East Claims Corp.	KAK 35	8S003S036W31	160
ADL 552966	Pebble East Claims Corp.	KAK 36	8S003S036W31	160
ADL 552967	Pebble East Claims Corp.	KAK 37	8S003S036W30	160
ADL 552968	Pebble East Claims Corp.	KAK 38	8S003S036W30	160
ADL 552969	Pebble East Claims Corp.	KAK 39	8S003S037W25	160
ADL 552970	Pebble East Claims Corp.	KAK 40	8S003S037W25	160
ADL 552971	Pebble East Claims Corp.	KAK 41	8S003S037W26	160
ADL 552972	Pebble East Claims Corp.	KAK 42	8S003S037W26	160
ADL 552973	Pebble East Claims Corp.	KAK 43	8S003S037W27	160
ADL 552974	Pebble East Claims Corp.	KAK 44	8S003S037W27	160
ADL 552975	Pebble East Claims Corp.	KAK 45	8S003S037W27	160
ADL 552976	Pebble East Claims Corp.	KAK 46	8S003S037W27	160
ADL 552977	Pebble East Claims Corp.	KAK 47	8S003S037W26	160
ADL 552978	Pebble East Claims Corp.	KAK 48	8S003S037W26	160
ADL 552979	Pebble East Claims Corp.	KAK 49	8S003S037W25	160
ADL 552980	Pebble East Claims Corp.	KAK 50	8S003S037W25	160
ADL 552981	Pebble East Claims Corp.	KAK 51	8S003S036W30	160
ADL 552982	Pebble East Claims Corp.	KAK 52	8S003S036W30	160
ADL 552983	Pebble East Claims Corp.	KAK 53	8S003S036W19	160
ADL 552984	Pebble East Claims Corp.	KAK 54	8S003S036W19	160
ADL 552985	Pebble East Claims Corp.	KAK 55	8S003S037W24	160
ADL 552986	Pebble East Claims Corp.	KAK 56	8S003S037W24	160
ADL 552987	Pebble East Claims Corp.	KAK 57	8S003S037W23	160
ADL 552988	Pebble East Claims Corp.	KAK 58	8S003S037W23	160
ADL 552989	Pebble East Claims Corp.	KAK 59	8S003S037W22	160
ADL 552990	Pebble East Claims Corp.	KAK 60	8S003S037W24	160
ADL 552991	Pebble East Claims Corp.	KAK 61	8S003S037W24	160
ADL 552992	Pebble East Claims Corp.	KAK 62	8S003S036W19	160
ADL 552993	Pebble East Claims Corp.	KAK 63	8S003S036W19	160
ADL 552994	Pebble East Claims Corp.	KAK 64	8S003S036W18	160
ADL 552995	Pebble East Claims Corp.	KAK 65	8S003S036W18	160
ADL 552996	Pebble East Claims Corp.	KAK 66	8S003S037W13	160
ADL 552997	Pebble East Claims Corp.	KAK 67	8S003S037W13	160
ADL 552998	Pebble East Claims Corp.	KAK 68	8S003S036W18	160
ADL 552999	Pebble East Claims Corp.	KAK 69	8S003S036W18	160
ADL 553000	Pebble East Claims Corp.	KAK 70	8S003S036W17	160
ADL 553001	Pebble East Claims Corp.	KAK 71	8S003S036W17	160
ADL 553002	Pebble East Claims Corp.	KAK 72	8S003S036W10	160
ADL 553003	Pebble East Claims Corp.	KAK 73	8S003S036W10	160
ADL 553004	Pebble East Claims Corp.	KAK 74	8S003S036W09	160
ADL 553005	Pebble East Claims Corp.	KAK 75	8S003S036W09	160
ADL 553006	Pebble East Claims Corp.	KAK 76	8S003S036W08	160
ADL 553007	Pebble East Claims Corp.	KAK 77	8S003S036W08	160
ADL 553008	Pebble East Claims Corp.	KAK 78	8S003S036W07	160
ADL 553009	Pebble East Claims Corp.	KAK 79	8S003S036W07	160
ADL 553010	Pebble East Claims Corp.	KAK 80	8S003S037W12	160
ADL 553011	Pebble East Claims Corp.	KAK 81	8S003S037W12	160
ADL 553012	Pebble East Claims Corp.	KAK 82	8S003S036W07	160
ADL 553013	Pebble East Claims Corp.	KAK 83	8S003S036W07	160
ADL 553014	Pebble East Claims Corp.	KAK 84	8S003S036W08	160
ADL 553015	Pebble East Claims Corp.	KAK 85	8S003S036W08	160
ADL 553016	Pebble East Claims Corp.	KAK 86	8S003S036W09	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 553017	Pebble East Claims Corp.	KAK 87	8S003S036W09	160
ADL 553018	Pebble East Claims Corp.	KAK 88	8S003S036W10	160
ADL 553019	Pebble East Claims Corp.	KAK 89	8S003S036W10	160
ADL 553427	Pebble East Claims Corp.	PEBA 1	8S003S033W19	160
ADL 553428	Pebble East Claims Corp.	PEBA 2	8S003S033W19	160
ADL 553429	Pebble East Claims Corp.	PEBA 3	8S003S033W20	160
ADL 553437	Pebble East Claims Corp.	PEBA 11	8S003S033W19	160
ADL 553438	Pebble East Claims Corp.	PEBA 12	8S003S033W19	160
ADL 553439	Pebble East Claims Corp.	PEBA 13	8S003S033W20	160
ADL 553447	Pebble East Claims Corp.	PEBA 21	8S003S033W30	160
ADL 553448	Pebble East Claims Corp.	PEBA 22	8S003S033W30	160
ADL 553449	Pebble East Claims Corp.	PEBA 23	8S003S033W29	160
ADL 553457	Pebble East Claims Corp.	PEBA 31	8S003S033W30	160
ADL 553458	Pebble East Claims Corp.	PEBA 32	8S003S033W30	160
ADL 553459	Pebble East Claims Corp.	PEBA 33	8S003S033W29	160
ADL 553467	Pebble East Claims Corp.	PEBA 41	8S003S034W35	160
ADL 553468	Pebble East Claims Corp.	PEBA 42	8S003S034W36	160
ADL 553469	Pebble East Claims Corp.	PEBA 43	8S003S034W36	160
ADL 553470	Pebble East Claims Corp.	PEBA 44	8S003S033W31	160
ADL 553471	Pebble East Claims Corp.	PEBA 45	8S003S033W31	160
ADL 553472	Pebble East Claims Corp.	PEBA 46	8S003S033W32	160
ADL 553478	Pebble East Claims Corp.	PEBA 52	8S003S034W35	160
ADL 553479	Pebble East Claims Corp.	PEBA 53	8S003S034W36	160
ADL 553480	Pebble East Claims Corp.	PEBA 54	8S003S034W36	160
ADL 553481	Pebble East Claims Corp.	PEBA 55	8S003S033W31	160
ADL 553482	Pebble East Claims Corp.	PEBA 56	8S003S033W32	160
ADL 553488	Pebble East Claims Corp.	PEBA 62	8S004S034W02	160
ADL 553489	Pebble East Claims Corp.	PEBA 63	8S004S034W02	160
ADL 553490	Pebble East Claims Corp.	PEBA 64	8S004S034W01	160
ADL 553491	Pebble East Claims Corp.	PEBA 65	8S004S034W01	160
ADL 553492	Pebble East Claims Corp.	PEBA 66	8S004S033W06	160
ADL 553493	Pebble East Claims Corp.	PEBA 67	8S004S033W06	160
ADL 553494	Pebble East Claims Corp.	PEBA 68	8S004S033W05	160
ADL 553500	Pebble East Claims Corp.	PEBA 74	8S004S034W05	160
ADL 553501	Pebble East Claims Corp.	PEBA 75	8S004S034W04	160
ADL 553502	Pebble East Claims Corp.	PEBA 76	8S004S034W04	160
ADL 553503	Pebble East Claims Corp.	PEBA 77	8S004S034W03	160
ADL 553504	Pebble East Claims Corp.	PEBA 78	8S004S034W03	160
ADL 553505	Pebble East Claims Corp.	PEBA 79	8S004S034W02	160
ADL 553506	Pebble East Claims Corp.	PEBA 80	8S004S034W02	160
ADL 553507	Pebble East Claims Corp.	PEBA 81	8S004S034W01	160
ADL 553508	Pebble East Claims Corp.	PEBA 82	8S004S034W01	160
ADL 553509	Pebble East Claims Corp.	PEBA 83	8S004S033W06	160
ADL 553510	Pebble East Claims Corp.	PEBA 84	8S004S033W06	160
ADL 553511	Pebble East Claims Corp.	PEBA 85	8S004S033W05	160
ADL 553517	Pebble East Claims Corp.	PEBA 91	8S004S034W08	160
ADL 553518	Pebble East Claims Corp.	PEBA 92	8S004S034W09	160
ADL 553519	Pebble East Claims Corp.	PEBA 93	8S004S034W09	160
ADL 553520	Pebble East Claims Corp.	PEBA 94	8S004S034W10	160
ADL 553521	Pebble East Claims Corp.	PEBA 95	8S004S034W10	160
ADL 553522	Pebble East Claims Corp.	PEBA 96	8S004S034W08	160
ADL 553523	Pebble East Claims Corp.	PEBA 97	8S004S034W09	160
ADL 553524	Pebble East Claims Corp.	PEBA 98	8S004S034W09	160
ADL 553525	Pebble East Claims Corp.	PEBA 99	8S004S034W10	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 553526	Pebble East Claims Corp.	PEBA 100	8S004S034W10	160
ADL 553527	Pebble East Claims Corp.	PEBA 101	8S004S034W17	160
ADL 553528	Pebble East Claims Corp.	PEBA 102	8S004S034W17	160
ADL 553529	Pebble East Claims Corp.	PEBA 103	8S004S034W16	160
ADL 553530	Pebble East Claims Corp.	PEBA 104	8S004S034W16	160
ADL 553531	Pebble East Claims Corp.	PEBA 105	8S004S034W15	160
ADL 553532	Pebble East Claims Corp.	PEBA 106	8S004S034W15	160
ADL 553533	Pebble East Claims Corp.	PEBA 107	8S004S034W17	160
ADL 553534	Pebble East Claims Corp.	PEBA 108	8S004S034W17	160
ADL 553535	Pebble East Claims Corp.	PEBA 109	8S004S034W16	160
ADL 553536	Pebble East Claims Corp.	PEBA 110	8S004S034W16	160
ADL 553537	Pebble East Claims Corp.	PEBA 111	8S004S034W15	160
ADL 553538	Pebble East Claims Corp.	PEBA 112	8S004S034W15	160
ADL 553539	Pebble East Claims Corp.	PEBB 1	8S003S036W16	160
ADL 553540	Pebble East Claims Corp.	PEBB 2	8S003S036W16	160
ADL 553541	Pebble East Claims Corp.	PEBB 3	8S003S036W15	160
ADL 553542	Pebble East Claims Corp.	PEBB 4	8S003S036W15	160
ADL 553543	Pebble East Claims Corp.	PEBB 5	8S003S036W17	160
ADL 553544	Pebble East Claims Corp.	PEBB 6	8S003S036W17	160
ADL 553545	Pebble East Claims Corp.	PEBB 7	8S003S036W16	160
ADL 553546	Pebble East Claims Corp.	PEBB 8	8S003S036W16	160
ADL 553547	Pebble East Claims Corp.	PEBB 9	8S003S036W20	160
ADL 553548	Pebble East Claims Corp.	PEBB 10	8S003S036W20	160
ADL 553549	Pebble East Claims Corp.	PEBB 11	8S003S036W21	160
ADL 553550	Pebble East Claims Corp.	PEBB 12	8S003S036W21	160
ADL 553551	Pebble East Claims Corp.	PEBB 13	8S003S036W20	160
ADL 553552	Pebble East Claims Corp.	PEBB 14	8S003S036W20	160
ADL 553553	Pebble East Claims Corp.	PEBB 15	8S003S036W21	160
ADL 553554	Pebble East Claims Corp.	PEBB 16	8S003S036W29	160
ADL 553555	Pebble East Claims Corp.	PEBB 17	8S003S036W29	160
ADL 553556	Pebble East Claims Corp.	PEBB 18	8S003S036W29	160
ADL 553557	Pebble East Claims Corp.	PEBB 19	8S003S036W29	160
ADL 553558	Pebble East Claims Corp.	PEBB 20	8S003S036W32	160
ADL 553559	Pebble East Claims Corp.	PEBB 21	8S003S036W32	160
ADL 553560	Pebble East Claims Corp.	PEBB 22	8S003S036W32	160
ADL 553561	Pebble East Claims Corp.	PEBB 23	8S003S036W32	160
ADL 553562	Pebble East Claims Corp.	PEBB 24	8S004S036W06	160
ADL 553563	Pebble East Claims Corp.	PEBB 25	8S004S036W06	160
ADL 553564	Pebble East Claims Corp.	PEBB 26	8S004S036W05	160
ADL 553565	Pebble East Claims Corp.	PEBB 27	8S004S036W05	160
ADL 553566	Pebble East Claims Corp.	PEBB 28	8S004S036W06	160
ADL 553567	Pebble East Claims Corp.	PEBB 29	8S004S036W06	160
ADL 553568	Pebble East Claims Corp.	PEBB 30	8S004S036W05	160
ADL 553569	Pebble East Claims Corp.	PEBB 31	8S004S036W05	160
ADL 553570	Pebble East Claims Corp.	PEBB 32	8S004S036W07	160
ADL 553571	Pebble East Claims Corp.	PEBB 33	8S004S036W07	160
ADL 553572	Pebble East Claims Corp.	PEBB 34	8S004S036W08	160
ADL 553573	Pebble East Claims Corp.	PEBB 35	8S004S036W08	160
ADL 553574	Pebble East Claims Corp.	PEBB 36	8S004S036W07	160
ADL 553575	Pebble East Claims Corp.	PEBB 37	8S004S036W07	160
ADL 553576	Pebble East Claims Corp.	PEBB 38	8S004S036W08	160
ADL 553577	Pebble East Claims Corp.	PEBB 39	8S004S036W08	160
ADL 553578	Pebble East Claims Corp.	PEBE 1	8S002S037W25	160
ADL 553579	Pebble East Claims Corp.	PEBE 2	8S002S037W25	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 553580	Pebble East Claims Corp.	PEBE 3	8S002S037W26	160
ADL 553581	Pebble East Claims Corp.	PEBE 4	8S002S037W25	160
ADL 553582	Pebble East Claims Corp.	PEBE 5	8S002S037W25	160
ADL 553583	Pebble East Claims Corp.	PEBE 6	8S002S037W35	160
ADL 553584	Pebble East Claims Corp.	PEBE 7	8S002S037W36	160
ADL 553585	Pebble East Claims Corp.	PEBE 8	8S002S037W36	160
ADL 553586	Pebble East Claims Corp.	PEBE 9	8S002S037W36	160
ADL 553587	Pebble East Claims Corp.	PEBE 10	8S002S037W36	160
ADL 553588	Pebble East Claims Corp.	PEBF 1	8S003S038W26	160
ADL 553589	Pebble East Claims Corp.	PEBF 2	8S003S038W26	160
ADL 553590	Pebble East Claims Corp.	PEBF 3	8S003S038W25	160
ADL 553591	Pebble East Claims Corp.	PEBF 4	8S003S038W25	160
ADL 553592	Pebble East Claims Corp.	PEBF 5	8S003S037W30	160
ADL 553593	Pebble East Claims Corp.	PEBF 6	8S003S037W30	160
ADL 553594	Pebble East Claims Corp.	PEBF 7	8S003S038W26	160
ADL 553595	Pebble East Claims Corp.	PEBF 8	8S003S038W26	160
ADL 553596	Pebble East Claims Corp.	PEBF 9	8S003S038W25	160
ADL 553597	Pebble East Claims Corp.	PEBF 10	8S003S038W25	160
ADL 553598	Pebble East Claims Corp.	PEBF 11	8S003S037W30	160
ADL 553599	Pebble East Claims Corp.	PEBF 12	8S003S037W30	160
ADL 553600	Pebble East Claims Corp.	PEBF 13	8S003S037W29	160
ADL 553601	Pebble East Claims Corp.	PEBF 14	8S003S038W35	160
ADL 553602	Pebble East Claims Corp.	PEBF 15	8S003S038W35	160
ADL 553603	Pebble East Claims Corp.	PEBF 16	8S003S038W36	160
ADL 553604	Pebble East Claims Corp.	PEBF 17	8S003S038W36	160
ADL 553605	Pebble East Claims Corp.	PEBF 18	8S003S037W31	160
ADL 553606	Pebble East Claims Corp.	PEBF 19	8S003S037W31	160
ADL 553607	Pebble East Claims Corp.	PEBF 20	8S003S037W32	160
ADL 553608	Pebble East Claims Corp.	PEBF 21	8S003S038W35	160
ADL 553609	Pebble East Claims Corp.	PEBF 22	8S003S038W35	160
ADL 553610	Pebble East Claims Corp.	PEBF 23	8S003S038W36	160
ADL 553611	Pebble East Claims Corp.	PEBF 24	8S003S038W36	160
ADL 553612	Pebble East Claims Corp.	PEBF 25	8S003S037W31	160
ADL 553613	Pebble East Claims Corp.	PEBF 26	8S003S037W31	160
ADL 553614	Pebble East Claims Corp.	PEBF 27	8S003S037W32	160
ADL 553615	Pebble East Claims Corp.	SILL 6155	8S004S034W07	40
ADL 553616	Pebble East Claims Corp.	SILL 6156	8S004S034W07	40
ADL 553617	Pebble East Claims Corp.	SILL 6256	8S004S034W07	40
ADL 638779	Pebble East Claims Corp.	PEB 1	8S004S036W22	160
ADL 638780	Pebble East Claims Corp.	PEB 2	8S004S036W22	160
ADL 638781	Pebble East Claims Corp.	PEB 3	8S004S036W23	160
ADL 638782	Pebble East Claims Corp.	PEB 4	8S004S036W23	160
ADL 638783	Pebble East Claims Corp.	PEB 5	8S004S036W22	160
ADL 638784	Pebble East Claims Corp.	PEB 6	8S004S036W22	160
ADL 638785	Pebble East Claims Corp.	PEB 7	8S004S036W23	160
ADL 638786	Pebble East Claims Corp.	PEB 8	8S004S036W23	160
ADL 638791	Pebble East Claims Corp.	PEB 13	8S004S037W25	160
ADL 638792	Pebble East Claims Corp.	PEB 14	8S004S036W30	160
ADL 638793	Pebble East Claims Corp.	PEB 15	8S004S036W30	160
ADL 638794	Pebble East Claims Corp.	PEB 16	8S004S036W29	160
ADL 638795	Pebble East Claims Corp.	PEB 17	8S004S036W29	160
ADL 638796	Pebble East Claims Corp.	PEB 18	8S004S036W28	160
ADL 638797	Pebble East Claims Corp.	PEB 19	8S004S036W28	160
ADL 638798	Pebble East Claims Corp.	PEB 20	8S004S036W27	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 638799	Pebble East Claims Corp.	PEB 21	8S004S036W27	160
ADL 638800	Pebble East Claims Corp.	PEB 22	8S004S036W26	160
ADL 638801	Pebble East Claims Corp.	PEB 23	8S004S036W26	40
ADL 638802	Pebble East Claims Corp.	PEB 24	8S004S036W26	40
ADL 638807	Pebble East Claims Corp.	PEB 29	8S004S037W25	160
ADL 638808	Pebble East Claims Corp.	PEB 30	8S004S036W30	160
ADL 638809	Pebble East Claims Corp.	PEB 31	8S004S036W30	160
ADL 638810	Pebble East Claims Corp.	PEB 32	8S004S036W29	160
ADL 638811	Pebble East Claims Corp.	PEB 33	8S004S036W29	160
ADL 638812	Pebble East Claims Corp.	PEB 34	8S004S036W28	160
ADL 638813	Pebble East Claims Corp.	PEB 35	8S004S036W28	160
ADL 638814	Pebble East Claims Corp.	PEB 36	8S004S036W27	160
ADL 638815	Pebble East Claims Corp.	PEB 37	8S004S036W27	160
ADL 638816	Pebble East Claims Corp.	PEB 38	8S004S036W26	160
ADL 638821	Pebble East Claims Corp.	PEB 43	8S004S037W36	160
ADL 638822	Pebble East Claims Corp.	PEB 44	8S004S036W31	160
ADL 638823	Pebble East Claims Corp.	PEB 45	8S004S036W31	160
ADL 638824	Pebble East Claims Corp.	PEB 46	8S004S036W32	160
ADL 638825	Pebble East Claims Corp.	PEB 47	8S004S036W32	160
ADL 638826	Pebble East Claims Corp.	PEB 48	8S004S036W33	160
ADL 638827	Pebble East Claims Corp.	PEB 49	8S004S036W33	160
ADL 638828	Pebble East Claims Corp.	PEB 50	8S004S036W34	160
ADL 638829	Pebble East Claims Corp.	PEB 51	8S004S036W34	160
ADL 638830	Pebble East Claims Corp.	PEB 52	8S004S036W35	160
ADL 638835	Pebble East Claims Corp.	PEB 57	8S004S037W36	160
ADL 638836	Pebble East Claims Corp.	PEB 58	8S004S036W31	160
ADL 638837	Pebble East Claims Corp.	PEB 59	8S004S036W31	160
ADL 638838	Pebble East Claims Corp.	PEB 60	8S004S036W32	160
ADL 638839	Pebble East Claims Corp.	PEB 61	8S004S036W32	160
ADL 638840	Pebble East Claims Corp.	PEB 62	8S004S036W33	160
ADL 638841	Pebble East Claims Corp.	PEB 63	8S004S036W33	160
ADL 638842	Pebble East Claims Corp.	PEB 64	8S004S036W34	160
ADL 638843	Pebble East Claims Corp.	PEB 65	8S004S036W34	160
ADL 638844	Pebble East Claims Corp.	PEB 66	8S004S036W35	160
ADL 638848	Pebble East Claims Corp.	PEB 70	8S005S037W03	160
ADL 638849	Pebble East Claims Corp.	PEB 71	8S005S037W03	160
ADL 638850	Pebble East Claims Corp.	PEB 72	8S005S037W02	160
ADL 638851	Pebble East Claims Corp.	PEB 73	8S005S037W02	160
ADL 638852	Pebble East Claims Corp.	PEB 74	8S005S037W01	160
ADL 638853	Pebble East Claims Corp.	PEB 75	8S005S037W01	160
ADL 638854	Pebble East Claims Corp.	PEB 76	8S005S036W06	160
ADL 638855	Pebble East Claims Corp.	PEB 77	8S005S036W06	160
ADL 638856	Pebble East Claims Corp.	PEB 78	8S005S036W05	160
ADL 638857	Pebble East Claims Corp.	PEB 79	8S005S036W05	160
ADL 638858	Pebble East Claims Corp.	PEB 80	8S005S036W04	160
ADL 638862	Pebble East Claims Corp.	PEB 84	8S005S037W03	160
ADL 638863	Pebble East Claims Corp.	PEB 85	8S005S037W03	160
ADL 638864	Pebble East Claims Corp.	PEB 86	8S005S037W02	160
ADL 638865	Pebble East Claims Corp.	PEB 87	8S005S037W02	160
ADL 638866	Pebble East Claims Corp.	PEB 88	8S005S037W01	160
ADL 638867	Pebble East Claims Corp.	PEB 89	8S005S037W01	160
ADL 638868	Pebble East Claims Corp.	PEB 90	8S005S036W06	160
ADL 638869	Pebble East Claims Corp.	PEB 91	8S005S036W06	160
ADL 638870	Pebble East Claims Corp.	PEB 92	8S005S036W05	160

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 638871	Pebble East Claims Corp.	PEB 93	8S005S036W05	160
ADL 638872	Pebble East Claims Corp.	PEB 94	8S005S036W04	160
ADL 638873	Pebble East Claims Corp.	PEB 95	8S005S036W04	40
ADL 638874	Pebble East Claims Corp.	PEB 96	8S005S036W04	40
ADL 638875	Pebble East Claims Corp.	PEB 97	8S005S036W03	40
ADL 638882	Pebble East Claims Corp.	PEB 104	8S005S037W10	160
ADL 638883	Pebble East Claims Corp.	PEB 105	8S005S037W10	160
ADL 638884	Pebble East Claims Corp.	PEB 106	8S005S037W11	160
ADL 638885	Pebble East Claims Corp.	PEB 107	8S005S037W11	160
ADL 638886	Pebble East Claims Corp.	PEB 108	8S005S037W12	160
ADL 638887	Pebble East Claims Corp.	PEB 109	8S005S037W12	160
ADL 638888	Pebble East Claims Corp.	PEB 110	8S005S036W07	160
ADL 638889	Pebble East Claims Corp.	PEB 111	8S005S036W07	160
ADL 638890	Pebble East Claims Corp.	PEB 112	8S005S036W08	160
ADL 638891	Pebble East Claims Corp.	PEB 113	8S005S036W08	160
ADL 638892	Pebble East Claims Corp.	PEB 114	8S005S036W09	160
ADL 638893	Pebble East Claims Corp.	PEB 115	8S005S036W09	160
ADL 640061	Pebble East Claims Corp.	PEB N-1	8S004S037W24	160
ADL 640062	Pebble East Claims Corp.	PEB N-2	8S004S036W19	160
ADL 640063	Pebble East Claims Corp.	PEB N-3	8S004S036W19	160
ADL 640064	Pebble East Claims Corp.	PEB N-4	8S004S036W20	160
ADL 640065	Pebble East Claims Corp.	PEB N-5	8S004S036W20	160
ADL 640066	Pebble East Claims Corp.	PEB N-6	8S004S036W21	160
ADL 640067	Pebble East Claims Corp.	PEB N-7	8S004S036W21	160
ADL 640068	Pebble East Claims Corp.	PEB N-8	8S004S037W24	160
ADL 640069	Pebble East Claims Corp.	PEB N-9	8S004S036W19	160
ADL 640070	Pebble East Claims Corp.	PEB N-10	8S004S036W19	160
ADL 640071	Pebble East Claims Corp.	PEB N-11	8S004S036W20	160
ADL 640072	Pebble East Claims Corp.	PEB N-12	8S004S036W20	160
ADL 640073	Pebble East Claims Corp.	PEB N-13	8S004S036W21	160
ADL 640074	Pebble East Claims Corp.	PEB N-14	8S004S036W21	160
ADL 640075	Pebble East Claims Corp.	PEB N-15	8S004S037W13	160
ADL 640076	Pebble East Claims Corp.	PEB N-16	8S004S036W18	160
ADL 640077	Pebble East Claims Corp.	PEB N-17	8S004S036W18	160
ADL 640078	Pebble East Claims Corp.	PEB N-18	8S004S036W17	160
ADL 640079	Pebble East Claims Corp.	PEB N-19	8S004S036W17	160
ADL 640080	Pebble East Claims Corp.	PEB N-20	8S004S036W16	160
ADL 640081	Pebble East Claims Corp.	PEB N-21	8S004S036W16	160
ADL 640082	Pebble East Claims Corp.	PEB N-22	8S004S036W15	160
ADL 640083	Pebble East Claims Corp.	PEB N-23	8S004S036W15	160
ADL 640084	Pebble East Claims Corp.	PEB N-24	8S004S036W14	160
ADL 640085	Pebble East Claims Corp.	PEB N-25	8S004S036W14	160
ADL 640086	Pebble East Claims Corp.	PEB N-26	8S004S037W13	160
ADL 640087	Pebble East Claims Corp.	PEB N-27	8S004S036W18	160
ADL 640088	Pebble East Claims Corp.	PEB N-28	8S004S036W18	160
ADL 640089	Pebble East Claims Corp.	PEB N-29	8S004S036W17	160
ADL 640090	Pebble East Claims Corp.	PEB N-30	8S004S036W17	160
ADL 640091	Pebble East Claims Corp.	PEB N-31	8S004S036W16	160
ADL 640092	Pebble East Claims Corp.	PEB N-32	8S004S036W16	160
ADL 640093	Pebble East Claims Corp.	PEB N-33	8S004S036W15	160
ADL 640094	Pebble East Claims Corp.	PEB N-34	8S004S036W15	160
ADL 640095	Pebble East Claims Corp.	PEB N-35	8S004S036W14	160
ADL 640096	Pebble East Claims Corp.	PEB N-36	8S004S036W14	160
ADL 642027	Pebble East Claims Corp.	SOUTH PEBBLE 71	8S005S037W23	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642028	Pebble East Claims Corp.	SOUTH PEBBLE 72	8S005S037W23	160
ADL 642029	Pebble East Claims Corp.	SOUTH PEBBLE 73	8S005S037W23	160
ADL 642035	Pebble East Claims Corp.	SOUTH PEBBLE 79	8S005S036W23	160
ADL 642036	Pebble East Claims Corp.	SOUTH PEBBLE 80	8S005S036W14	160
ADL 642037	Pebble East Claims Corp.	SOUTH PEBBLE 81	8S005S036W14	160
ADL 642038	Pebble East Claims Corp.	SOUTH PEBBLE 82	8S005S036W15	160
ADL 642039	Pebble East Claims Corp.	SOUTH PEBBLE 83	8S005S036W15	160
ADL 642040	Pebble East Claims Corp.	SOUTH PEBBLE 84	8S005S037W13	160
ADL 642041	Pebble East Claims Corp.	SOUTH PEBBLE 85	8S005S037W13	160
ADL 642042	Pebble East Claims Corp.	SOUTH PEBBLE 86	8S005S037W14	160
ADL 642043	Pebble East Claims Corp.	SOUTH PEBBLE 87	8S005S037W14	160
ADL 642044	Pebble East Claims Corp.	SOUTH PEBBLE 88	8S005S037W15	160
ADL 642045	Pebble East Claims Corp.	SOUTH PEBBLE 89	8S005S037W15	160
ADL 642046	Pebble East Claims Corp.	SOUTH PEBBLE 90	8S005S037W15	160
ADL 642047	Pebble East Claims Corp.	SOUTH PEBBLE 91	8S005S037W15	160
ADL 642048	Pebble East Claims Corp.	SOUTH PEBBLE 92	8S005S037W14	160
ADL 642049	Pebble East Claims Corp.	SOUTH PEBBLE 93	8S005S037W14	160
ADL 642050	Pebble East Claims Corp.	SOUTH PEBBLE 94	8S005S037W13	160
ADL 642051	Pebble East Claims Corp.	SOUTH PEBBLE 95	8S005S037W13	160
ADL 642052	Pebble East Claims Corp.	SOUTH PEBBLE 96	8S005S036W15	160
ADL 642053	Pebble East Claims Corp.	SOUTH PEBBLE 97	8S005S036W15	160
ADL 642054	Pebble East Claims Corp.	SOUTH PEBBLE 98	8S005S036W14	160
ADL 642055	Pebble East Claims Corp.	SOUTH PEBBLE 99	8S005S036W14	160
ADL 642056	Pebble East Claims Corp.	SOUTH PEBBLE 100	8S005S036W11	160
ADL 642057	Pebble East Claims Corp.	SOUTH PEBBLE 101	8S005S036W11	160
ADL 642058	Pebble East Claims Corp.	SOUTH PEBBLE 102	8S005S036W10	160
ADL 642059	Pebble East Claims Corp.	SOUTH PEBBLE 103	8S005S036W10	160
ADL 642060	Pebble East Claims Corp.	SOUTH PEBBLE 104	8S005S036W09	160
ADL 642061	Pebble East Claims Corp.	SOUTH PEBBLE 105	8S005S036W07	160
ADL 642062	Pebble East Claims Corp.	SOUTH PEBBLE 106	8S005S036W07	160
ADL 642063	Pebble East Claims Corp.	SOUTH PEBBLE 107	8S005S037W12	160
ADL 642064	Pebble East Claims Corp.	SOUTH PEBBLE 108	8S005S037W12	160
ADL 642065	Pebble East Claims Corp.	SOUTH PEBBLE 109	8S005S037W11	160
ADL 642066	Pebble East Claims Corp.	SOUTH PEBBLE 110	8S005S037W11	160
ADL 642067	Pebble East Claims Corp.	SOUTH PEBBLE 111	8S005S037W10	160
ADL 642068	Pebble East Claims Corp.	SOUTH PEBBLE 112	8S005S037W10	160
ADL 642334	Pebble East Claims Corp.	PEB EBA 1	8S004S035W02	40
ADL 642335	Pebble East Claims Corp.	PEB EBA 2	8S004S035W02	40
ADL 642336	Pebble East Claims Corp.	PEB EBA 3	8S004S035W02	40
ADL 642337	Pebble East Claims Corp.	PEB EBA 4	8S004S035W02	40
ADL 642338	Pebble East Claims Corp.	PEB EB 1	8S003S035W35	160
ADL 642339	Pebble East Claims Corp.	PEB EB 2	8S003S035W35	160
ADL 642340	Pebble East Claims Corp.	PEB EB 3	8S003S035W35	160
ADL 642341	Pebble East Claims Corp.	PEB EB 4	8S003S035W35	160
ADL 642342	Pebble East Claims Corp.	PEB EB 5	8S003S034W31	160
ADL 642343	Pebble East Claims Corp.	PEB EB 6	8S003S034W31	160
ADL 642344	Pebble East Claims Corp.	PEB EB 7	8S003S034W32	160
ADL 642345	Pebble East Claims Corp.	PEB EB 8	8S003S034W32	160
ADL 642346	Pebble East Claims Corp.	PEB EB 9	8S003S034W33	160
ADL 642347	Pebble East Claims Corp.	PEB EB 10	8S003S034W33	160
ADL 642348	Pebble East Claims Corp.	PEB EB 11	8S003S034W31	160
ADL 642349	Pebble East Claims Corp.	PEB EB 12	8S003S034W31	160
ADL 642350	Pebble East Claims Corp.	PEB EB 13	8S003S034W32	160
ADL 642351	Pebble East Claims Corp.	PEB EB 14	8S003S034W32	160

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ADL 642352	Pebble East Claims Corp.	PEB EB 15	8S003S034W33	160
ADL 642353	Pebble East Claims Corp.	PEB EB 16	8S003S034W33	160
ADL 642354	Pebble East Claims Corp.	PEB EB 17	8S003S035W26	160
ADL 642355	Pebble East Claims Corp.	PEB EB 18	8S003S035W26	160
ADL 642356	Pebble East Claims Corp.	PEB EB 19	8S003S035W25	160
ADL 642357	Pebble East Claims Corp.	PEB EB 20	8S003S035W25	160
ADL 642358	Pebble East Claims Corp.	PEB EB 21	8S003S034W30	160
ADL 642359	Pebble East Claims Corp.	PEB EB 22	8S003S034W30	160
ADL 642360	Pebble East Claims Corp.	PEB EB 23	8S003S034W29	160
ADL 642361	Pebble East Claims Corp.	PEB EB 24	8S003S034W29	160
ADL 642362	Pebble East Claims Corp.	PEB EB 25	8S003S034W28	160
ADL 642363	Pebble East Claims Corp.	PEB EB 26	8S003S034W28	160
ADL 642364	Pebble East Claims Corp.	PEB EB 27	8S003S035W26	160
ADL 642365	Pebble East Claims Corp.	PEB EB 28	8S003S035W26	160
ADL 642366	Pebble East Claims Corp.	PEB EB 29	8S003S035W25	160
ADL 642367	Pebble East Claims Corp.	PEB EB 30	8S003S035W25	160
ADL 642368	Pebble East Claims Corp.	PEB EB 31	8S003S034W30	160
ADL 642369	Pebble East Claims Corp.	PEB EB 32	8S003S034W30	160
ADL 642370	Pebble East Claims Corp.	PEB EB 33	8S003S034W29	160
ADL 642371	Pebble East Claims Corp.	PEB EB 34	8S003S034W29	160
ADL 642372	Pebble East Claims Corp.	PEB EB 35	8S003S034W28	160
ADL 642373	Pebble East Claims Corp.	PEB EB 36	8S003S034W28	160
ADL 642374	Pebble East Claims Corp.	PEB EB 37	8S003S035W24	160
ADL 642375	Pebble East Claims Corp.	PEB EB 38	8S003S035W24	160
ADL 642376	Pebble East Claims Corp.	PEB EB 39	8S003S034W19	160
ADL 642377	Pebble East Claims Corp.	PEB EB 40	8S003S034W19	160
ADL 642378	Pebble East Claims Corp.	PEB EB 41	8S003S034W20	160
ADL 642379	Pebble East Claims Corp.	PEB EB 42	8S003S034W20	160
ADL 642380	Pebble East Claims Corp.	PEB EB 43	8S003S034W21	160
ADL 642381	Pebble East Claims Corp.	PEB EB 44	8S003S034W21	160
ADL 642382	Pebble East Claims Corp.	PEB EB 45	8S003S035W24	160
ADL 642383	Pebble East Claims Corp.	PEB EB 46	8S003S035W24	160
ADL 642384	Pebble East Claims Corp.	PEB EB 47	8S003S034W19	160
ADL 642385	Pebble East Claims Corp.	PEB EB 48	8S003S034W19	160
ADL 642386	Pebble East Claims Corp.	PEB EB 49	8S003S034W20	160
ADL 642387	Pebble East Claims Corp.	PEB EB 50	8S003S034W20	160
ADL 642388	Pebble East Claims Corp.	PEB EB 51	8S003S034W21	160
ADL 642389	Pebble East Claims Corp.	PEB EB 52	8S003S034W21	160
ADL 642390	Pebble East Claims Corp.	PEB EB 53	8S003S035W13	160
ADL 642391	Pebble East Claims Corp.	PEB EB 54	8S003S035W13	160
ADL 642392	Pebble East Claims Corp.	PEB EB 55	8S003S034W18	160
ADL 642393	Pebble East Claims Corp.	PEB EB 56	8S003S034W18	160
ADL 642394	Pebble East Claims Corp.	PEB EB 57	8S003S034W17	160
ADL 642395	Pebble East Claims Corp.	PEB EB 58	8S003S034W17	160
ADL 642396	Pebble East Claims Corp.	PEB EB 59	8S003S034W16	160
ADL 642397	Pebble East Claims Corp.	PEB EB 60	8S003S034W16	160
ADL 642398	Pebble East Claims Corp.	PEB EB 61	8S003S035W13	160
ADL 642399	Pebble East Claims Corp.	PEB EB 62	8S003S035W13	160
ADL 642400	Pebble East Claims Corp.	PEB EB 63	8S003S034W18	160
ADL 642401	Pebble East Claims Corp.	PEB EB 64	8S003S034W18	160
ADL 642402	Pebble East Claims Corp.	PEB EB 65	8S003S034W17	160
ADL 642403	Pebble East Claims Corp.	PEB EB 66	8S003S034W17	160
ADL 642404	Pebble East Claims Corp.	PEB EB 67	8S003S034W16	160
ADL 642405	Pebble East Claims Corp.	PEB EB 68	8S003S034W16	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642406	Pebble East Claims Corp.	PEB EB 69	8S003S035W12	160
ADL 642407	Pebble East Claims Corp.	PEB EB 70	8S003S035W12	160
ADL 642408	Pebble East Claims Corp.	PEB EB 71	8S003S034W07	160
ADL 642409	Pebble East Claims Corp.	PEB EB 72	8S003S034W07	160
ADL 642410	Pebble East Claims Corp.	PEB EB 73	8S003S034W08	160
ADL 642411	Pebble East Claims Corp.	PEB EB 74	8S003S034W08	160
ADL 642412	Pebble East Claims Corp.	PEB WB 1	8S003S036W33	160
ADL 642413	Pebble East Claims Corp.	PEB WB 2	8S003S036W33	160
ADL 642414	Pebble East Claims Corp.	PEB WB 3	8S003S036W34	160
ADL 642415	Pebble East Claims Corp.	PEB WB 4	8S003S036W34	160
ADL 642416	Pebble East Claims Corp.	PEB WB 5	8S003S036W33	160
ADL 642417	Pebble East Claims Corp.	PEB WB 6	8S003S036W33	160
ADL 642418	Pebble East Claims Corp.	PEB WB 7	8S003S036W34	160
ADL 642419	Pebble East Claims Corp.	PEB WB 8	8S003S036W34	160
ADL 642420	Pebble East Claims Corp.	PEB WB 9	8S003S036W28	160
ADL 642421	Pebble East Claims Corp.	PEB WB 10	8S003S036W28	160
ADL 642422	Pebble East Claims Corp.	PEB WB 11	8S003S036W27	160
ADL 642423	Pebble East Claims Corp.	PEB WB 12	8S003S036W27	160
ADL 642424	Pebble East Claims Corp.	PEB WB 13	8S003S036W26	160
ADL 642425	Pebble East Claims Corp.	PEB WB 14	8S003S036W26	160
ADL 642426	Pebble East Claims Corp.	PEB WB 15	8S003S036W28	160
ADL 642427	Pebble East Claims Corp.	PEB WB 16	8S003S036W28	160
ADL 642428	Pebble East Claims Corp.	PEB WB 17	8S003S036W27	160
ADL 642429	Pebble East Claims Corp.	PEB WB 18	8S003S036W27	160
ADL 642430	Pebble East Claims Corp.	PEB WB 19	8S003S036W26	160
ADL 642431	Pebble East Claims Corp.	PEB WB 20	8S003S036W26	160
ADL 642432	Pebble East Claims Corp.	PEB WB 21	8S003S036W21	160
ADL 642433	Pebble East Claims Corp.	PEB WB 22	8S003S036W22	160
ADL 642434	Pebble East Claims Corp.	PEB WB 23	8S003S036W22	160
ADL 642435	Pebble East Claims Corp.	PEB WB 24	8S003S036W23	160
ADL 642436	Pebble East Claims Corp.	PEB WB 25	8S003S036W23	160
ADL 642437	Pebble East Claims Corp.	PEB WB 26	8S003S036W22	160
ADL 642438	Pebble East Claims Corp.	PEB WB 27	8S003S036W22	160
ADL 642439	Pebble East Claims Corp.	PEB WB 28	8S003S036W23	160
ADL 642440	Pebble East Claims Corp.	PEB WB 29	8S003S036W23	160
ADL 642441	Pebble East Claims Corp.	PEB WB 30	8S003S036W15	160
ADL 642442	Pebble East Claims Corp.	PEB WB 31	8S003S036W15	160
ADL 642443	Pebble East Claims Corp.	PEB WB 32	8S003S036W14	160
ADL 642444	Pebble East Claims Corp.	PEB WB 33	8S003S036W14	160
ADL 642445	Pebble East Claims Corp.	PEB WB 34	8S003S036W14	160
ADL 642446	Pebble East Claims Corp.	PEB WB 35	8S003S036W14	160
ADL 642447	Pebble East Claims Corp.	PEB WB 36	8S003S036W11	160
ADL 642448	Pebble East Claims Corp.	PEB WB 37	8S003S036W11	160
ADL 642449	Pebble East Claims Corp.	PEB WB 38	8S003S036W11	160
ADL 642450	Pebble East Claims Corp.	PEB WB 39	8S003S036W11	160
ADL 643892	Pebble East Claims Corp.	PEB SE A1	8S004S035W31	40
ADL 643893	Pebble East Claims Corp.	PEB SE A2	8S004S035W31	40
ADL 643894	Pebble East Claims Corp.	PEB SE A3	8S004S035W31	40
ADL 643895	Pebble East Claims Corp.	PEB SE A4	8S004S035W31	40
ADL 643896	Pebble East Claims Corp.	PEB SE A5	8S004S035W31	40
ADL 643897	Pebble East Claims Corp.	PEB SE A6	8S004S035W19	40
ADL 643898	Pebble East Claims Corp.	PEB SE A7	8S004S035W19	40
ADL 643899	Pebble East Claims Corp.	PEB SE 1	8S004S035W31	160
ADL 643900	Pebble East Claims Corp.	PEB SE 2	8S004S035W32	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 643901	Pebble East Claims Corp.	PEB SE 3	8S004S035W32	160
ADL 643902	Pebble East Claims Corp.	PEB SE 4	8S004S035W31	160
ADL 643903	Pebble East Claims Corp.	PEB SE 5	8S004S035W32	160
ADL 643904	Pebble East Claims Corp.	PEB SE 6	8S004S035W32	160
ADL 643905	Pebble East Claims Corp.	PEB SE 7	8S004S035W30	160
ADL 643906	Pebble East Claims Corp.	PEB SE 8	8S004S035W30	160
ADL 643907	Pebble East Claims Corp.	PEB SE 9	8S004S035W29	160
ADL 643908	Pebble East Claims Corp.	PEB SE 10	8S004S035W29	160
ADL 643909	Pebble East Claims Corp.	PEB SE 11	8S004S035W28	160
ADL 643910	Pebble East Claims Corp.	PEB SE 12	8S004S035W28	160
ADL 643911	Pebble East Claims Corp.	PEB SE 13	8S004S035W30	160
ADL 643912	Pebble East Claims Corp.	PEB SE 14	8S004S035W30	160
ADL 643913	Pebble East Claims Corp.	PEB SE 15	8S004S035W29	160
ADL 643914	Pebble East Claims Corp.	PEB SE 16	8S004S035W29	160
ADL 643915	Pebble East Claims Corp.	PEB SE 17	8S004S035W28	160
ADL 643916	Pebble East Claims Corp.	PEB SE 18	8S004S035W28	160
ADL 643917	Pebble East Claims Corp.	PEB SE 19	8S004S035W19	160
ADL 643918	Pebble East Claims Corp.	PEB SE 20	8S004S035W19	160
ADL 643919	Pebble East Claims Corp.	PEB SE 21	8S004S035W20	160
ADL 643920	Pebble East Claims Corp.	PEB SE 22	8S004S035W20	160
ADL 643921	Pebble East Claims Corp.	PEB SE 23	8S004S035W21	160
ADL 643922	Pebble East Claims Corp.	PEB SE 24	8S004S035W21	160
ADL 643923	Pebble East Claims Corp.	PEB SE 25	8S004S035W19	160
ADL 643924	Pebble East Claims Corp.	PEB SE 26	8S004S035W20	160
ADL 643925	Pebble East Claims Corp.	PEB SE 27	8S004S035W20	160
ADL 643926	Pebble East Claims Corp.	PEB SE 28	8S004S035W21	160
ADL 643927	Pebble East Claims Corp.	PEB SE 29	8S004S035W33	160
ADL 643928	Pebble East Claims Corp.	PEB SE 30	8S004S035W33	160
ADL 643929	Pebble East Claims Corp.	PEB SE 31	8S004S035W33	160
ADL 643930	Pebble East Claims Corp.	PEB SE 32	8S004S035W33	160
ADL 643931	Pebble East Claims Corp.	PEB NW A1	8S003S036W12	40
ADL 643932	Pebble East Claims Corp.	PEB NW A2	8S003S036W12	40
ADL 643933	Pebble East Claims Corp.	PEB NW A3	8S003S036W12	40
ADL 643934	Pebble East Claims Corp.	PEB NW A4	8S003S036W12	40
ADL 643935	Pebble East Claims Corp.	PEB NW 1	8S003S036W02	160
ADL 643936	Pebble East Claims Corp.	PEB NW 2	8S003S036W02	160
ADL 643937	Pebble East Claims Corp.	PEB NW 3	8S003S036W01	160
ADL 643938	Pebble East Claims Corp.	PEB NW 4	8S003S036W01	160
ADL 643939	Pebble East Claims Corp.	PEB NW 5	8S003S036W02	160
ADL 643940	Pebble East Claims Corp.	PEB NW 6	8S003S036W02	160
ADL 643941	Pebble East Claims Corp.	PEB NW 7	8S003S036W01	160
ADL 643942	Pebble East Claims Corp.	PEB NW 8	8S003S036W01	160
ADL 643943	Pebble East Claims Corp.	PEB NW 9	8S002S036W35	160
ADL 643943	Pebble East Claims Corp.	PEB NW 9	8S002S036W35	160
ADL 643944	Pebble East Claims Corp.	PEB NW 10	8S002S036W35	160
ADL 643945	Pebble East Claims Corp.	PEB NW 11	8S002S036W36	160
ADL 643946	Pebble East Claims Corp.	PEB NW 12	8S002S036W36	160
ADL 643947	Pebble East Claims Corp.	PEB NW 13	8S002S036W35	160
ADL 643948	Pebble East Claims Corp.	PEB NW 14	8S002S036W35	160
ADL 643949	Pebble East Claims Corp.	PEB NW 15	8S002S036W36	160
ADL 643950	Pebble East Claims Corp.	PEB NW 16	8S002S036W36	160
ADL 643951	Pebble East Claims Corp.	PEB NW 17	8S002S036W26	160
ADL 643952	Pebble East Claims Corp.	PEB NW 18	8S002S036W26	160
ADL 643953	Pebble East Claims Corp.	PEB NW 19	8S002S036W25	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 643954	Pebble East Claims Corp.	PEB NW 20	8S002S036W25	160
ADL 643955	Pebble East Claims Corp.	PEB NW 21	8S002S036W26	160
ADL 643956	Pebble East Claims Corp.	PEB NW 22	8S002S036W26	160
ADL 643957	Pebble East Claims Corp.	PEB NW 23	8S002S036W25	160
ADL 643958	Pebble East Claims Corp.	PEB NW 24	8S002S036W25	160
ADL 643959	Pebble East Claims Corp.	PEB NW 25	8S002S036W23	160
ADL 643960	Pebble East Claims Corp.	PEB NW 26	8S002S036W23	160
ADL 643961	Pebble East Claims Corp.	PEB NW 27	8S002S036W24	160
ADL 643962	Pebble East Claims Corp.	PEB NW 28	8S002S036W24	160
ADL 643963	Pebble East Claims Corp.	PEB NW 29	8S002S036W23	160
ADL 643964	Pebble East Claims Corp.	PEB NW 30	8S002S036W23	160
ADL 643965	Pebble East Claims Corp.	PEB NW 31	8S002S036W24	160
ADL 643966	Pebble East Claims Corp.	PEB NW 32	8S002S036W24	160
ADL 644196	Pebble East Claims Corp.	PEB SE 33	8S004S035W22	160
ADL 644197	Pebble East Claims Corp.	PEB SE 34	8S004S035W22	160
ADL 644198	Pebble East Claims Corp.	PEB SE 35	8S004S035W23	160
ADL 644199	Pebble East Claims Corp.	PEB SE 36	8S004S035W23	160
ADL 644200	Pebble East Claims Corp.	PEB SE 37	8S004S035W27	160
ADL 644201	Pebble East Claims Corp.	PEB SE 38	8S004S035W27	160
ADL 644202	Pebble East Claims Corp.	PEB SE 39	8S004S035W26	160
ADL 644203	Pebble East Claims Corp.	PEB SE 40	8S004S035W26	160
ADL 644204	Pebble East Claims Corp.	PEB SE 41	8S004S035W27	160
ADL 644205	Pebble East Claims Corp.	PEB SE 42	8S004S035W27	160
ADL 644206	Pebble East Claims Corp.	PEB SE 43	8S004S035W26	160
ADL 644207	Pebble East Claims Corp.	PEB SE 44	8S004S035W26	160
ADL 644208	Pebble East Claims Corp.	PEB SE 45	8S004S035W34	160
ADL 644209	Pebble East Claims Corp.	PEB SE 46	8S004S035W34	160
ADL 644210	Pebble East Claims Corp.	PEB SE 47	8S004S035W35	160
ADL 644211	Pebble East Claims Corp.	PEB SE 48	8S004S035W34	160
ADL 644212	Pebble East Claims Corp.	PEB SE 49	8S004S035W34	160
ADL 644213	Pebble East Claims Corp.	PEB SE 50	8S005S036W02	160
ADL 644214	Pebble East Claims Corp.	PEB SE 51	8S005S036W02	160
ADL 644215	Pebble East Claims Corp.	PEB SE 52	8S005S036W01	160
ADL 644216	Pebble East Claims Corp.	PEB SE 53	8S005S036W01	160
ADL 644217	Pebble East Claims Corp.	PEB SE 54	8S005S035W06	160
ADL 644218	Pebble East Claims Corp.	PEB SE 55	8S005S035W06	160
ADL 644219	Pebble East Claims Corp.	PEB SE 56	8S005S036W02	160
ADL 644220	Pebble East Claims Corp.	PEB SE 57	8S005S036W02	160
ADL 644221	Pebble East Claims Corp.	PEB SE 58	8S005S036W01	160
ADL 644222	Pebble East Claims Corp.	PEB SE 59	8S005S036W01	160
ADL 644223	Pebble East Claims Corp.	PEB SE 60	8S005S035W06	160
ADL 644224	Pebble East Claims Corp.	PEB SE 61	8S005S035W06	160
ADL 644225	Pebble East Claims Corp.	PEB SE A8	8S004S035W23	40
ADL 644226	Pebble East Claims Corp.	PEB SE A9	8S005S036W04	40
ADL 644227	Pebble East Claims Corp.	PEB SE A10	8S005S036W03	40
ADL 644228	Pebble East Claims Corp.	PEB SE A11	8S005S036W03	40
ADL 644229	Pebble East Claims Corp.	PEB SE A12	8S005S036W03	40
ADL 644230	Pebble East Claims Corp.	PEB SE A13	8S005S036W03	40
ADL 644231	Pebble East Claims Corp.	PEB EB 75	8S003S034W09	160
ADL 644232	Pebble East Claims Corp.	PEB EB 76	8S003S034W09	160
ADL 644233	Pebble East Claims Corp.	PEB EB 77	8S003S035W11	160
ADL 644234	Pebble East Claims Corp.	PEB EB 78	8S003S035W11	160
ADL 644235	Pebble East Claims Corp.	PEB EB 79	8S003S035W12	160
ADL 644236	Pebble East Claims Corp.	PEB EB 80	8S003S035W12	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 644237	Pebble East Claims Corp.	PEB EB 81	8S003S034W07	160
ADL 644238	Pebble East Claims Corp.	PEB EB 82	8S003S034W07	160
ADL 644239	Pebble East Claims Corp.	PEB EB 83	8S003S034W08	160
ADL 644240	Pebble East Claims Corp.	PEB EB 84	8S003S034W08	160
ADL 644241	Pebble East Claims Corp.	PEB EB 85	8S003S034W09	160
ADL 644242	Pebble East Claims Corp.	PEB EB 86	8S003S034W09	160
ADL 644243	Pebble East Claims Corp.	PEB EB 87	8S003S035W02	160
ADL 644244	Pebble East Claims Corp.	PEB EB 88	8S003S035W02	160
ADL 644245	Pebble East Claims Corp.	PEB EB 89	8S003S035W01	160
ADL 644246	Pebble East Claims Corp.	PEB EB 90	8S003S035W01	160
ADL 644247	Pebble East Claims Corp.	PEB EB 91	8S003S034W06	160
ADL 644248	Pebble East Claims Corp.	PEB EB 92	8S003S034W04	160
ADL 644249	Pebble East Claims Corp.	PEB EB 93	8S003S034W04	160
ADL 644250	Pebble East Claims Corp.	PEB EB 94	8S003S035W02	160
ADL 644251	Pebble East Claims Corp.	PEB EB 95	8S003S035W02	160
ADL 644252	Pebble East Claims Corp.	PEB EB A5	8S003S035W11	40
ADL 644253	Pebble East Claims Corp.	PEB EB A6	8S003S035W11	40
ADL 644254	Pebble East Claims Corp.	PEB EB A7	8S003S035W11	40
ADL 644255	Pebble East Claims Corp.	PEB EB A8	8S003S035W11	40
ADL 644256	Pebble East Claims Corp.	PEB WB 40	8S004S036W04	160
ADL 644257	Pebble East Claims Corp.	PEB WB 41	8S004S036W04	160
ADL 644258	Pebble East Claims Corp.	PEB WB 42	8S004S036W03	160
ADL 644259	Pebble East Claims Corp.	PEB WB 43	8S004S036W03	160
ADL 644260	Pebble East Claims Corp.	PEB WB 44	8S004S036W02	160
ADL 644261	Pebble East Claims Corp.	PEB WB 45	8S004S036W02	160
ADL 644262	Pebble East Claims Corp.	PEB WB 46	8S004S036W04	160
ADL 644263	Pebble East Claims Corp.	PEB WB 47	8S004S036W04	160
ADL 644264	Pebble East Claims Corp.	PEB WB 48	8S004S036W03	160
ADL 644265	Pebble East Claims Corp.	PEB WB 49	8S004S036W03	160
ADL 644266	Pebble East Claims Corp.	PEB WB 50	8S004S036W02	160
ADL 644267	Pebble East Claims Corp.	PEB WB 51	8S004S036W02	160
ADL 644268	Pebble East Claims Corp.	PEB WB 52	8S004S036W09	160
ADL 644269	Pebble East Claims Corp.	PEB WB 53	8S004S036W09	160
ADL 644270	Pebble East Claims Corp.	PEB WB 54	8S004S036W10	160
ADL 644271	Pebble East Claims Corp.	PEB WB 55	8S004S036W10	160
ADL 644272	Pebble East Claims Corp.	PEB WB 56	8S004S036W11	160
ADL 644273	Pebble East Claims Corp.	PEB WB 57	8S004S036W11	160
ADL 644274	Pebble East Claims Corp.	PEB WB 58	8S004S036W09	160
ADL 644275	Pebble East Claims Corp.	PEB WB 59	8S004S036W09	160
ADL 644276	Pebble East Claims Corp.	PEB WB 60	8S004S036W10	160
ADL 644277	Pebble East Claims Corp.	PEB WB 61	8S004S036W10	160
ADL 644278	Pebble East Claims Corp.	PEB WB 62	8S004S036W11	160
ADL 644279	Pebble East Claims Corp.	PEB WB 63	8S004S036W11	160
ADL 644304	Pebble East Claims Corp.	SP 193	8S005S036W12	160
ADL 644305	Pebble East Claims Corp.	SP 194	8S005S036W12	160
ADL 644306	Pebble East Claims Corp.	SP 195	8S005S036W11	160
ADL 644307	Pebble East Claims Corp.	SP 196	8S005S036W11	160
ADL 644308	Pebble East Claims Corp.	SP 197	8S005S036W10	160
ADL 644309	Pebble East Claims Corp.	SP 198	8S005S036W10	160
ADL 644310	Pebble East Claims Corp.	SP 199	8S005S036W12	160
ADL 644311	Pebble East Claims Corp.	SP 200	8S005S036W12	160
ADL 644316	Pebble East Claims Corp.	SP 205	8S005S036W13	160
ADL 644317	Pebble East Claims Corp.	SP 206	8S005S036W13	160
ADL 644371	Pebble East Claims Corp.	SP 280	8S005S037W28	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 644374	Pebble East Claims Corp.	SP 283	8S005S037W22	160
ADL 644375	Pebble East Claims Corp.	SP 284	8S005S037W22	160
ADL 644376	Pebble East Claims Corp.	SP 285	8S005S037W21	160
ADL 644377	Pebble East Claims Corp.	SP 286	8S005S037W21	160
ADL 644378	Pebble East Claims Corp.	SP 287	8S005S037W21	160
ADL 644379	Pebble East Claims Corp.	SP 288	8S005S037W21	160
ADL 644380	Pebble East Claims Corp.	SP 289	8S005S037W22	160
ADL 644381	Pebble East Claims Corp.	SP 290	8S005S037W22	160
ADL 644382	Pebble East Claims Corp.	SP 291	8S005S037W16	160
ADL 644383	Pebble East Claims Corp.	SP 292	8S005S037W16	160
ADL 644384	Pebble East Claims Corp.	SP 293	8S005S037W16	160
ADL 644385	Pebble East Claims Corp.	SP 294	8S005S037W16	160
ADL 644386	Pebble East Claims Corp.	KAK 90	8S003S037W33	160
ADL 644387	Pebble East Claims Corp.	KAK 91	8S003S037W33	160
ADL 644388	Pebble East Claims Corp.	KAK 92	8S003S037W32	160
ADL 644389	Pebble East Claims Corp.	KAK 93	8S003S037W32	160
ADL 644390	Pebble East Claims Corp.	KAK 94	8S003S037W33	160
ADL 644391	Pebble East Claims Corp.	KAK 95	8S003S037W33	160
ADL 644392	Pebble East Claims Corp.	KAK 96	8S003S037W28	160
ADL 644393	Pebble East Claims Corp.	KAK 97	8S003S037W28	160
ADL 644394	Pebble East Claims Corp.	KAK 98	8S003S037W29	160
ADL 644395	Pebble East Claims Corp.	KAK 99	8S003S037W29	160
ADL 644396	Pebble East Claims Corp.	KAK 100	8S003S037W28	160
ADL 644397	Pebble East Claims Corp.	KAK 101	8S003S037W28	160
ADL 644398	Pebble East Claims Corp.	KAK 102	8S003S037W22	160
ADL 644399	Pebble East Claims Corp.	KAK 103	8S003S037W21	160
ADL 644400	Pebble East Claims Corp.	KAK 104	8S003S037W21	160
ADL 644401	Pebble East Claims Corp.	KAK 105	8S003S037W20	160
ADL 644402	Pebble East Claims Corp.	KAK 106	8S003S036W05	160
ADL 644403	Pebble East Claims Corp.	KAK 107	8S003S036W05	160
ADL 644404	Pebble East Claims Corp.	KAK 108	8S003S036W06	160
ADL 644405	Pebble East Claims Corp.	KAK 109	8S003S036W06	160
ADL 644406	Pebble East Claims Corp.	KAK 110	8S003S037W01	160
ADL 644407	Pebble East Claims Corp.	KAK 111	8S003S037W01	160
ADL 644408	Pebble East Claims Corp.	KAK 112	8S003S036W06	160
ADL 644409	Pebble East Claims Corp.	KAK 113	8S003S036W06	160
ADL 644410	Pebble East Claims Corp.	KAK 114	8S003S036W05	160
ADL 644411	Pebble East Claims Corp.	KAK 115	8S003S036W05	160
ADL 644412	Pebble East Claims Corp.	KAK 116	8S002S036W32	160
ADL 644413	Pebble East Claims Corp.	KAK 117	8S002S036W32	160
ADL 644414	Pebble East Claims Corp.	KAK 118	8S002S036W31	160
ADL 644415	Pebble East Claims Corp.	KAK 119	8S002S036W31	160
ADL 644421	Pebble East Claims Corp.	KAK 125	8S002S036W31	160
ADL 644422	Pebble East Claims Corp.	KAK 126	8S002S036W31	160
ADL 644423	Pebble East Claims Corp.	KAK 127	8S002S036W32	160
ADL 644424	Pebble East Claims Corp.	KAK 128	8S002S036W29	160
ADL 644425	Pebble East Claims Corp.	KAK 129	8S002S036W30	160
ADL 644426	Pebble East Claims Corp.	KAK 130	8S002S036W30	160
ADL 644467	Pebble East Claims Corp.	KAK 171	8S002S036W28	160
ADL 644468	Pebble East Claims Corp.	KAK 172	8S002S036W29	160
ADL 644469	Pebble East Claims Corp.	KAK 173	8S002S036W32	160
ADL 644470	Pebble East Claims Corp.	KAK 174	8S002S036W33	160
ADL 644471	Pebble East Claims Corp.	KAK 175	8S002S036W33	160
ADL 644472	Pebble East Claims Corp.	KAK 176	8S002S036W34	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 644473	Pebble East Claims Corp.	KAK 177	8S002S036W34	160
ADL 644474	Pebble East Claims Corp.	KAK 178	8S002S036W33	160
ADL 644475	Pebble East Claims Corp.	KAK 179	8S002S036W33	160
ADL 644476	Pebble East Claims Corp.	KAK 180	8S003S036W04	160
ADL 644477	Pebble East Claims Corp.	KAK 181	8S003S036W04	160
ADL 644478	Pebble East Claims Corp.	KAK 182	8S003S036W03	160
ADL 644479	Pebble East Claims Corp.	KAK 183	8S003S036W03	160
ADL 644480	Pebble East Claims Corp.	KAK 184	8S003S036W03	160
ADL 644481	Pebble East Claims Corp.	KAK 185	8S003S036W03	160
ADL 644482	Pebble East Claims Corp.	KAK 186	8S003S036W04	160
ADL 644483	Pebble East Claims Corp.	KAK 187	8S003S036W04	160
ADL 644881	Pebble East Claims Corp.	KAK 188	8S002S036W34	160
ADL 644882	Pebble East Claims Corp.	KAK 189	8S002S036W34	160
ADL 644883	Pebble East Claims Corp.	KAK 190	8S002S036W28	160
ADL 644884	Pebble East Claims Corp.	KAK 191	8S002S036W27	160
ADL 644885	Pebble East Claims Corp.	KAK 192	8S002S036W27	160
ADL 644886	Pebble East Claims Corp.	KAK 193	8S002S036W27	160
ADL 644887	Pebble East Claims Corp.	KAK 194	8S002S036W27	160
ADL 644888	Pebble East Claims Corp.	KAK 195	8S002S036W28	160
ADL 644889	Pebble East Claims Corp.	KAK 196	8S002S036W21	160
ADL 644890	Pebble East Claims Corp.	KAK 197	8S002S036W21	160
ADL 644891	Pebble East Claims Corp.	KAK 198	8S002S036W22	160
ADL 644892	Pebble East Claims Corp.	KAK 199	8S002S036W22	160
ADL 644893	Pebble East Claims Corp.	KAK 200	8S002S036W22	160
ADL 644894	Pebble East Claims Corp.	KAK 201	8S002S036W22	160
ADL 644895	Pebble East Claims Corp.	KAK 202	8S002S036W21	160
ADL 644896	Pebble East Claims Corp.	KAK 203	8S002S036W21	160
ADL 644897	Pebble East Claims Corp.	KAK 204	8S002S036W16	160
ADL 644898	Pebble East Claims Corp.	KAK 205	8S002S036W16	160
ADL 644899	Pebble East Claims Corp.	KAK 206	8S002S036W15	160
ADL 644900	Pebble East Claims Corp.	KAK 207	8S002S036W15	160
ADL 644901	Pebble East Claims Corp.	KAK 208	8S002S036W14	160
ADL 644902	Pebble East Claims Corp.	KAK 209	8S002S036W14	160
ADL 644903	Pebble East Claims Corp.	KAK 210	8S002S036W13	160
ADL 644904	Pebble East Claims Corp.	KAK 211	8S002S036W13	160
ADL 644905	Pebble East Claims Corp.	KAK 212	8S002S036W13	160
ADL 644906	Pebble East Claims Corp.	KAK 213	8S002S036W13	160
ADL 644907	Pebble East Claims Corp.	KAK 214	8S002S036W14	160
ADL 644908	Pebble East Claims Corp.	KAK 215	8S002S036W14	160
ADL 644909	Pebble East Claims Corp.	KAK 216	8S002S036W15	160
ADL 644910	Pebble East Claims Corp.	KAK 217	8S002S036W15	160
ADL 644911	Pebble East Claims Corp.	KAK 218	8S002S036W16	160
ADL 644912	Pebble East Claims Corp.	KAK 219	8S002S036W16	160
ADL 645600	Pebble East Claims Corp.	SP 310	8S005S037W20	160
ADL 645601	Pebble East Claims Corp.	SP 311	8S005S037W20	160
ADL 645606	Pebble East Claims Corp.	SP 316	8S005S037W17	160
ADL 645607	Pebble East Claims Corp.	SP 317	8S005S037W17	160
ADL 645608	Pebble East Claims Corp.	SP 318	8S005S037W17	160
ADL 645609	Pebble East Claims Corp.	SP 319	8S005S037W17	160
ADL 646604	Pebble East Claims Corp.	PEBBLE BEACH 5942	8S003S035W18	40
ADL 646605	Pebble East Claims Corp.	PEBBLE BEACH 5943	8S003S035W18	40
ADL 646606	Pebble East Claims Corp.	PEB K 1	8S003S035W36	160
ADL 646607	Pebble East Claims Corp.	PEB K 2	8S003S035W36	160
ADL 646608	Pebble East Claims Corp.	PEB K 3	8S003S035W36	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 646609	Pebble East Claims Corp.	PEB K 4	8S003S035W36	160
ADL 646610	Pebble East Claims Corp.	PEB K 5	8S004S035W01	40
ADL 646611	Pebble East Claims Corp.	PEB K 6	8S004S035W01	40
ADL 646612	Pebble East Claims Corp.	PEB K 7	8S004S035W01	40
ADL 646613	Pebble East Claims Corp.	PEB K 8	8S004S035W01	40
ADL 646614	Pebble East Claims Corp.	PEB K 9	8S004S034W06	40
ADL 646615	Pebble East Claims Corp.	PEB K 10	8S004S034W06	40
ADL 646616	Pebble East Claims Corp.	PEB K 11	8S004S034W06	40
ADL 646617	Pebble East Claims Corp.	PEB K 12	8S004S034W06	40
ADL 648906	Pebble East Claims Corp.	PEB WB 64	8S003S036W35	160
ADL 648907	Pebble East Claims Corp.	PEB WB 65	8S003S036W35	160
ADL 648908	Pebble East Claims Corp.	PEB WB 66	8S003S036W35	160
ADL 648909	Pebble East Claims Corp.	PEB WB 67	8S003S036W35	160
ADL 649664	Pebble East Claims Corp.	KAK 220	8S002S037W23	160
ADL 649665	Pebble East Claims Corp.	KAK 221	8S002S037W23	160
ADL 649666	Pebble East Claims Corp.	KAK 222	8S002S037W22	160
ADL 649667	Pebble East Claims Corp.	KAK 223	8S002S037W22	160
ADL 649668	Pebble East Claims Corp.	KAK 224	8S002S037W21	160
ADL 649669	Pebble East Claims Corp.	KAK 225	8S002S037W21	160
ADL 649670	Pebble East Claims Corp.	KAK 226	8S002S037W20	160
ADL 649671	Pebble East Claims Corp.	KAK 227	8S002S037W21	160
ADL 649672	Pebble East Claims Corp.	KAK 228	8S002S037W21	160
ADL 649673	Pebble East Claims Corp.	KAK 229	8S002S037W22	160
ADL 649674	Pebble East Claims Corp.	KAK 230	8S002S037W22	160
ADL 649675	Pebble East Claims Corp.	KAK 231	8S002S037W23	160
ADL 649676	Pebble East Claims Corp.	KAK 232	8S002S037W23	160
ADL 649677	Pebble East Claims Corp.	KAK 233	8S002S037W26	160
ADL 649678	Pebble East Claims Corp.	KAK 234	8S002S037W26	160
ADL 649679	Pebble East Claims Corp.	KAK 235	8S002S037W27	160
ADL 649680	Pebble East Claims Corp.	KAK 236	8S002S037W27	160
ADL 649681	Pebble East Claims Corp.	KAK 237	8S002S037W28	160
ADL 649682	Pebble East Claims Corp.	KAK 238	8S002S037W28	160
ADL 649683	Pebble East Claims Corp.	KAK 239	8S002S037W29	160
ADL 649684	Pebble East Claims Corp.	KAK 240	8S002S037W29	160
ADL 649685	Pebble East Claims Corp.	KAK 241	8S002S037W29	160
ADL 649686	Pebble East Claims Corp.	KAK 242	8S002S037W29	160
ADL 649687	Pebble East Claims Corp.	KAK 243	8S002S037W28	160
ADL 649688	Pebble East Claims Corp.	KAK 244	8S002S037W28	160
ADL 649689	Pebble East Claims Corp.	KAK 245	8S002S037W27	160
ADL 649690	Pebble East Claims Corp.	KAK 246	8S002S037W27	160
ADL 649691	Pebble East Claims Corp.	KAK 247	8S002S037W26	160
ADL 649692	Pebble East Claims Corp.	KAK 248	8S002S037W35	160
ADL 649693	Pebble East Claims Corp.	KAK 249	8S002S037W34	160
ADL 649694	Pebble East Claims Corp.	KAK 250	8S002S037W34	160
ADL 649695	Pebble East Claims Corp.	KAK 251	8S002S037W33	160
ADL 649696	Pebble East Claims Corp.	KAK 252	8S002S037W33	160
ADL 649697	Pebble East Claims Corp.	KAK 253	8S002S037W32	160
ADL 649698	Pebble East Claims Corp.	KAK 254	8S002S037W32	160
ADL 649699	Pebble East Claims Corp.	KAK 255	8S002S037W32	160
ADL 649700	Pebble East Claims Corp.	KAK 256	8S002S037W32	160
ADL 649701	Pebble East Claims Corp.	KAK 257	8S002S037W33	160
ADL 649702	Pebble East Claims Corp.	KAK 258	8S002S037W33	160
ADL 649703	Pebble East Claims Corp.	KAK 259	8S002S037W34	160
ADL 649704	Pebble East Claims Corp.	KAK 260	8S002S037W34	160

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 649705	Pebble East Claims Corp.	KAK 261	8S002S037W35	160
ADL 649706	Pebble East Claims Corp.	KAK 262	8S002S037W35	160
ADL 649707	Pebble East Claims Corp.	KAK 263	8S003S037W01	160
ADL 649708	Pebble East Claims Corp.	KAK 264	8S003S037W02	160
ADL 649709	Pebble East Claims Corp.	KAK 265	8S003S037W02	160
ADL 649710	Pebble East Claims Corp.	KAK 266	8S003S037W03	160
ADL 649711	Pebble East Claims Corp.	KAK 267	8S003S037W03	160
ADL 649712	Pebble East Claims Corp.	KAK 268	8S003S037W04	160
ADL 649713	Pebble East Claims Corp.	KAK 269	8S003S037W04	160
ADL 649714	Pebble East Claims Corp.	KAK 270	8S003S037W05	160
ADL 649715	Pebble East Claims Corp.	KAK 271	8S003S037W05	160
ADL 649716	Pebble East Claims Corp.	KAK 272	8S003S037W05	160
ADL 649717	Pebble East Claims Corp.	KAK 273	8S003S037W05	160
ADL 649718	Pebble East Claims Corp.	KAK 274	8S003S037W04	160
ADL 649719	Pebble East Claims Corp.	KAK 275	8S003S037W04	160
ADL 649720	Pebble East Claims Corp.	KAK 276	8S003S037W03	160
ADL 649721	Pebble East Claims Corp.	KAK 277	8S003S037W03	160
ADL 649722	Pebble East Claims Corp.	KAK 278	8S003S037W02	160
ADL 649723	Pebble East Claims Corp.	KAK 279	8S003S037W02	160
ADL 649724	Pebble East Claims Corp.	KAK 280	8S003S037W01	160
ADL 649725	Pebble East Claims Corp.	KAK 281	8S003S037W12	160
ADL 649726	Pebble East Claims Corp.	KAK 282	8S003S037W11	160
ADL 649727	Pebble East Claims Corp.	KAK 283	8S003S037W11	160
ADL 649728	Pebble East Claims Corp.	KAK 284	8S003S037W10	160
ADL 649729	Pebble East Claims Corp.	KAK 285	8S003S037W10	160
ADL 649730	Pebble East Claims Corp.	KAK 286	8S003S037W09	160
ADL 649731	Pebble East Claims Corp.	KAK 287	8S003S037W09	160
ADL 649732	Pebble East Claims Corp.	KAK 288	8S003S037W08	160
ADL 649733	Pebble East Claims Corp.	KAK 289	8S003S037W08	160
ADL 649734	Pebble East Claims Corp.	KAK 290	8S003S037W08	160
ADL 649735	Pebble East Claims Corp.	KAK 291	8S003S037W08	160
ADL 649736	Pebble East Claims Corp.	KAK 292	8S003S037W09	160
ADL 649737	Pebble East Claims Corp.	KAK 293	8S003S037W09	160
ADL 649738	Pebble East Claims Corp.	KAK 294	8S003S037W10	160
ADL 649739	Pebble East Claims Corp.	KAK 295	8S003S037W10	160
ADL 649740	Pebble East Claims Corp.	KAK 296	8S003S037W11	160
ADL 649741	Pebble East Claims Corp.	KAK 297	8S003S037W11	160
ADL 649742	Pebble East Claims Corp.	KAK 298	8S003S037W12	160
ADL 649743	Pebble East Claims Corp.	KAK 299	8S003S037W13	160
ADL 649744	Pebble East Claims Corp.	KAK 300	8S003S037W14	160
ADL 649745	Pebble East Claims Corp.	KAK 301	8S003S037W14	160
ADL 649746	Pebble East Claims Corp.	KAK 302	8S003S037W15	160
ADL 649747	Pebble East Claims Corp.	KAK 303	8S003S037W15	160
ADL 649748	Pebble East Claims Corp.	KAK 304	8S003S037W16	160
ADL 649749	Pebble East Claims Corp.	KAK 305	8S003S037W16	160
ADL 649750	Pebble East Claims Corp.	KAK 306	8S003S037W17	160
ADL 649751	Pebble East Claims Corp.	KAK 307	8S003S037W17	160
ADL 649752	Pebble East Claims Corp.	KAK 308	8S003S037W17	160
ADL 649753	Pebble East Claims Corp.	KAK 309	8S003S037W17	160
ADL 649754	Pebble East Claims Corp.	KAK 310	8S003S037W16	160
ADL 649755	Pebble East Claims Corp.	KAK 311	8S003S037W16	160
ADL 649756	Pebble East Claims Corp.	KAK 312	8S003S037W15	160
ADL 649757	Pebble East Claims Corp.	KAK 313	8S003S037W15	160
ADL 649758	Pebble East Claims Corp.	KAK 314	8S003S037W14	160

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 649759	Pebble East Claims Corp.	KAK 315	8S003S037W14	160
ADL 649760	Pebble East Claims Corp.	KAK 316	8S003S037W13	160
ADL 649761	Pebble East Claims Corp.	KAK 317	8S003S037W23	160
ADL 649762	Pebble East Claims Corp.	KAK 318	8S003S037W23	160
ADL 649763	Pebble East Claims Corp.	KAK 319	8S003S037W22	160
ADL 649764	Pebble East Claims Corp.	KAK 320	8S003S037W22	160
ADL 649765	Pebble East Claims Corp.	KAK 321	8S003S037W21	160
ADL 649766	Pebble East Claims Corp.	KAK 322	8S003S037W21	160
ADL 649767	Pebble East Claims Corp.	KAK 323	8S003S037W20	160
ADL 649768	Pebble East Claims Corp.	KAK 324	8S003S037W20	160
ADL 649769	Pebble East Claims Corp.	KAK 325	8S003S037W20	160
ADL 649770	Pebble East Claims Corp.	KAK 326	8S003S037W29	160
ADL 657890	Pebble East Claims Corp.	KAK 327	8S004S037W04	160
ADL 657891	Pebble East Claims Corp.	KAK 328	8S004S037W04	160
ADL 657892	Pebble East Claims Corp.	KAK 329	8S004S037W04	160
ADL 657893	Pebble East Claims Corp.	KAK 330	8S004S037W09	160
ADL 657894	Pebble East Claims Corp.	KAK 331	8S004S037W10	160
ADL 657895	Pebble East Claims Corp.	KAK 332	8S004S037W10	160
ADL 657896	Pebble East Claims Corp.	KAK 333	8S004S037W10	160
ADL 657897	Pebble East Claims Corp.	KAK 334	8S004S037W10	160
ADL 657898	Pebble East Claims Corp.	KAK 335	8S004S037W09	160
ADL 657899	Pebble East Claims Corp.	KAK 336	8S004S037W16	160
ADL 657900	Pebble East Claims Corp.	KAK 337	8S004S037W15	160
ADL 657901	Pebble East Claims Corp.	KAK 338	8S004S037W15	160
ADL 657902	Pebble East Claims Corp.	KAK 339	8S004S037W14	160
ADL 657903	Pebble East Claims Corp.	KAK 340	8S004S037W14	160
ADL 657904	Pebble East Claims Corp.	KAK 341	8S004S037W13	160
ADL 657905	Pebble East Claims Corp.	KAK 342	8S004S037W13	160
ADL 657906	Pebble East Claims Corp.	KAK 343	8S004S037W14	160
ADL 657907	Pebble East Claims Corp.	KAK 344	8S004S037W14	160
ADL 657908	Pebble East Claims Corp.	KAK 345	8S004S037W15	160
ADL 657909	Pebble East Claims Corp.	KAK 346	8S004S037W15	160
ADL 657910	Pebble East Claims Corp.	KAK 347	8S004S037W16	160
ADL 657911	Pebble East Claims Corp.	KAK 348	8S004S037W21	160
ADL 657912	Pebble East Claims Corp.	KAK 349	8S004S037W22	160
ADL 657913	Pebble East Claims Corp.	KAK 350	8S004S037W22	160
ADL 657914	Pebble East Claims Corp.	KAK 351	8S004S037W23	160
ADL 657915	Pebble East Claims Corp.	KAK 352	8S004S037W23	160
ADL 657916	Pebble East Claims Corp.	KAK 353	8S004S037W24	160
ADL 657917	Pebble East Claims Corp.	KAK 354	8S004S037W24	160
ADL 657918	Pebble East Claims Corp.	KAK 355	8S004S037W23	160
ADL 657919	Pebble East Claims Corp.	KAK 356	8S004S037W23	160
ADL 657920	Pebble East Claims Corp.	KAK 357	8S004S037W22	160
ADL 657921	Pebble East Claims Corp.	KAK 358	8S004S037W22	160
ADL 657922	Pebble East Claims Corp.	KAK 359	8S004S037W21	160
ADL 657923	Pebble East Claims Corp.	KAK 360	8S004S037W28	160
ADL 657924	Pebble East Claims Corp.	KAK 361	8S004S037W27	160
ADL 657925	Pebble East Claims Corp.	KAK 362	8S004S037W27	160
ADL 657926	Pebble East Claims Corp.	KAK 363	8S004S037W26	160
ADL 657927	Pebble East Claims Corp.	KAK 364	8S004S037W26	160
ADL 657928	Pebble East Claims Corp.	KAK 365	8S004S037W25	160
ADL 657929	Pebble East Claims Corp.	KAK 366	8S004S037W25	160
ADL 657930	Pebble East Claims Corp.	KAK 367	8S004S037W26	160
ADL 657931	Pebble East Claims Corp.	KAK 368	8S004S037W26	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 657932	Pebble East Claims Corp.	KAK 369	8S004S037W27	160
ADL 657933	Pebble East Claims Corp.	KAK 370	8S004S037W27	160
ADL 657934	Pebble East Claims Corp.	KAK 371	8S004S037W28	160
ADL 657935	Pebble East Claims Corp.	KAK 372	8S004S037W33	160
ADL 657936	Pebble East Claims Corp.	KAK 373	8S004S037W34	160
ADL 657937	Pebble East Claims Corp.	KAK 374	8S004S037W34	160
ADL 657938	Pebble East Claims Corp.	KAK 375	8S004S037W35	160
ADL 657939	Pebble East Claims Corp.	KAK 376	8S004S037W35	160
ADL 657940	Pebble East Claims Corp.	KAK 377	8S004S037W36	160
ADL 657941	Pebble East Claims Corp.	KAK 378	8S004S037W36	160
ADL 657942	Pebble East Claims Corp.	KAK 379	8S004S037W35	160
ADL 657943	Pebble East Claims Corp.	KAK 380	8S004S037W35	160
ADL 657944	Pebble East Claims Corp.	KAK 381	8S004S037W34	160
ADL 657945	Pebble East Claims Corp.	KAK 382	8S004S037W34	160
ADL 657946	Pebble East Claims Corp.	KAK 383	8S004S037W33	160
ADL 657947	Pebble East Claims Corp.	KAK 384	8S005S037W06	160
ADL 657948	Pebble East Claims Corp.	KAK 385	8S005S037W05	160
ADL 657949	Pebble East Claims Corp.	KAK 386	8S005S037W05	160
ADL 657950	Pebble East Claims Corp.	KAK 387	8S005S037W04	160
ADL 657951	Pebble East Claims Corp.	KAK 388	8S005S037W04	160
ADL 657952	Pebble East Claims Corp.	KAK 389	8S005S037W04	160
ADL 657953	Pebble East Claims Corp.	KAK 390	8S005S037W04	160
ADL 657954	Pebble East Claims Corp.	KAK 391	8S005S037W05	160
ADL 657955	Pebble East Claims Corp.	KAK 392	8S005S037W05	160
ADL 657958	Pebble East Claims Corp.	KAK 395	8S005S037W08	160
ADL 657959	Pebble East Claims Corp.	KAK 396	8S005S037W08	160
ADL 657960	Pebble East Claims Corp.	KAK 397	8S005S037W09	160
ADL 657961	Pebble East Claims Corp.	KAK 398	8S005S037W09	160
ADL 657962	Pebble East Claims Corp.	KAK 399	8S005S037W09	160
ADL 657963	Pebble East Claims Corp.	KAK 400	8S005S037W09	160
ADL 657964	Pebble East Claims Corp.	KAK 401	8S005S037W08	160
ADL 657965	Pebble East Claims Corp.	KAK 402	8S005S037W08	160
ADL 663828	Pebble East Claims Corp.	KAK 136A	8S002S036W30	160
ADL 663829	Pebble East Claims Corp.	KAK 137A	8S002S036W30	160
ADL 663830	Pebble East Claims Corp.	KAK 138A	8S002S036W19	160
ADL 663831	Pebble East Claims Corp.	KAK 139A	8S002S036W19	160
ADL 663832	Pebble East Claims Corp.	KAK 144A	8S002S036W19	160
ADL 663833	Pebble East Claims Corp.	KAK 145A	8S002S036W19	160
ADL 663834	Pebble East Claims Corp.	KAK 146A	8S002S036W18	160
ADL 663835	Pebble East Claims Corp.	KAK 147A	8S002S036W18	160
ADL 663836	Pebble East Claims Corp.	KAK 158A	8S002S036W18	160
ADL 663837	Pebble East Claims Corp.	KAK 159A	8S002S036W18	160
ADL 663838	Pebble East Claims Corp.	KAK 160A	8S002S036W17	160
ADL 663839	Pebble East Claims Corp.	KAK 161A	8S002S036W17	160
ADL 663840	Pebble East Claims Corp.	KAK 162A	8S002S036W17	160
ADL 663841	Pebble East Claims Corp.	KAK 163A	8S002S036W17	160
ADL 663842	Pebble East Claims Corp.	KAK 164A	8S002S036W20	160
ADL 663843	Pebble East Claims Corp.	KAK 165A	8S002S036W20	160
ADL 663844	Pebble East Claims Corp.	KAK 166A	8S002S036W20	160
ADL 663845	Pebble East Claims Corp.	KAK 167A	8S002S036W20	160
ADL 663846	Pebble East Claims Corp.	KAK 168A	8S002S036W29	160
ADL 663847	Pebble East Claims Corp.	KAK 169A	8S002S036W29	160
ADL 663848	Pebble East Claims Corp.	KAK 170A	8S002S036W28	160
ADL 668740	Pebble East Claims Corp.	PEBA 113	8S003S033W31	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 668741	Pebble East Claims Corp.	KAS 1	8S005S037W19	160
ADL 668742	Pebble East Claims Corp.	KAS 2	8S005S037W19	160
ADL 668743	Pebble East Claims Corp.	KAS 3	8S005S037W20	160
ADL 668744	Pebble East Claims Corp.	KAS 4	8S005S037W20	160
ADL 668749	Pebble East Claims Corp.	KAS 9	8S005S037W30	160
ADL 668750	Pebble East Claims Corp.	KAS 10	8S005S037W30	160
ADL 668751	Pebble East Claims Corp.	KAS 11	8S005S037W29	160
ADL 668752	Pebble East Claims Corp.	KAS 12	8S005S037W29	160
ADL 668753	Pebble East Claims Corp.	KAS 13	8S005S037W28	160
ADL 668758	Pebble East Claims Corp.	KAS 18	8S005S037W30	160
ADL 668759	Pebble East Claims Corp.	KAS 19	8S005S037W30	160
ADL 668760	Pebble East Claims Corp.	KAS 20	8S005S037W29	160
ADL 668761	Pebble East Claims Corp.	KAS 21	8S005S037W29	160
ADL 668762	Pebble East Claims Corp.	KAS 22	8S005S037W28	160
ADL 668769	Pebble East Claims Corp.	KAS 29	8S005S037W31	160
ADL 668770	Pebble East Claims Corp.	KAS 30	8S005S037W31	160
ADL 668771	Pebble East Claims Corp.	KAS 31	8S005S037W32	160
ADL 668772	Pebble East Claims Corp.	KAS 32	8S005S037W32	160
ADL 668773	Pebble East Claims Corp.	KAS 33	8S005S037W33	160
ADL 668784	Pebble East Claims Corp.	KAS 44	8S005S037W31	160
ADL 668785	Pebble East Claims Corp.	KAS 45	8S005S037W31	160
ADL 668786	Pebble East Claims Corp.	KAS 46	8S005S037W32	160
ADL 668787	Pebble East Claims Corp.	KAS 47	8S005S037W32	160
ADL 668788	Pebble East Claims Corp.	KAS 48	8S005S037W33	160
ADL 668801	Pebble East Claims Corp.	KAS 61	8S006S038W01	160
ADL 668802	Pebble East Claims Corp.	KAS 62	8S006S037W06	160
ADL 668803	Pebble East Claims Corp.	KAS 63	8S006S037W06	160
ADL 668804	Pebble East Claims Corp.	KAS 64	8S006S037W05	160
ADL 668805	Pebble East Claims Corp.	KAS 65	8S006S037W05	160
ADL 668806	Pebble East Claims Corp.	KAS 66	8S006S037W04	160
ADL 668823	Pebble East Claims Corp.	KAS 83	8S006S038W02	160
ADL 668824	Pebble East Claims Corp.	KAS 84	8S006S038W01	160
ADL 668825	Pebble East Claims Corp.	KAS 85	8S006S038W01	160
ADL 668826	Pebble East Claims Corp.	KAS 86	8S006S037W06	160
ADL 668827	Pebble East Claims Corp.	KAS 87	8S006S037W06	160
ADL 668828	Pebble East Claims Corp.	KAS 88	8S006S037W05	160
ADL 668829	Pebble East Claims Corp.	KAS 89	8S006S037W05	160
ADL 668849	Pebble East Claims Corp.	KAS 109	8S006S038W11	160
ADL 668850	Pebble East Claims Corp.	KAS 110	8S006S038W11	160
ADL 668851	Pebble East Claims Corp.	KAS 111	8S006S038W12	160
ADL 668852	Pebble East Claims Corp.	KAS 112	8S006S038W12	160
ADL 668853	Pebble East Claims Corp.	KAS 113	8S006S037W07	160
ADL 668854	Pebble East Claims Corp.	KAS 114	8S006S037W07	160
ADL 668855	Pebble East Claims Corp.	KAS 115	8S006S037W08	160
ADL 668875	Pebble East Claims Corp.	KAS 135	8S006S038W10	160
ADL 668876	Pebble East Claims Corp.	KAS 136	8S006S038W11	160
ADL 668877	Pebble East Claims Corp.	KAS 137	8S006S038W11	160
ADL 668878	Pebble East Claims Corp.	KAS 138	8S006S038W12	160
ADL 668879	Pebble East Claims Corp.	KAS 139	8S006S038W12	160
ADL 668880	Pebble East Claims Corp.	KAS 140	8S006S037W07	160
ADL 668881	Pebble East Claims Corp.	KAS 141	8S006S037W07	160
ADL 668901	Pebble East Claims Corp.	KAS 161	8S006S038W15	160
ADL 668902	Pebble East Claims Corp.	KAS 162	8S006S038W15	160
ADL 668903	Pebble East Claims Corp.	KAS 163	8S006S038W14	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 668904	Pebble East Claims Corp.	KAS 164	8S006S038W14	160
ADL 668905	Pebble East Claims Corp.	KAS 165	8S006S038W13	160
ADL 668906	Pebble East Claims Corp.	KAS 166	8S006S038W13	160
ADL 668929	Pebble East Claims Corp.	KAS 189	8S006S038W15	160
ADL 668930	Pebble East Claims Corp.	KAS 190	8S006S038W15	160
ADL 668931	Pebble East Claims Corp.	KAS 191	8S006S038W14	160
ADL 668932	Pebble East Claims Corp.	KAS 192	8S006S038W14	160
ADL 668933	Pebble East Claims Corp.	KAS 193	8S006S038W13	160
ADL 668934	Pebble East Claims Corp.	KAS 194	8S006S038W13	160
ADL 668956	Pebble East Claims Corp.	KAS 216	8S006S038W21	160
ADL 668957	Pebble East Claims Corp.	KAS 217	8S006S038W22	160
ADL 668958	Pebble East Claims Corp.	KAS 218	8S006S038W22	160
ADL 668959	Pebble East Claims Corp.	KAS 219	8S006S038W23	160
ADL 668960	Pebble East Claims Corp.	KAS 220	8S006S038W23	160
ADL 668961	Pebble East Claims Corp.	KAS 221	8S006S038W24	160
ADL 668983	Pebble East Claims Corp.	KAS 243	8S006S038W21	160
ADL 668984	Pebble East Claims Corp.	KAS 244	8S006S038W21	160
ADL 668985	Pebble East Claims Corp.	KAS 245	8S006S038W22	160
ADL 668986	Pebble East Claims Corp.	KAS 246	8S006S038W22	160
ADL 668987	Pebble East Claims Corp.	KAS 247	8S006S038W23	160
ADL 668988	Pebble East Claims Corp.	KAS 248	8S006S038W23	160
ADL 669010	Pebble East Claims Corp.	KAS 270	8S006S038W29	160
ADL 669011	Pebble East Claims Corp.	KAS 271	8S006S038W28	160
ADL 669012	Pebble East Claims Corp.	KAS 272	8S006S038W28	160
ADL 669013	Pebble East Claims Corp.	KAS 273	8S006S038W27	160
ADL 669014	Pebble East Claims Corp.	KAS 274	8S006S038W27	160
ADL 669015	Pebble East Claims Corp.	KAS 275	8S006S038W26	160
ADL 669038	Pebble East Claims Corp.	KAS 298	8S006S038W29	160
ADL 669039	Pebble East Claims Corp.	KAS 299	8S006S038W28	160
ADL 669040	Pebble East Claims Corp.	KAS 300	8S006S038W28	160
ADL 669041	Pebble East Claims Corp.	KAS 301	8S006S038W27	160
ADL 669042	Pebble East Claims Corp.	KAS 302	8S006S038W27	160
ADL 669043	Pebble East Claims Corp.	KAS 303	8S006S038W26	160
ADL 669060	Pebble East Claims Corp.	KAS 324	8S006S038W32	160
ADL 669061	Pebble East Claims Corp.	KAS 325	8S006S038W32	160
ADL 669062	Pebble East Claims Corp.	KAS 326	8S006S038W33	160
ADL 669063	Pebble East Claims Corp.	KAS 327	8S006S038W33	160
ADL 669064	Pebble East Claims Corp.	KAS 328	8S006S038W34	160
ADL 669065	Pebble East Claims Corp.	KAS 329	8S006S038W34	160
ADL 669075	Pebble East Claims Corp.	KAS 340	8S006S038W32	160
ADL 669076	Pebble East Claims Corp.	KAS 341	8S006S038W32	160
ADL 669077	Pebble East Claims Corp.	KAS 342	8S006S038W33	160
ADL 669078	Pebble East Claims Corp.	KAS 343	8S006S038W33	160
ADL 669079	Pebble East Claims Corp.	KAS 344	8S006S038W34	160
ADL 669087	Pebble East Claims Corp.	KAS 352	8S007S038W06	160
ADL 669088	Pebble East Claims Corp.	KAS 353	8S007S038W05	160
ADL 669089	Pebble East Claims Corp.	KAS 354	8S007S038W05	160
ADL 669090	Pebble East Claims Corp.	KAS 355	8S007S038W04	160
ADL 669091	Pebble East Claims Corp.	KAS 356	8S007S038W04	160
ADL 669098	Pebble East Claims Corp.	KAS 363	8S007S038W06	160
ADL 669099	Pebble East Claims Corp.	KAS 364	8S007S038W06	160
ADL 669100	Pebble East Claims Corp.	KAS 365	8S007S038W05	160
ADL 669101	Pebble East Claims Corp.	KAS 366	8S007S038W05	160
ADL 669102	Pebble East Claims Corp.	KAS 367	8S007S038W04	160

Appendix A
Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 669109	Pebble East Claims Corp.	KAS 374	8S007S038W07	160
ADL 669110	Pebble East Claims Corp.	KAS 375	8S007S038W07	160
ADL 669111	Pebble East Claims Corp.	KAS 376	8S007S038W08	160
ADL 669112	Pebble East Claims Corp.	KAS 377	8S007S038W08	160
ADL 669118	Pebble East Claims Corp.	KAS 383	8S007S039W12	160
ADL 669119	Pebble East Claims Corp.	KAS 384	8S007S038W07	160
ADL 669120	Pebble East Claims Corp.	KAS 385	8S007S038W07	160
ADL 669121	Pebble East Claims Corp.	KAS 386	8S007S038W08	160
ADL 669122	Pebble East Claims Corp.	KAS 387	8S007S038W08	160
ADL 669127	Pebble East Claims Corp.	KAS 392	8S007S039W13	160
ADL 669128	Pebble East Claims Corp.	KAS 393	8S007S038W18	160
ADL 669129	Pebble East Claims Corp.	KAS 394	8S007S038W18	160
ADL 669130	Pebble East Claims Corp.	KAS 395	8S007S038W17	160
ADL 669135	Pebble East Claims Corp.	KAS 400	8S007S039W13	160
ADL 669136	Pebble East Claims Corp.	KAS 401	8S007S039W13	160
ADL 669137	Pebble East Claims Corp.	KAS 402	8S007S038W18	160
ADL 669138	Pebble East Claims Corp.	KAS 403	8S007S038W18	160
ADL 516769	Pebble West Claims Corp.	SILL 5951	8S004S035W12	40
ADL 516770	Pebble West Claims Corp.	SILL 5952	8S004S035W12	40
ADL 516779	Pebble West Claims Corp.	SILL 6051	8S004S035W12	40
ADL 516780	Pebble West Claims Corp.	SILL 6052	8S004S035W12	40
ADL 516789	Pebble West Claims Corp.	SILL 6151	8S004S035W12	40
ADL 516790	Pebble West Claims Corp.	SILL 6152	8S004S035W12	40
ADL 516797	Pebble West Claims Corp.	SILL 6247	8S004S035W11	40
ADL 516798	Pebble West Claims Corp.	SILL 6248	8S004S035W11	40
ADL 516799	Pebble West Claims Corp.	SILL 6249	8S004S035W12	40
ADL 516800	Pebble West Claims Corp.	SILL 6250	8S004S035W12	40
ADL 516801	Pebble West Claims Corp.	SILL 6251	8S004S035W12	40
ADL 516802	Pebble West Claims Corp.	SILL 6252	8S004S035W12	40
ADL 516806	Pebble West Claims Corp.	PEBBLE BEACH 5448	8S003S035W20	40
ADL 516807	Pebble West Claims Corp.	PEBBLE BEACH 5449	8S003S035W20	40
ADL 516808	Pebble West Claims Corp.	PEBBLE BEACH 5450	8S003S035W21	40
ADL 516809	Pebble West Claims Corp.	PEBBLE BEACH 5451	8S003S035W21	40
ADL 516810	Pebble West Claims Corp.	PEBBLE BEACH 5452	8S003S035W21	40
ADL 516811	Pebble West Claims Corp.	PEBBLE BEACH 5453	8S003S035W21	40
ADL 516812	Pebble West Claims Corp.	PEBBLE BEACH 5454	8S003S035W22	40
ADL 516813	Pebble West Claims Corp.	PEBBLE BEACH 5548	8S003S035W20	40
ADL 516814	Pebble West Claims Corp.	PEBBLE BEACH 5549	8S003S035W20	40
ADL 516815	Pebble West Claims Corp.	PEBBLE BEACH 5550	8S003S035W21	40
ADL 516816	Pebble West Claims Corp.	PEBBLE BEACH 5551	8S003S035W21	40
ADL 516817	Pebble West Claims Corp.	PEBBLE BEACH 5552	8S003S035W21	40
ADL 516818	Pebble West Claims Corp.	PEBBLE BEACH 5553	8S003S035W21	40
ADL 516819	Pebble West Claims Corp.	PEBBLE BEACH 5554	8S003S035W22	40
ADL 516820	Pebble West Claims Corp.	PEBBLE BEACH 5651	8S003S035W21	40
ADL 516821	Pebble West Claims Corp.	PEBBLE BEACH 5652	8S003S035W21	40
ADL 516822	Pebble West Claims Corp.	PEBBLE BEACH 5653	8S003S035W21	40
ADL 516823	Pebble West Claims Corp.	PEBBLE BEACH 5654	8S003S035W22	40
ADL 516824	Pebble West Claims Corp.	PEBBLE BEACH 5751	8S003S035W21	40
ADL 516825	Pebble West Claims Corp.	PEBBLE BEACH 5752	8S003S035W21	40
ADL 516826	Pebble West Claims Corp.	PEBBLE BEACH 5753	8S003S035W21	40
ADL 516827	Pebble West Claims Corp.	PEBBLE BEACH 5754	8S003S035W22	40
ADL 516828	Pebble West Claims Corp.	PEBBLE BEACH 5852	8S003S035W16	40
ADL 516829	Pebble West Claims Corp.	PEBBLE BEACH 5853	8S003S035W16	40
ADL 516830	Pebble West Claims Corp.	PEBBLE BEACH 5854	8S003S035W15	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 516831	Pebble West Claims Corp.	PEBBLE BEACH 5952	8S003S035W16	40
ADL 516832	Pebble West Claims Corp.	PEBBLE BEACH 5953	8S003S035W16	40
ADL 516833	Pebble West Claims Corp.	PEBBLE BEACH 5954	8S003S035W15	40
ADL 516834	Pebble West Claims Corp.	PEBBLE BEACH 6052	8S003S035W16	40
ADL 516835	Pebble West Claims Corp.	PEBBLE BEACH 6053	8S003S035W16	40
ADL 516836	Pebble West Claims Corp.	PEBBLE BEACH 6054	8S003S035W15	40
ADL 516837	Pebble West Claims Corp.	PEBBLE BEACH 6153	8S003S035W16	40
ADL 516838	Pebble West Claims Corp.	PEBBLE BEACH 6154	8S003S035W15	40
ADL 516839	Pebble West Claims Corp.	PEBBLE BEACH 4651	8S003S035W33	40
ADL 516840	Pebble West Claims Corp.	PEBBLE BEACH 4652	8S003S035W33	40
ADL 516841	Pebble West Claims Corp.	PEBBLE BEACH 4653	8S003S035W33	40
ADL 516842	Pebble West Claims Corp.	PEBBLE BEACH 4751	8S003S035W33	40
ADL 516843	Pebble West Claims Corp.	PEEBLE BEACH 4752	8S003S035W33	40
ADL 516844	Pebble West Claims Corp.	PEEBLE BEACH 4753	8S003S035W33	40
ADL 516845	Pebble West Claims Corp.	PEEBLE BEACH 4851	8S003S035W33	40
ADL 516846	Pebble West Claims Corp.	PEEBLE BEACH 4852	8S003S035W33	40
ADL 516847	Pebble West Claims Corp.	PEEBLE BEACH 4853	8S003S035W33	40
ADL 516848	Pebble West Claims Corp.	PEEBLE BEACH 4951	8S003S035W33	40
ADL 516849	Pebble West Claims Corp.	PEEBLE BEACH 4952	8S003S035W33	40
ADL 516850	Pebble West Claims Corp.	PEEBLE BEACH 4953	8S003S035W33	40
ADL 516851	Pebble West Claims Corp.	PEEBLE BEACH 5048	8S003S035W29	40
ADL 516852	Pebble West Claims Corp.	PEEBLE BEACH 5049	8S003S035W29	40
ADL 516853	Pebble West Claims Corp.	PEEBLE BEACH 5050	8S003S035W28	40
ADL 516854	Pebble West Claims Corp.	PEEBLE BEACH 5051	8S003S035W28	40
ADL 516855	Pebble West Claims Corp.	PEEBLE BEACH 5052	8S003S035W28	40
ADL 516856	Pebble West Claims Corp.	PEEBLE BEACH 5053	8S003S035W28	40
ADL 516857	Pebble West Claims Corp.	PEEBLE BEACH 5148	8S003S035W29	40
ADL 516858	Pebble West Claims Corp.	PEEBLE BEACH 5149	8S003S035W29	40
ADL 516859	Pebble West Claims Corp.	PEEBLE BEACH 5150	8S003S035W28	40
ADL 516860	Pebble West Claims Corp.	PEEBLE BEACH 5151	8S003S035W28	40
ADL 516861	Pebble West Claims Corp.	PEEBLE BEACH 5152	8S003S035W28	40
ADL 516862	Pebble West Claims Corp.	PEEBLE BEACH 5153	8S003S035W28	40
ADL 516863	Pebble West Claims Corp.	PEEBLE BEACH 5248	8S003S035W29	40
ADL 516864	Pebble West Claims Corp.	PEEBLE BEACH 5249	8S003S035W29	40
ADL 516865	Pebble West Claims Corp.	PEEBLE BEACH 5250	8S003S035W28	40
ADL 516866	Pebble West Claims Corp.	PEEBLE BEACH 5251	8S003S035W28	40
ADL 516867	Pebble West Claims Corp.	PEEBLE BEACH 5252	8S003S035W28	40
ADL 516868	Pebble West Claims Corp.	PEEBLE BEACH 5253	8S003S035W28	40
ADL 516869	Pebble West Claims Corp.	PEEBLE BEACH 5348	8S003S035W29	40
ADL 516870	Pebble West Claims Corp.	PEEBLE BEACH 5349	8S003S035W29	40
ADL 516871	Pebble West Claims Corp.	PEEBLE BEACH 5350	8S003S035W28	40
ADL 516872	Pebble West Claims Corp.	PEEBLE BEACH 5351	8S003S035W28	40
ADL 516873	Pebble West Claims Corp.	PEEBLE BEACH 5352	8S003S035W28	40
ADL 516874	Pebble West Claims Corp.	PEEBLE BEACH 5353	8S003S035W28	40
ADL 516879	Pebble West Claims Corp.	SILL 6351	8S004S035W01	40
ADL 516880	Pebble West Claims Corp.	SILL 6352	8S004S035W01	40
ADL 516888	Pebble West Claims Corp.	SILL 6451	8S004S035W01	40
ADL 516889	Pebble West Claims Corp.	SILL 6452	8S004S035W01	40
ADL 516948	Pebble West Claims Corp.	PEBBLE BEACH 3850	8S004S035W09	40
ADL 516949	Pebble West Claims Corp.	PEBBLE BEACH 3851	8S004S035W09	40
ADL 516950	Pebble West Claims Corp.	PEBBLE BEACH 3852	8S004S035W09	40
ADL 516951	Pebble West Claims Corp.	PEBBLE BEACH 3950	8S004S035W09	40
ADL 516952	Pebble West Claims Corp.	PEBBLE BEACH 3951	8S004S035W09	40
ADL 516953	Pebble West Claims Corp.	PEBBLE BEACH 3952	8S004S035W09	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 516954	Pebble West Claims Corp.	PEBBLE BEACH 4050	8S004S035W09	40
ADL 516955	Pebble West Claims Corp.	PEBBLE BEACH 4051	8S004S035W09	40
ADL 516956	Pebble West Claims Corp.	PEBBLE BEACH 4052	8S004S035W09	40
ADL 516957	Pebble West Claims Corp.	PEBBLE BEACH 4150	8S004S035W09	40
ADL 516958	Pebble West Claims Corp.	PEBBLE BEACH 4151	8S004S035W09	40
ADL 516959	Pebble West Claims Corp.	PEBBLE BEACH 4152	8S004S035W09	40
ADL 516960	Pebble West Claims Corp.	PEBBLE BEACH 4250	8S004S035W04	40
ADL 516961	Pebble West Claims Corp.	PEBBLE BEACH 4251	8S004S035W04	40
ADL 516962	Pebble West Claims Corp.	PEBBLE BEACH 4252	8S004S035W04	40
ADL 516963	Pebble West Claims Corp.	PEBBLE BEACH 4253	8S004S035W04	40
ADL 516964	Pebble West Claims Corp.	PEBBLE BEACH 4254	8S004S035W03	40
ADL 516965	Pebble West Claims Corp.	PEBBLE BEACH 4350	8S004S035W04	40
ADL 516966	Pebble West Claims Corp.	PEBBLE BEACH 4351	8S004S035W04	40
ADL 516967	Pebble West Claims Corp.	PEBBLE BEACH 4352	8S004S035W04	40
ADL 516968	Pebble West Claims Corp.	PEBBLE BEACH 4353	8S004S035W04	40
ADL 516969	Pebble West Claims Corp.	PEBBLE BEACH 4354	8S004S035W03	40
ADL 516970	Pebble West Claims Corp.	PEBBLE BEACH 4451	8S004S035W04	40
ADL 516971	Pebble West Claims Corp.	PEBBLE BEACH 4452	8S004S035W04	40
ADL 516972	Pebble West Claims Corp.	PEBBLE BEACH 4453	8S004S035W04	40
ADL 516973	Pebble West Claims Corp.	PEBBLE BEACH 4551	8S004S035W04	40
ADL 516974	Pebble West Claims Corp.	PEBBLE BEACH 4552	8S004S035W04	40
ADL 516975	Pebble West Claims Corp.	PEBBLE BEACH 4553	8S004S035W04	40
ADL 524511	Pebble West Claims Corp.	SILL 5543	8S004S035W15	40
ADL 524512	Pebble West Claims Corp.	SILL 5544	8S004S035W15	40
ADL 524515	Pebble West Claims Corp.	SILL 5643	8S004S035W15	40
ADL 524516	Pebble West Claims Corp.	SILL 5644	8S004S035W15	40
ADL 524519	Pebble West Claims Corp.	SILL 5743	8S004S035W15	40
ADL 524520	Pebble West Claims Corp.	SILL 5744	8S004S035W15	40
ADL 524523	Pebble West Claims Corp.	SILL 5843	8S004S035W15	40
ADL 524524	Pebble West Claims Corp.	SILL 5844	8S004S035W15	40
ADL 524527	Pebble West Claims Corp.	SILL 5943	8S004S035W10	40
ADL 524528	Pebble West Claims Corp.	SILL 5944	8S004S035W10	40
ADL 524531	Pebble West Claims Corp.	SILL 6043	8S004S035W10	40
ADL 524532	Pebble West Claims Corp.	SILL 6044	8S004S035W10	40
ADL 524535	Pebble West Claims Corp.	SILL 6143	8S004S035W10	40
ADL 524536	Pebble West Claims Corp.	SILL 6144	8S004S035W10	40
ADL 524539	Pebble West Claims Corp.	SILL 6243	8S004S035W10	40
ADL 524540	Pebble West Claims Corp.	SILL 6244	8S004S035W10	40
ADL 524541	Pebble West Claims Corp.	SILL 6245	8S004S035W11	40
ADL 524542	Pebble West Claims Corp.	SILL 6246	8S004S035W11	40
ADL 524543	Pebble West Claims Corp.	SILL 6343	8S004S035W03	40
ADL 524544	Pebble West Claims Corp.	SILL 6344	8S004S035W03	40
ADL 524550	Pebble West Claims Corp.	SILL 6443	8S004S035W03	40
ADL 524551	Pebble West Claims Corp.	SILL 6444	8S004S035W03	40
ADL 524557	Pebble West Claims Corp.	SILL 6543	8S004S035W03	40
ADL 524558	Pebble West Claims Corp.	SILL 6544	8S004S035W03	40
ADL 524568	Pebble West Claims Corp.	SILL 6643	8S004S035W03	40
ADL 524569	Pebble West Claims Corp.	SILL 6644	8S004S035W03	40
ADL 524579	Pebble West Claims Corp.	SILL 6743	8S003S035W34	40
ADL 524580	Pebble West Claims Corp.	SILL 6744	8S003S035W34	40
ADL 524595	Pebble West Claims Corp.	SILL 6843	8S003S035W34	40
ADL 524596	Pebble West Claims Corp.	SILL 6844	8S003S035W34	40
ADL 524611	Pebble West Claims Corp.	SILL 6943	8S003S035W34	40
ADL 524612	Pebble West Claims Corp.	SILL 6944	8S003S035W34	40

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ADL 524630	Pebble West Claims Corp.	SILL 7043	8S003S035W34	40
ADL 524631	Pebble West Claims Corp.	SILL 7044	8S003S035W34	40
ADL 524649	Pebble West Claims Corp.	SILL 7143	8S003S035W27	40
ADL 524650	Pebble West Claims Corp.	SILL 7144	8S003S035W27	40
ADL 524668	Pebble West Claims Corp.	SILL 7243	8S003S035W27	40
ADL 524669	Pebble West Claims Corp.	SILL 7244	8S003S035W27	40
ADL 524684	Pebble West Claims Corp.	SILL 7343	8S003S035W27	40
ADL 524685	Pebble West Claims Corp.	SILL 7344	8S003S035W27	40
ADL 524698	Pebble West Claims Corp.	SILL 7443	8S003S035W27	40
ADL 524699	Pebble West Claims Corp.	SILL 7444	8S003S035W27	40
ADL 524712	Pebble West Claims Corp.	SILL 7543	8S003S035W22	40
ADL 524713	Pebble West Claims Corp.	SILL 7544	8S003S035W22	40
ADL 524714	Pebble West Claims Corp.	SILL 7545	8S003S035W23	40
ADL 524715	Pebble West Claims Corp.	SILL 7546	8S003S035W23	40
ADL 524716	Pebble West Claims Corp.	SILL 7547	8S003S035W23	40
ADL 524717	Pebble West Claims Corp.	SILL 7548	8S003S035W23	40
ADL 524748	Pebble West Claims Corp.	PEBBLE BEACH 3452	8S004S035W16	40
ADL 524749	Pebble West Claims Corp.	PEBBLE BEACH 3453	8S004S035W16	40
ADL 524750	Pebble West Claims Corp.	PEBBLE BEACH 3454	8S004S035W15	40
ADL 524751	Pebble West Claims Corp.	PEBBLE BEACH 3455	8S004S035W15	40
ADL 524752	Pebble West Claims Corp.	PEBBLE BEACH 3552	8S004S035W16	40
ADL 524753	Pebble West Claims Corp.	PEBBLE BEACH 3553	8S004S035W16	40
ADL 524754	Pebble West Claims Corp.	PEBBLE BEACH 3554	8S004S035W15	40
ADL 524755	Pebble West Claims Corp.	PEBBLE BEACH 3555	8S004S035W15	40
ADL 524756	Pebble West Claims Corp.	PEBBLE BEACH 3652	8S004S035W16	40
ADL 524757	Pebble West Claims Corp.	PEBBLE BEACH 3653	8S004S035W16	40
ADL 524758	Pebble West Claims Corp.	PEBBLE BEACH 3654	8S004S035W15	40
ADL 524759	Pebble West Claims Corp.	PEBBLE BEACH 3655	8S004S035W15	40
ADL 524760	Pebble West Claims Corp.	PEBBLE BEACH 3752	8S004S035W16	40
ADL 524761	Pebble West Claims Corp.	PEBBLE BEACH 3753	8S004S035W16	40
ADL 524762	Pebble West Claims Corp.	PEBBLE BEACH 3754	8S004S035W15	40
ADL 524763	Pebble West Claims Corp.	PEBBLE BEACH 3755	8S004S035W15	40
ADL 524764	Pebble West Claims Corp.	PEBBLE BEACH 3848	8S004S035W08	40
ADL 524765	Pebble West Claims Corp.	PEBBLE BEACH 3849	8S004S035W08	40
ADL 524766	Pebble West Claims Corp.	PEBBLE BEACH 3853	8S004S035W09	40
ADL 524767	Pebble West Claims Corp.	PEBBLE BEACH 3854	8S004S035W10	40
ADL 524768	Pebble West Claims Corp.	PEBBLE BEACH 3855	8S004S035W10	40
ADL 524769	Pebble West Claims Corp.	PEBBLE BEACH 3948	8S004S035W08	40
ADL 524770	Pebble West Claims Corp.	PEBBLE BEACH 3949	8S004S035W08	40
ADL 524771	Pebble West Claims Corp.	PEBBLE BEACH 3953	8S004S035W09	40
ADL 524772	Pebble West Claims Corp.	PEBBLE BEACH 3954	8S004S035W10	40
ADL 524773	Pebble West Claims Corp.	PEBBLE BEACH 3955	8S004S035W10	40
ADL 524774	Pebble West Claims Corp.	PEBBLE BEACH 4048	8S004S035W08	40
ADL 524775	Pebble West Claims Corp.	PEBBLE BEACH 4049	8S004S035W08	40
ADL 524776	Pebble West Claims Corp.	PEBBLE BEACH 4053	8S004S035W09	40
ADL 524777	Pebble West Claims Corp.	PEBBLE BEACH 4054	8S004S035W10	40
ADL 524778	Pebble West Claims Corp.	PEBBLE BEACH 4055	8S004S035W10	40
ADL 524779	Pebble West Claims Corp.	PEBBLE BEACH 4148	8S004S035W08	40
ADL 524780	Pebble West Claims Corp.	PEBBLE BEACH 4149	8S004S035W08	40
ADL 524781	Pebble West Claims Corp.	PEBBLE BEACH 4153	8S004S035W09	40
ADL 524782	Pebble West Claims Corp.	PEBBLE BEACH 4154	8S004S035W10	40
ADL 524783	Pebble West Claims Corp.	PEBBLE BEACH 4155	8S004S035W10	40
ADL 524784	Pebble West Claims Corp.	PEBBLE BEACH 4248	8S004S035W05	0
ADL 524785	Pebble West Claims Corp.	PEBBLE BEACH 4249	8S004S035W05	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 524786	Pebble West Claims Corp.	PEBBLE BEACH 4255	8S004S035W03	40
ADL 524787	Pebble West Claims Corp.	PEBBLE BEACH 4348	8S004S035W05	40
ADL 524788	Pebble West Claims Corp.	PEBBLE BEACH 4349	8S004S035W05	40
ADL 524789	Pebble West Claims Corp.	PEBBLE BEACH 4355	8S004S035W03	40
ADL 524790	Pebble West Claims Corp.	PEBBLE BEACH 4448	8S004S035W05	40
ADL 524791	Pebble West Claims Corp.	PEBBLE BEACH 4449	8S004S035W05	40
ADL 524792	Pebble West Claims Corp.	PEBBLE BEACH 4450	8S004S035W04	40
ADL 524793	Pebble West Claims Corp.	PEBBLE BEACH 4454	8S004S035W03	40
ADL 524794	Pebble West Claims Corp.	PEBBLE BEACH 4455	8S004S035W03	40
ADL 524795	Pebble West Claims Corp.	PEBBLE BEACH 4548	8S004S035W05	40
ADL 524796	Pebble West Claims Corp.	PEBBLE BEACH 4549	8S004S035W05	40
ADL 524797	Pebble West Claims Corp.	PEBBLE BEACH 4550	8S004S035W04	40
ADL 524798	Pebble West Claims Corp.	PEBBLE BEACH 4554	8S004S035W03	40
ADL 524799	Pebble West Claims Corp.	PEBBLE BEACH 4555	8S004S035W03	40
ADL 524800	Pebble West Claims Corp.	PEBBLE BEACH 4648	8S003S035W32	40
ADL 524801	Pebble West Claims Corp.	PEBBLE BEACH 4649	8S003S035W32	40
ADL 524802	Pebble West Claims Corp.	PEBBLE BEACH 4650	8S003S035W33	40
ADL 524803	Pebble West Claims Corp.	PEBBLE BEACH 4654	8S003S035W34	40
ADL 524804	Pebble West Claims Corp.	PEBBLE BEACH 4655	8S003S035W34	40
ADL 524805	Pebble West Claims Corp.	PEBBLE BEACH 4748	8S003S035W32	40
ADL 524806	Pebble West Claims Corp.	PEBBLE BEACH 4749	8S003S035W32	40
ADL 524807	Pebble West Claims Corp.	PEBBLE BEACH 4750	8S003S035W33	40
ADL 524808	Pebble West Claims Corp.	PEBBLE BEACH 4754	8S003S035W34	40
ADL 524809	Pebble West Claims Corp.	PEBBLE BEACH 4755	8S003S035W34	40
ADL 524810	Pebble West Claims Corp.	PEBBLE BEACH 4848	8S003S035W32	40
ADL 524811	Pebble West Claims Corp.	PEBBLE BEACH 4849	8S003S035W32	40
ADL 524812	Pebble West Claims Corp.	PEBBLE BEACH 4850	8S003S035W33	40
ADL 524813	Pebble West Claims Corp.	PEBBLE BEACH 4854	8S003S035W34	40
ADL 524814	Pebble West Claims Corp.	PEBBLE BEACH 4855	8S003S035W34	40
ADL 524815	Pebble West Claims Corp.	PEBBLE BEACH 4948	8S003S035W32	40
ADL 524816	Pebble West Claims Corp.	PEBBLE BEACH 4949	8S003S035W32	40
ADL 524817	Pebble West Claims Corp.	PEBBLE BEACH 4950	8S003S035W33	40
ADL 524818	Pebble West Claims Corp.	PEBBLE BEACH 4954	8S003S035W34	40
ADL 524819	Pebble West Claims Corp.	PEBBLE BEACH 4955	8S003S035W34	40
ADL 524820	Pebble West Claims Corp.	PEBBLE BEACH 5054	8S003S035W27	40
ADL 524821	Pebble West Claims Corp.	PEBBLE BEACH 5055	8S003S035W27	40
ADL 524822	Pebble West Claims Corp.	PEBBLE BEACH 5154	8S003S035W27	40
ADL 524823	Pebble West Claims Corp.	PEBBLE BEACH 5155	8S003S035W27	40
ADL 524824	Pebble West Claims Corp.	PEBBLE BEACH 5254	8S003S035W27	40
ADL 524825	Pebble West Claims Corp.	PEBBLE BEACH 5255	8S003S035W27	40
ADL 524826	Pebble West Claims Corp.	PEBBLE BEACH 5354	8S003S035W27	40
ADL 524827	Pebble West Claims Corp.	PEBBLE BEACH 5355	8S003S035W27	40
ADL 524828	Pebble West Claims Corp.	PEBBLE BEACH 5455	8S003S035W22	40
ADL 524829	Pebble West Claims Corp.	PEBBLE BEACH 5648	8S003S035W20	40
ADL 524830	Pebble West Claims Corp.	PEBBLE BEACH 5649	8S003S035W20	40
ADL 524831	Pebble West Claims Corp.	PEBBLE BEACH 5650	8S003S035W21	40
ADL 524832	Pebble West Claims Corp.	PEBBLE BEACH 5748	8S003S035W20	40
ADL 524833	Pebble West Claims Corp.	PEBBLE BEACH 5749	8S003S035W20	40
ADL 524834	Pebble West Claims Corp.	PEBBLE BEACH 5750	8S003S035W21	40
ADL 524835	Pebble West Claims Corp.	PEBBLE BEACH 5848	8S003S035W17	40
ADL 524836	Pebble West Claims Corp.	PEBBLE BEACH 5849	8S003S035W17	40
ADL 524837	Pebble West Claims Corp.	PEBBLE BEACH 5850	8S003S035W16	40
ADL 524838	Pebble West Claims Corp.	PEBBLE BEACH 5851	8S003S035W16	40
ADL 524839	Pebble West Claims Corp.	PEBBLE BEACH 5948	8S003S035W17	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 524840	Pebble West Claims Corp.	PEBBLE BEACH 5949	8S003S035W17	40
ADL 524841	Pebble West Claims Corp.	PEBBLE BEACH 5950	8S003S035W16	40
ADL 524842	Pebble West Claims Corp.	PEBBLE BEACH 5951	8S003S035W16	40
ADL 524843	Pebble West Claims Corp.	PEBBLE BEACH 6048	8S003S035W17	40
ADL 524844	Pebble West Claims Corp.	PEBBLE BEACH 6049	8S003S035W17	40
ADL 524845	Pebble West Claims Corp.	PEBBLE BEACH 6050	8S003S035W16	40
ADL 524846	Pebble West Claims Corp.	PEBBLE BEACH 6051	8S003S035W16	40
ADL 524847	Pebble West Claims Corp.	PEBBLE BEACH 6148	8S003S035W17	40
ADL 524848	Pebble West Claims Corp.	PEBBLE BEACH 6149	8S003S035W17	40
ADL 524849	Pebble West Claims Corp.	PEBBLE BEACH 6150	8S003S035W16	40
ADL 524850	Pebble West Claims Corp.	PEBBLE BEACH 6151	8S003S035W16	40
ADL 524851	Pebble West Claims Corp.	PEBBLE BEACH 6248	8S003S035W08	40
ADL 524852	Pebble West Claims Corp.	PEBBLE BEACH 6249	8S003S035W08	40
ADL 524853	Pebble West Claims Corp.	PEBBLE BEACH 6250	8S003S035W09	40
ADL 524854	Pebble West Claims Corp.	PEBBLE BEACH 6251	8S003S035W09	40
ADL 524855	Pebble West Claims Corp.	PEBBLE BEACH 6252	8S003S035W09	40
ADL 524856	Pebble West Claims Corp.	PEBBLE BEACH 6253	8S003S035W09	40
ADL 524857	Pebble West Claims Corp.	PEBBLE BEACH 6254	8S003S035W10	40
ADL 524858	Pebble West Claims Corp.	PEBBLE BEACH 6348	8S003S035W08	40
ADL 524859	Pebble West Claims Corp.	PEBBLE BEACH 6349	8S003S035W08	40
ADL 524860	Pebble West Claims Corp.	PEBBLE BEACH 6350	8S003S035W09	40
ADL 524861	Pebble West Claims Corp.	PEBBLE BEACH 6351	8S003S035W09	40
ADL 524862	Pebble West Claims Corp.	PEBBLE BEACH 6352	8S003S035W09	40
ADL 524863	Pebble West Claims Corp.	PEBBLE BEACH 6353	8S003S035W09	40
ADL 524864	Pebble West Claims Corp.	PEBBLE BEACH 6354	8S003S035W10	40
ADL 525849	Pebble West Claims Corp.	PEBBLE BEACH 6152	8S003S035W16	40
ADL 531355	Pebble West Claims Corp.	PEBBLE BEACH 3642	8S004S035W18	40
ADL 531356	Pebble West Claims Corp.	PEBBLE BEACH 3643	8S004S035W18	40
ADL 531357	Pebble West Claims Corp.	PEBBLE BEACH 3644	8S004S035W18	40
ADL 531358	Pebble West Claims Corp.	PEBBLE BEACH 3645	8S004S035W18	40
ADL 531359	Pebble West Claims Corp.	PEBBLE BEACH 3742	8S004S035W18	40
ADL 531360	Pebble West Claims Corp.	PEBBLE BEACH 3743	8S004S035W18	40
ADL 531361	Pebble West Claims Corp.	PEBBLE BEACH 3744	8S004S035W18	40
ADL 531362	Pebble West Claims Corp.	PEBBLE BEACH 3745	8S004S035W18	40
ADL 531363	Pebble West Claims Corp.	PEBBLE BEACH 3842	8S004S035W07	40
ADL 531364	Pebble West Claims Corp.	PEBBLE BEACH 3843	8S004S035W07	40
ADL 531365	Pebble West Claims Corp.	PEBBLE BEACH 3844	8S004S035W07	40
ADL 531366	Pebble West Claims Corp.	PEBBLE BEACH 3845	8S004S035W07	40
ADL 531367	Pebble West Claims Corp.	PEBBLE BEACH 3846	8S004S035W08	40
ADL 531368	Pebble West Claims Corp.	PEBBLE BEACH 3847	8S004S035W08	40
ADL 531369	Pebble West Claims Corp.	PEBBLE BEACH 3942	8S004S035W07	40
ADL 531370	Pebble West Claims Corp.	PEBBLE BEACH 3943	8S004S035W07	40
ADL 531371	Pebble West Claims Corp.	PEBBLE BEACH 3944	8S004S035W07	40
ADL 531372	Pebble West Claims Corp.	PEBBLE BEACH 3945	8S004S035W07	40
ADL 531373	Pebble West Claims Corp.	PEBBLE BEACH 3946	8S004S035W08	40
ADL 531374	Pebble West Claims Corp.	PEBBLE BEACH 3947	8S004S035W08	40
ADL 531375	Pebble West Claims Corp.	PEBBLE BEACH 4042	8S004S035W07	40
ADL 531376	Pebble West Claims Corp.	PEBBLE BEACH 4043	8S004S035W07	40
ADL 531377	Pebble West Claims Corp.	PEBBLE BEACH 4044	8S004S035W07	40
ADL 531378	Pebble West Claims Corp.	PEBBLE BEACH 4045	8S004S035W07	40
ADL 531379	Pebble West Claims Corp.	PEBBLE BEACH 4046	8S004S035W08	40
ADL 531380	Pebble West Claims Corp.	PEBBLE BEACH 4047	8S004S035W08	40
ADL 531381	Pebble West Claims Corp.	PEBBLE BEACH 4142	8S004S035W07	40
ADL 531382	Pebble West Claims Corp.	PEBBLE BEACH 4143	8S004S035W07	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 531383	Pebble West Claims Corp.	PEBBLE BEACH 4144	8S004S035W07	40
ADL 531384	Pebble West Claims Corp.	PEBBLE BEACH 4145	8S004S035W07	40
ADL 531385	Pebble West Claims Corp.	PEBBLE BEACH 4146	8S004S035W08	40
ADL 531386	Pebble West Claims Corp.	PEBBLE BEACH 4147	8S004S035W08	40
ADL 531387	Pebble West Claims Corp.	PEBBLE BEACH 4244	8S004S035W06	40
ADL 531388	Pebble West Claims Corp.	PEBBLE BEACH 4245	8S004S035W06	40
ADL 531389	Pebble West Claims Corp.	PEBBLE BEACH 4246	8S004S035W05	40
ADL 531390	Pebble West Claims Corp.	PEBBLE BEACH 4247	8S004S035W05	40
ADL 531391	Pebble West Claims Corp.	PEBBLE BEACH 4344	8S004S035W06	40
ADL 531392	Pebble West Claims Corp.	PEBBLE BEACH 4345	8S004S035W06	40
ADL 531393	Pebble West Claims Corp.	PEBBLE BEACH 4346	8S004S035W05	40
ADL 531394	Pebble West Claims Corp.	PEBBLE BEACH 4347	8S004S035W05	40
ADL 531395	Pebble West Claims Corp.	PEBBLE BEACH 4444	8S004S035W06	40
ADL 531396	Pebble West Claims Corp.	PEBBLE BEACH 4445	8S004S035W06	40
ADL 531397	Pebble West Claims Corp.	PEBBLE BEACH 4446	8S004S035W05	40
ADL 531398	Pebble West Claims Corp.	PEBBLE BEACH 4447	8S004S035W05	40
ADL 531399	Pebble West Claims Corp.	PEBBLE BEACH 4544	8S004S035W06	40
ADL 531400	Pebble West Claims Corp.	PEBBLE BEACH 4547	8S004S035W05	40
ADL 531401	Pebble West Claims Corp.	PEBBLE BEACH 4644	8S003S035W31	40
ADL 531402	Pebble West Claims Corp.	PEBBLE BEACH 4645	8S003S035W31	40
ADL 531403	Pebble West Claims Corp.	PEBBLE BEACH 4646	8S003S035W32	40
ADL 531404	Pebble West Claims Corp.	PEBBLE BEACH 4647	8S003S035W32	40
ADL 531405	Pebble West Claims Corp.	PEBBLE BEACH 4744	8S003S035W31	40
ADL 531406	Pebble West Claims Corp.	PEBBLE BEACH 4745	8S003S035W31	40
ADL 531407	Pebble West Claims Corp.	PEBBLE BEACH 4746	8S003S035W32	40
ADL 531408	Pebble West Claims Corp.	PEBBLE BEACH 4747	8S003S035W32	40
ADL 531409	Pebble West Claims Corp.	PEBBLE BEACH 4844	8S003S035W31	40
ADL 531410	Pebble West Claims Corp.	PEBBLE BEACH 4845	8S003S035W31	40
ADL 531411	Pebble West Claims Corp.	PEBBLE BEACH 4846	8S003S035W32	40
ADL 531412	Pebble West Claims Corp.	PEBBLE BEACH 4847	8S003S035W32	40
ADL 531413	Pebble West Claims Corp.	PEBBLE BEACH 4944	8S003S035W31	40
ADL 531414	Pebble West Claims Corp.	PEBBLE BEACH 4945	8S003S035W31	40
ADL 531415	Pebble West Claims Corp.	PEBBLE BEACH 4946	8S003S035W32	40
ADL 531416	Pebble West Claims Corp.	PEBBLE BEACH 4947	8S003S035W32	40
ADL 531417	Pebble West Claims Corp.	PEBBLE BEACH 5044	8S003S035W30	40
ADL 531418	Pebble West Claims Corp.	PEBBLE BEACH 5045	8S003S035W30	40
ADL 531419	Pebble West Claims Corp.	PEBBLE BEACH 5046	8S003S035W29	40
ADL 531420	Pebble West Claims Corp.	PEBBLE BEACH 5047	8S003S035W29	40
ADL 531421	Pebble West Claims Corp.	PEBBLE BEACH 5144	8S003S035W30	40
ADL 531422	Pebble West Claims Corp.	PEBBLE BEACH 5145	8S003S035W30	40
ADL 531423	Pebble West Claims Corp.	PEBBLE BEACH 5146	8S003S035W29	40
ADL 531424	Pebble West Claims Corp.	PEBBLE BEACH 5147	8S003S035W29	40
ADL 531425	Pebble West Claims Corp.	PEBBLE BEACH 5244	8S003S035W30	40
ADL 531426	Pebble West Claims Corp.	PEBBLE BEACH 5245	8S003S035W30	40
ADL 531427	Pebble West Claims Corp.	PEBBLE BEACH 5246	8S003S035W29	40
ADL 531428	Pebble West Claims Corp.	PEBBLE BEACH 5247	8S003S035W29	40
ADL 531429	Pebble West Claims Corp.	PEBBLE BEACH 5344	8S003S035W30	40
ADL 531430	Pebble West Claims Corp.	PEBBLE BEACH 5345	8S003S035W30	40
ADL 531431	Pebble West Claims Corp.	PEBBLE BEACH 5346	8S003S035W29	40
ADL 531432	Pebble West Claims Corp.	PEBBLE BEACH 5347	8S003S035W29	40
ADL 531433	Pebble West Claims Corp.	PEBBLE BEACH 5444	8S003S035W19	40
ADL 531434	Pebble West Claims Corp.	PEBBLE BEACH 5445	8S003S035W19	40
ADL 531435	Pebble West Claims Corp.	PEBBLE BEACH 5446	8S003S035W20	40
ADL 531436	Pebble West Claims Corp.	PEBBLE BEACH 5447	8S003S035W20	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 531437	Pebble West Claims Corp.	PEBBLE BEACH 5544	8S003S035W19	40
ADL 531438	Pebble West Claims Corp.	PEBBLE BEACH 5545	8S003S035W19	40
ADL 531439	Pebble West Claims Corp.	PEBBLE BEACH 5546	8S003S035W20	40
ADL 531440	Pebble West Claims Corp.	PEBBLE BEACH 5547	8S003S035W20	40
ADL 531441	Pebble West Claims Corp.	PEBBLE BEACH 5644	8S003S035W19	40
ADL 531442	Pebble West Claims Corp.	PEBBLE BEACH 5645	8S003S035W19	40
ADL 531443	Pebble West Claims Corp.	PEBBLE BEACH 5646	8S003S035W20	40
ADL 531444	Pebble West Claims Corp.	PEBBLE BEACH 5647	8S003S035W20	40
ADL 531445	Pebble West Claims Corp.	PEBBLE BEACH 5744	8S003S035W19	40
ADL 531446	Pebble West Claims Corp.	PEBBLE BEACH 5745	8S003S035W19	40
ADL 531447	Pebble West Claims Corp.	PEBBLE BEACH 5746	8S003S035W20	40
ADL 531448	Pebble West Claims Corp.	PEBBLE BEACH 5747	8S003S035W20	40
ADL 531449	Pebble West Claims Corp.	PEBBLE BEACH 5844	8S003S035W18	40
ADL 531450	Pebble West Claims Corp.	PEBBLE BEACH 5845	8S003S035W18	40
ADL 531451	Pebble West Claims Corp.	PEBBLE BEACH 5846	8S003S035W17	40
ADL 531452	Pebble West Claims Corp.	PEBBLE BEACH 5847	8S003S035W17	40
ADL 531453	Pebble West Claims Corp.	PEBBLE BEACH 5944	8S003S035W18	40
ADL 531454	Pebble West Claims Corp.	PEBBLE BEACH 5945	8S003S035W18	40
ADL 531455	Pebble West Claims Corp.	PEBBLE BEACH 5946	8S003S035W17	40
ADL 531456	Pebble West Claims Corp.	PEBBLE BEACH 5947	8S003S035W17	40
ADL 531457	Pebble West Claims Corp.	PEBBLE BEACH 6044	8S003S035W18	40
ADL 531458	Pebble West Claims Corp.	PEBBLE BEACH 6045	8S003S035W18	40
ADL 531459	Pebble West Claims Corp.	PEBBLE BEACH 6046	8S003S035W17	40
ADL 531460	Pebble West Claims Corp.	PEBBLE BEACH 6047	8S003S035W17	40
ADL 531461	Pebble West Claims Corp.	PEBBLE BEACH 6144	8S003S035W18	40
ADL 531462	Pebble West Claims Corp.	PEBBLE BEACH 6145	8S003S035W18	40
ADL 531463	Pebble West Claims Corp.	PEBBLE BEACH 6146	8S003S035W17	40
ADL 531464	Pebble West Claims Corp.	PEBBLE BEACH 6147	8S003S035W17	40
ADL 531648	Pebble West Claims Corp.	PEBBLE BEACH 4545	8S004S035W06	40
ADL 531649	Pebble West Claims Corp.	PEBBLE BEACH 4546	8S004S035W05	40
ADL 540399	Pebble West Claims Corp.	PEBBLE BEACH 5555	8S003S035W22	40
ADL 540400	Pebble West Claims Corp.	PEBBLE BEACH 5655	8S003S035W22	40
ADL 540401	Pebble West Claims Corp.	PEBBLE BEACH 5755	8S003S035W22	40
ADL 540402	Pebble West Claims Corp.	PEBBLE BEACH 5855	8S003S035W15	40
ADL 540403	Pebble West Claims Corp.	PEBBLE BEACH 5955	8S003S035W15	40
ADL 540404	Pebble West Claims Corp.	PEBBLE BEACH 6055	8S003S035W15	40
ADL 540405	Pebble West Claims Corp.	PEBBLE BEACH 6155	8S003S035W15	40
ADL 540406	Pebble West Claims Corp.	PEBBLE BEACH 6255	8S003S035W10	40
ADL 540407	Pebble West Claims Corp.	PEBBLE BEACH 6355	8S003S035W10	40
ADL 540408	Pebble West Claims Corp.	PEBBLE BEACH 6448	8S003S035W08	40
ADL 540409	Pebble West Claims Corp.	PEBBLE BEACH 6449	8S003S035W08	40
ADL 540410	Pebble West Claims Corp.	PEBBLE BEACH 6450	8S003S035W09	40
ADL 540411	Pebble West Claims Corp.	PEBBLE BEACH 6451	8S003S035W09	40
ADL 540412	Pebble West Claims Corp.	PEBBLE BEACH 6452	8S003S035W09	40
ADL 540413	Pebble West Claims Corp.	PEBBLE BEACH 6453	8S003S035W09	40
ADL 540414	Pebble West Claims Corp.	PEBBLE BEACH 6454	8S003S035W10	40
ADL 540415	Pebble West Claims Corp.	PEBBLE BEACH 6455	8S003S035W10	40
ADL 540416	Pebble West Claims Corp.	PEBBLE BEACH 6548	8S003S035W08	40
ADL 540417	Pebble West Claims Corp.	PEBBLE BEACH 6549	8S003S035W08	40
ADL 540418	Pebble West Claims Corp.	PEBBLE BEACH 6550	8S003S035W09	40
ADL 540419	Pebble West Claims Corp.	PEBBLE BEACH 6551	8S003S035W09	40
ADL 540420	Pebble West Claims Corp.	PEBBLE BEACH 6552	8S003S035W09	40
ADL 540421	Pebble West Claims Corp.	PEBBLE BEACH 6553	8S003S035W09	40
ADL 540422	Pebble West Claims Corp.	PEBBLE BEACH 6554	8S003S035W10	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 540423	Pebble West Claims Corp.	PEBBLE BEACH 6555	8S003S035W10	40
ADL 540424	Pebble West Claims Corp.	SILL 7643	8S003S035W22	40
ADL 540425	Pebble West Claims Corp.	SILL 7644	8S003S035W22	40
ADL 540426	Pebble West Claims Corp.	SILL 7645	8S003S035W23	40
ADL 540427	Pebble West Claims Corp.	SILL 7646	8S003S035W23	40
ADL 540428	Pebble West Claims Corp.	SILL 7647	8S003S035W23	40
ADL 540429	Pebble West Claims Corp.	SILL 7648	8S003S035W23	40
ADL 540430	Pebble West Claims Corp.	SILL 7743	8S003S035W22	40
ADL 540431	Pebble West Claims Corp.	SILL 7744	8S003S035W22	40
ADL 540432	Pebble West Claims Corp.	SILL 7745	8S003S035W23	40
ADL 540433	Pebble West Claims Corp.	SILL 7746	8S003S035W23	40
ADL 540434	Pebble West Claims Corp.	SILL 7747	8S003S035W23	40
ADL 540435	Pebble West Claims Corp.	SILL 7748	8S003S035W23	40
ADL 540436	Pebble West Claims Corp.	SILL 7843	8S003S035W22	40
ADL 540437	Pebble West Claims Corp.	SILL 7844	8S003S035W22	40
ADL 540438	Pebble West Claims Corp.	SILL 7845	8S003S035W23	40
ADL 540439	Pebble West Claims Corp.	SILL 7846	8S003S035W23	40
ADL 540440	Pebble West Claims Corp.	SILL 7847	8S003S035W23	40
ADL 540441	Pebble West Claims Corp.	SILL 7848	8S003S035W23	40
ADL 540442	Pebble West Claims Corp.	SILL 7943	8S003S035W15	40
ADL 540443	Pebble West Claims Corp.	SILL 7944	8S003S035W15	40
ADL 540444	Pebble West Claims Corp.	SILL 7945	8S003S035W14	40
ADL 540445	Pebble West Claims Corp.	SILL 7946	8S003S035W14	40
ADL 540446	Pebble West Claims Corp.	SILL 7947	8S003S035W14	40
ADL 540447	Pebble West Claims Corp.	SILL 7948	8S003S035W14	40
ADL 540448	Pebble West Claims Corp.	SILL 8043	8S003S035W15	40
ADL 540449	Pebble West Claims Corp.	SILL 8044	8S003S035W15	40
ADL 540450	Pebble West Claims Corp.	SILL 8045	8S003S035W14	40
ADL 540451	Pebble West Claims Corp.	SILL 8046	8S003S035W14	40
ADL 540452	Pebble West Claims Corp.	SILL 8047	8S003S035W14	40
ADL 540453	Pebble West Claims Corp.	SILL 8048	8S003S035W14	40
ADL 540454	Pebble West Claims Corp.	SILL 8143	8S003S035W15	40
ADL 540455	Pebble West Claims Corp.	SILL 8144	8S003S035W15	40
ADL 540456	Pebble West Claims Corp.	SILL 8145	8S003S035W14	40
ADL 540457	Pebble West Claims Corp.	SILL 8146	8S003S035W14	40
ADL 540458	Pebble West Claims Corp.	SILL 8147	8S003S035W14	40
ADL 540459	Pebble West Claims Corp.	SILL 8148	8S003S035W14	40
ADL 540460	Pebble West Claims Corp.	SILL 8243	8S003S035W15	40
ADL 540461	Pebble West Claims Corp.	SILL 8244	8S003S035W15	40
ADL 540462	Pebble West Claims Corp.	SILL 8245	8S003S035W14	40
ADL 540463	Pebble West Claims Corp.	SILL 8246	8S003S035W14	40
ADL 540464	Pebble West Claims Corp.	SILL 8247	8S003S035W14	40
ADL 540465	Pebble West Claims Corp.	SILL 8248	8S003S035W14	40
ADL 540466	Pebble West Claims Corp.	SILL 8343	8S003S035W10	40
ADL 540467	Pebble West Claims Corp.	SILL 8344	8S003S035W10	40
ADL 540468	Pebble West Claims Corp.	SILL 8443	8S003S035W10	40
ADL 540469	Pebble West Claims Corp.	SILL 8444	8S003S035W10	40
ADL 540470	Pebble West Claims Corp.	SILL 8543	8S003S035W10	40
ADL 540471	Pebble West Claims Corp.	SILL 8544	8S003S035W10	40
ADL 540472	Pebble West Claims Corp.	SILL 8643	8S003S035W10	40
ADL 540473	Pebble West Claims Corp.	SILL 8644	8S003S035W10	40
ADL 541245	Pebble West Claims Corp.	PB 113	8S004S035W18	40
ADL 541246	Pebble West Claims Corp.	PB 114	8S004S035W18	40
ADL 541247	Pebble West Claims Corp.	PB 115	8S004S035W18	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 541248	Pebble West Claims Corp.	PB 116	8S004S035W18	40
ADL 541249	Pebble West Claims Corp.	PB 117	8S004S035W18	40
ADL 541250	Pebble West Claims Corp.	PB 118	8S004S035W18	40
ADL 541251	Pebble West Claims Corp.	PB 119	8S004S035W18	40
ADL 541252	Pebble West Claims Corp.	PB 120	8S004S035W18	40
ADL 542561	Pebble West Claims Corp.	PEBBLE BEACH 4856	8S003S035W34	4
ADL 542562	Pebble West Claims Corp.	PEBBLE BEACH 4956	8S003S035W34	4
ADL 542563	Pebble West Claims Corp.	PEBBLE BEACH 5056	8S003S035W27	4
ADL 542564	Pebble West Claims Corp.	PEBBLE BEACH 5156	8S003S035W27	4
ADL 542565	Pebble West Claims Corp.	PEBBLE BEACH 5256	8S003S035W27	4
ADL 542566	Pebble West Claims Corp.	PEBBLE BEACH 5356	8S003S035W27	4
ADL 542567	Pebble West Claims Corp.	PEBBLE BEACH 5456	8S003S035W22	4
ADL 542568	Pebble West Claims Corp.	PEBBLE BEACH 5556	8S003S035W22	4
ADL 542569	Pebble West Claims Corp.	PEBBLE BEACH 5656	8S003S035W22	4
ADL 542570	Pebble West Claims Corp.	PEBBLE BEACH 5756	8S003S035W22	4
ADL 542571	Pebble West Claims Corp.	PEBBLE BEACH 5856	8S003S035W15	4
ADL 542572	Pebble West Claims Corp.	PEBBLE BEACH 5956	8S003S035W15	4
ADL 542573	Pebble West Claims Corp.	PEBBLE BEACH 6056	8S003S035W15	4
ADL 542574	Pebble West Claims Corp.	PEBBLE BEACH 6156	8S003S035W15	4
ADL 542575	Pebble West Claims Corp.	PEBBLE BEACH 6256	8S003S035W10	4
ADL 542576	Pebble West Claims Corp.	PEBBLE BEACH 6356	8S003S035W10	4
ADL 542577	Pebble West Claims Corp.	PEBBLE BEACH 6456	8S003S035W10	4
ADL 542578	Pebble West Claims Corp.	PEBBLE BEACH 6556	8S003S035W10	4
ADL 542579	Pebble West Claims Corp.	PEBBLE BEACH 4642	8S003S035W31	40
ADL 542580	Pebble West Claims Corp.	PEBBLE BEACH 4643	8S003S035W31	40
ADL 542581	Pebble West Claims Corp.	PEBBLE BEACH 4742	8S003S035W31	40
ADL 542582	Pebble West Claims Corp.	PEBBLE BEACH 4743	8S003S035W31	40
ADL 542583	Pebble West Claims Corp.	PEBBLE BEACH 4842	8S003S035W31	40
ADL 542584	Pebble West Claims Corp.	PEBBLE BEACH 4843	8S003S035W31	40
ADL 542585	Pebble West Claims Corp.	PEBBLE BEACH 4942	8S003S035W31	40
ADL 542586	Pebble West Claims Corp.	PEBBLE BEACH 4943	8S003S035W31	40
ADL 542587	Pebble West Claims Corp.	PEBBLE BEACH 5042	8S003S035W30	40
ADL 542588	Pebble West Claims Corp.	PEBBLE BEACH 5043	8S003S035W30	40
ADL 542589	Pebble West Claims Corp.	PEBBLE BEACH 5142	8S003S035W30	40
ADL 542590	Pebble West Claims Corp.	PEBBLE BEACH 5143	8S003S035W30	40
ADL 542591	Pebble West Claims Corp.	PEBBLE BEACH 5242	8S003S035W30	40
ADL 542592	Pebble West Claims Corp.	PEBBLE BEACH 5243	8S003S035W30	40
ADL 542593	Pebble West Claims Corp.	PEBBLE BEACH 5342	8S003S035W30	40
ADL 542594	Pebble West Claims Corp.	PEBBLE BEACH 5343	8S003S035W30	40
ADL 542595	Pebble West Claims Corp.	PEBBLE BEACH 5442	8S003S035W19	40
ADL 542596	Pebble West Claims Corp.	PEBBLE BEACH 5443	8S003S035W19	40
ADL 542597	Pebble West Claims Corp.	PEBBLE BEACH 5542	8S003S035W19	40
ADL 542598	Pebble West Claims Corp.	PEBBLE BEACH 5543	8S003S035W19	40
ADL 542599	Pebble West Claims Corp.	PEBBLE BEACH 5642	8S003S035W19	40
ADL 542600	Pebble West Claims Corp.	PEBBLE BEACH 5643	8S003S035W19	40
ADL 542601	Pebble West Claims Corp.	PEBBLE BEACH 5742	8S003S035W19	40
ADL 542602	Pebble West Claims Corp.	PEBBLE BEACH 5743	8S003S035W19	40
ADL 542603	Pebble West Claims Corp.	PEBBLE BEACH 5842	8S003S035W18	40
ADL 542604	Pebble West Claims Corp.	PEBBLE BEACH 5843	8S003S035W18	40
ADL 552917	Pebble West Claims Corp.	SOUTH PEBBLE 159	8S005S035W18	160
ADL 552918	Pebble West Claims Corp.	SOUTH PEBBLE 160	8S005S035W18	160
ADL 552919	Pebble West Claims Corp.	SOUTH PEBBLE 161	8S005S035W17	160
ADL 552920	Pebble West Claims Corp.	SOUTH PEBBLE 162	8S005S035W17	160
ADL 552921	Pebble West Claims Corp.	SOUTH PEBBLE 163	8S005S035W17	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 552922	Pebble West Claims Corp.	SOUTH PEBBLE 164	8S005S035W17	160
ADL 552923	Pebble West Claims Corp.	SOUTH PEBBLE 165	8S005S035W08	160
ADL 552924	Pebble West Claims Corp.	SOUTH PEBBLE 166	8S005S035W08	160
ADL 552925	Pebble West Claims Corp.	SOUTH PEBBLE 167	8S005S035W08	160
ADL 552926	Pebble West Claims Corp.	SOUTH PEBBLE 168	8S005S035W08	160
ADL 552927	Pebble West Claims Corp.	SOUTH PEBBLE 169	8S005S035W05	160
ADL 552928	Pebble West Claims Corp.	SOUTH PEBBLE 170	8S005S035W05	160
ADL 552929	Pebble West Claims Corp.	SOUTH PEBBLE 171	8S005S035W05	160
ADL 552930	Pebble West Claims Corp.	SOUTH PEBBLE 172	8S005S035W05	160
ADL 566247	Pebble West Claims Corp.	PEBBLE BEACH 1936	8S005S036W04	40
ADL 566248	Pebble West Claims Corp.	PEBBLE BEACH 1937	8S005S036W04	40
ADL 566249	Pebble West Claims Corp.	PEBBLE BEACH 1938	8S005S036W03	40
ADL 566250	Pebble West Claims Corp.	PEBBLE BEACH 1939	8S005S036W03	40
ADL 566251	Pebble West Claims Corp.	PEBBLE BEACH 1940	8S005S036W03	40
ADL 566252	Pebble West Claims Corp.	PEBBLE BEACH 1941	8S005S036W03	40
ADL 566287	Pebble West Claims Corp.	PEBBLE BEACH 2036	8S005S036W04	40
ADL 566288	Pebble West Claims Corp.	PEBBLE BEACH 2037	8S005S036W04	40
ADL 566289	Pebble West Claims Corp.	PEBBLE BEACH 2038	8S005S036W03	40
ADL 566290	Pebble West Claims Corp.	PEBBLE BEACH 2039	8S005S036W03	40
ADL 566291	Pebble West Claims Corp.	PEBBLE BEACH 2040	8S005S036W03	40
ADL 566292	Pebble West Claims Corp.	PEBBLE BEACH 2041	8S005S036W03	40
ADL 566327	Pebble West Claims Corp.	PEBBLE BEACH 2136	8S005S036W04	40
ADL 566328	Pebble West Claims Corp.	PEBBLE BEACH 2137	8S005S036W04	40
ADL 566329	Pebble West Claims Corp.	PEBBLE BEACH 2138	8S005S036W03	40
ADL 566330	Pebble West Claims Corp.	PEBBLE BEACH 2139	8S005S036W03	40
ADL 566331	Pebble West Claims Corp.	PEBBLE BEACH 2140	8S005S036W03	40
ADL 566332	Pebble West Claims Corp.	PEBBLE BEACH 2141	8S005S036W03	40
ADL 566367	Pebble West Claims Corp.	PEBBLE BEACH 2236	8S004S036W35	40
ADL 566368	Pebble West Claims Corp.	PEBBLE BEACH 2237	8S004S036W35	40
ADL 566369	Pebble West Claims Corp.	PEBBLE BEACH 2238	8S004S036W36	40
ADL 566370	Pebble West Claims Corp.	PEBBLE BEACH 2239	8S004S036W36	40
ADL 566371	Pebble West Claims Corp.	PEBBLE BEACH 2240	8S004S036W36	40
ADL 566372	Pebble West Claims Corp.	PEBBLE BEACH 2241	8S004S036W36	40
ADL 566373	Pebble West Claims Corp.	PEBBLE BEACH 2242	8S004S035W31	40
ADL 566407	Pebble West Claims Corp.	PEBBLE BEACH 2336	8S004S036W35	40
ADL 566408	Pebble West Claims Corp.	PEBBLE BEACH 2337	8S004S036W35	40
ADL 566409	Pebble West Claims Corp.	PEBBLE BEACH 2338	8S004S036W36	40
ADL 566410	Pebble West Claims Corp.	PEBBLE BEACH 2339	8S004S036W36	40
ADL 566411	Pebble West Claims Corp.	PEBBLE BEACH 2340	8S004S036W36	40
ADL 566412	Pebble West Claims Corp.	PEBBLE BEACH 2341	8S004S036W36	40
ADL 566413	Pebble West Claims Corp.	PEBBLE BEACH 2342	8S004S035W31	40
ADL 566447	Pebble West Claims Corp.	PEBBLE BEACH 2436	8S004S036W35	40
ADL 566448	Pebble West Claims Corp.	PEBBLE BEACH 2437	8S004S036W35	40
ADL 566449	Pebble West Claims Corp.	PEBBLE BEACH 2438	8S004S036W36	40
ADL 566450	Pebble West Claims Corp.	PEBBLE BEACH 2439	8S004S036W36	40
ADL 566451	Pebble West Claims Corp.	PEBBLE BEACH 2440	8S004S036W36	40
ADL 566452	Pebble West Claims Corp.	PEBBLE BEACH 2441	8S004S036W36	40
ADL 566453	Pebble West Claims Corp.	PEBBLE BEACH 2442	8S004S035W31	40
ADL 566487	Pebble West Claims Corp.	PEBBLE BEACH 2536	8S004S036W35	40
ADL 566488	Pebble West Claims Corp.	PEBBLE BEACH 2537	8S004S036W35	40
ADL 566489	Pebble West Claims Corp.	PEBBLE BEACH 2538	8S004S036W36	40
ADL 566490	Pebble West Claims Corp.	PEBBLE BEACH 2539	8S004S036W36	40
ADL 566491	Pebble West Claims Corp.	PEBBLE BEACH 2540	8S004S036W36	40
ADL 566492	Pebble West Claims Corp.	PEBBLE BEACH 2541	8S004S036W36	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 566527	Pebble West Claims Corp.	PEBBLE BEACH 2636	8S004S036W26	40
ADL 566528	Pebble West Claims Corp.	PEBBLE BEACH 2637	8S004S036W26	40
ADL 566529	Pebble West Claims Corp.	PEBBLE BEACH 2638	8S004S036W25	40
ADL 566530	Pebble West Claims Corp.	PEBBLE BEACH 2639	8S004S036W25	40
ADL 566531	Pebble West Claims Corp.	PEBBLE BEACH 2640	8S004S036W25	40
ADL 566532	Pebble West Claims Corp.	PEBBLE BEACH 2641	8S004S036W25	40
ADL 566567	Pebble West Claims Corp.	PEBBLE BEACH 2736	8S004S036W26	40
ADL 566568	Pebble West Claims Corp.	PEBBLE BEACH 2737	8S004S036W26	40
ADL 566569	Pebble West Claims Corp.	PEBBLE BEACH 2738	8S004S036W25	40
ADL 566570	Pebble West Claims Corp.	PEBBLE BEACH 2739	8S004S036W25	40
ADL 566571	Pebble West Claims Corp.	PEBBLE BEACH 2740	8S004S036W25	40
ADL 566572	Pebble West Claims Corp.	PEBBLE BEACH 2741	8S004S036W25	40
ADL 566607	Pebble West Claims Corp.	PEBBLE BEACH 3138	8S004S036W24	40
ADL 566608	Pebble West Claims Corp.	PEBBLE BEACH 3139	8S004S036W24	40
ADL 566609	Pebble West Claims Corp.	PEBBLE BEACH 3140	8S004S036W24	40
ADL 566610	Pebble West Claims Corp.	PEBBLE BEACH 3141	8S004S036W24	40
ADL 566637	Pebble West Claims Corp.	PEBBLE BEACH 2938	8S004S036W25	40
ADL 566638	Pebble West Claims Corp.	PEBBLE BEACH 2939	8S004S036W25	40
ADL 566639	Pebble West Claims Corp.	PEBBLE BEACH 2940	8S004S036W25	40
ADL 566640	Pebble West Claims Corp.	PEBBLE BEACH 2941	8S004S036W25	40
ADL 566655	Pebble West Claims Corp.	PEBBLE BEACH 2836	8S004S036W26	40
ADL 566656	Pebble West Claims Corp.	PEBBLE BEACH 2837	8S004S036W26	40
ADL 566657	Pebble West Claims Corp.	PEBBLE BEACH 2838	8S004S036W25	40
ADL 566658	Pebble West Claims Corp.	PEBBLE BEACH 2839	8S004S036W25	40
ADL 566659	Pebble West Claims Corp.	PEBBLE BEACH 2840	8S004S036W25	40
ADL 566660	Pebble West Claims Corp.	PEBBLE BEACH 2841	8S004S036W25	40
ADL 566697	Pebble West Claims Corp.	PEBBLE BEACH 3238	8S004S036W24	40
ADL 566698	Pebble West Claims Corp.	PEBBLE BEACH 3239	8S004S036W24	40
ADL 566699	Pebble West Claims Corp.	PEBBLE BEACH 3240	8S004S036W24	40
ADL 566700	Pebble West Claims Corp.	PEBBLE BEACH 3241	8S004S036W24	40
ADL 566701	Pebble West Claims Corp.	PEBBLE BEACH 3242	8S004S035W19	40
ADL 566737	Pebble West Claims Corp.	PEBBLE BEACH 3038	8S004S036W24	40
ADL 566738	Pebble West Claims Corp.	PEBBLE BEACH 3039	8S004S036W24	40
ADL 566739	Pebble West Claims Corp.	PEBBLE BEACH 3040	8S004S036W24	40
ADL 566740	Pebble West Claims Corp.	PEBBLE BEACH 3041	8S004S036W24	40
ADL 566751	Pebble West Claims Corp.	PEBBLE BEACH 3252	8S004S035W21	40
ADL 566752	Pebble West Claims Corp.	PEBBLE BEACH 3253	8S004S035W21	40
ADL 566753	Pebble West Claims Corp.	PEBBLE BEACH 3254	8S004S035W22	40
ADL 566754	Pebble West Claims Corp.	PEBBLE BEACH 3255	8S004S035W22	40
ADL 566767	Pebble West Claims Corp.	PEBBLE BEACH 3338	8S004S036W24	40
ADL 566768	Pebble West Claims Corp.	PEBBLE BEACH 3339	8S004S036W24	40
ADL 566769	Pebble West Claims Corp.	PEBBLE BEACH 3340	8S004S036W24	40
ADL 566770	Pebble West Claims Corp.	PEBBLE BEACH 3341	8S004S036W24	40
ADL 566771	Pebble West Claims Corp.	PEBBLE BEACH 3342	8S004S035W19	40
ADL 566781	Pebble West Claims Corp.	PEBBLE BEACH 3352	8S004S035W21	40
ADL 566782	Pebble West Claims Corp.	PEBBLE BEACH 3353	8S004S035W21	40
ADL 566783	Pebble West Claims Corp.	PEBBLE BEACH 3354	8S004S035W22	40
ADL 566784	Pebble West Claims Corp.	PEBBLE BEACH 3355	8S004S035W22	40
ADL 566793	Pebble West Claims Corp.	PEBBLE BEACH 3438	8S004S036W13	40
ADL 566794	Pebble West Claims Corp.	PEBBLE BEACH 3439	8S004S036W13	40
ADL 566795	Pebble West Claims Corp.	PEBBLE BEACH 3440	8S004S036W13	40
ADL 566796	Pebble West Claims Corp.	PEBBLE BEACH 3441	8S004S036W13	40
ADL 566797	Pebble West Claims Corp.	PEBBLE BEACH 3446	8S004S035W17	40
ADL 566798	Pebble West Claims Corp.	PEBBLE BEACH 3447	8S004S035W17	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 566799	Pebble West Claims Corp.	PEBBLE BEACH 3448	8S004S035W17	40
ADL 566800	Pebble West Claims Corp.	PEBBLE BEACH 3449	8S004S035W17	40
ADL 566801	Pebble West Claims Corp.	PEBBLE BEACH 3450	8S004S035W16	40
ADL 566802	Pebble West Claims Corp.	PEBBLE BEACH 3451	8S004S035W16	40
ADL 566811	Pebble West Claims Corp.	PEBBLE BEACH 3538	8S004S036W13	40
ADL 566812	Pebble West Claims Corp.	PEBBLE BEACH 3539	8S004S036W13	40
ADL 566813	Pebble West Claims Corp.	PEBBLE BEACH 3540	8S004S036W13	40
ADL 566814	Pebble West Claims Corp.	PEBBLE BEACH 3541	8S004S036W13	40
ADL 566815	Pebble West Claims Corp.	PEBBLE BEACH 3546	8S004S035W17	40
ADL 566816	Pebble West Claims Corp.	PEBBLE BEACH 3547	8S004S035W17	40
ADL 566817	Pebble West Claims Corp.	PEBBLE BEACH 3548	8S004S035W17	40
ADL 566818	Pebble West Claims Corp.	PEBBLE BEACH 3549	8S004S035W17	40
ADL 566819	Pebble West Claims Corp.	PEBBLE BEACH 3550	8S004S035W16	40
ADL 566820	Pebble West Claims Corp.	PEBBLE BEACH 3551	8S004S035W16	40
ADL 566829	Pebble West Claims Corp.	PEBBLE BEACH 3638	8S004S036W13	40
ADL 566830	Pebble West Claims Corp.	PEBBLE BEACH 3639	8S004S036W13	40
ADL 566831	Pebble West Claims Corp.	PEBBLE BEACH 3640	8S004S036W13	40
ADL 566832	Pebble West Claims Corp.	PEBBLE BEACH 3641	8S004S036W13	40
ADL 566833	Pebble West Claims Corp.	PEBBLE BEACH 3646	8S004S035W17	40
ADL 566834	Pebble West Claims Corp.	PEBBLE BEACH 3647	8S004S035W17	40
ADL 566835	Pebble West Claims Corp.	PEBBLE BEACH 3648	8S004S035W17	40
ADL 566836	Pebble West Claims Corp.	PEBBLE BEACH 3649	8S004S035W17	40
ADL 566837	Pebble West Claims Corp.	PEBBLE BEACH 3650	8S004S035W16	40
ADL 566838	Pebble West Claims Corp.	PEBBLE BEACH 3651	8S004S035W16	40
ADL 566847	Pebble West Claims Corp.	PEBBLE BEACH 3738	8S004S036W13	40
ADL 566848	Pebble West Claims Corp.	PEBBLE BEACH 3739	8S004S036W13	40
ADL 566849	Pebble West Claims Corp.	PEBBLE BEACH 3740	8S004S036W13	40
ADL 566850	Pebble West Claims Corp.	PEBBLE BEACH 3741	8S004S036W13	40
ADL 566851	Pebble West Claims Corp.	PEBBLE BEACH 3746	8S004S035W17	40
ADL 566852	Pebble West Claims Corp.	PEBBLE BEACH 3747	8S004S035W17	40
ADL 566853	Pebble West Claims Corp.	PEBBLE BEACH 3748	8S004S035W17	40
ADL 566854	Pebble West Claims Corp.	PEBBLE BEACH 3749	8S004S035W17	40
ADL 566855	Pebble West Claims Corp.	PEBBLE BEACH 3750	8S004S035W16	40
ADL 566856	Pebble West Claims Corp.	PEBBLE BEACH 3751	8S004S035W16	40
ADL 566865	Pebble West Claims Corp.	PEBBLE BEACH 3838	8S004S036W12	40
ADL 566866	Pebble West Claims Corp.	PEBBLE BEACH 3839	8S004S036W12	40
ADL 566867	Pebble West Claims Corp.	PEBBLE BEACH 3840	8S004S036W12	40
ADL 566868	Pebble West Claims Corp.	PEBBLE BEACH 3841	8S004S036W12	40
ADL 566877	Pebble West Claims Corp.	PEBBLE BEACH 3938	8S004S036W12	40
ADL 566878	Pebble West Claims Corp.	PEBBLE BEACH 3939	8S004S036W12	40
ADL 566879	Pebble West Claims Corp.	PEBBLE BEACH 3940	8S004S036W12	40
ADL 566880	Pebble West Claims Corp.	PEBBLE BEACH 3941	8S004S036W12	40
ADL 566889	Pebble West Claims Corp.	PEBBLE BEACH 4038	8S004S036W12	40
ADL 566890	Pebble West Claims Corp.	PEBBLE BEACH 4039	8S004S036W12	40
ADL 566891	Pebble West Claims Corp.	PEBBLE BEACH 4040	8S004S036W12	40
ADL 566892	Pebble West Claims Corp.	PEBBLE BEACH 4041	8S004S036W12	40
ADL 566901	Pebble West Claims Corp.	PEBBLE BEACH 4138	8S004S036W12	40
ADL 566902	Pebble West Claims Corp.	PEBBLE BEACH 4139	8S004S036W12	40
ADL 566903	Pebble West Claims Corp.	PEBBLE BEACH 4140	8S004S036W12	40
ADL 566904	Pebble West Claims Corp.	PEBBLE BEACH 4141	8S004S036W12	40
ADL 566905	Pebble West Claims Corp.	PEBBLE BEACH 4238	8S004S036W01	40
ADL 566906	Pebble West Claims Corp.	PEBBLE BEACH 4239	8S004S036W01	40
ADL 566907	Pebble West Claims Corp.	PEBBLE BEACH 4240	8S004S036W01	40
ADL 566908	Pebble West Claims Corp.	PEBBLE BEACH 4241	8S004S036W01	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 566909	Pebble West Claims Corp.	PEBBLE BEACH 4242	8S004S035W06	40
ADL 566910	Pebble West Claims Corp.	PEBBLE BEACH 4243	8S004S035W06	40
ADL 566911	Pebble West Claims Corp.	PEBBLE BEACH 4338	8S004S036W01	40
ADL 566912	Pebble West Claims Corp.	PEBBLE BEACH 4339	8S004S036W01	40
ADL 566913	Pebble West Claims Corp.	PEBBLE BEACH 4340	8S004S036W01	40
ADL 566914	Pebble West Claims Corp.	PEBBLE BEACH 4341	8S004S036W01	40
ADL 566915	Pebble West Claims Corp.	PEBBLE BEACH 4342	8S004S035W06	40
ADL 566916	Pebble West Claims Corp.	PEBBLE BEACH 4343	8S004S035W06	40
ADL 566917	Pebble West Claims Corp.	PEBBLE BEACH 4438	8S004S036W01	40
ADL 566918	Pebble West Claims Corp.	PEBBLE BEACH 4439	8S004S036W01	40
ADL 566919	Pebble West Claims Corp.	PEBBLE BEACH 4440	8S004S036W01	40
ADL 566920	Pebble West Claims Corp.	PEBBLE BEACH 4441	8S004S036W01	40
ADL 566921	Pebble West Claims Corp.	PEBBLE BEACH 4442	8S004S035W06	40
ADL 566922	Pebble West Claims Corp.	PEBBLE BEACH 4443	8S004S035W06	40
ADL 566923	Pebble West Claims Corp.	PEBBLE BEACH 4538	8S004S036W01	40
ADL 566924	Pebble West Claims Corp.	PEBBLE BEACH 4539	8S004S036W01	40
ADL 566925	Pebble West Claims Corp.	PEBBLE BEACH 4540	8S004S036W01	40
ADL 566926	Pebble West Claims Corp.	PEBBLE BEACH 4541	8S004S036W01	40
ADL 566927	Pebble West Claims Corp.	PEBBLE BEACH 4542	8S004S035W06	40
ADL 566928	Pebble West Claims Corp.	PEBBLE BEACH 4543	8S004S035W06	40
ADL 566929	Pebble West Claims Corp.	PEBBLE BEACH 4638	8S003S036W36	40
ADL 566930	Pebble West Claims Corp.	PEBBLE BEACH 4639	8S003S036W36	40
ADL 566931	Pebble West Claims Corp.	PEBBLE BEACH 4640	8S003S036W36	40
ADL 566932	Pebble West Claims Corp.	PEBBLE BEACH 4641	8S003S036W36	40
ADL 566933	Pebble West Claims Corp.	PEBBLE BEACH 4738	8S003S036W36	40
ADL 566934	Pebble West Claims Corp.	PEBBLE BEACH 4739	8S003S036W36	40
ADL 566935	Pebble West Claims Corp.	PEBBLE BEACH 4740	8S003S036W36	40
ADL 566936	Pebble West Claims Corp.	PEBBLE BEACH 4741	8S003S036W36	40
ADL 566937	Pebble West Claims Corp.	PEBBLE BEACH 4838	8S003S036W36	40
ADL 566938	Pebble West Claims Corp.	PEBBLE BEACH 4839	8S003S036W36	40
ADL 566939	Pebble West Claims Corp.	PEBBLE BEACH 4840	8S003S036W36	40
ADL 566940	Pebble West Claims Corp.	PEBBLE BEACH 4841	8S003S036W36	40
ADL 566941	Pebble West Claims Corp.	PEBBLE BEACH 4938	8S003S036W36	40
ADL 566942	Pebble West Claims Corp.	PEBBLE BEACH 4939	8S003S036W36	40
ADL 566943	Pebble West Claims Corp.	PEBBLE BEACH 4940	8S003S036W36	40
ADL 566944	Pebble West Claims Corp.	PEBBLE BEACH 4941	8S003S036W36	40
ADL 566945	Pebble West Claims Corp.	PEBBLE BEACH 5038	8S003S036W25	40
ADL 566946	Pebble West Claims Corp.	PEBBLE BEACH 5039	8S003S036W25	40
ADL 566947	Pebble West Claims Corp.	PEBBLE BEACH 5040	8S003S036W25	40
ADL 566948	Pebble West Claims Corp.	PEBBLE BEACH 5041	8S003S036W25	40
ADL 566949	Pebble West Claims Corp.	PEBBLE BEACH 5138	8S003S036W25	40
ADL 566950	Pebble West Claims Corp.	PEBBLE BEACH 5139	8S003S036W25	40
ADL 566951	Pebble West Claims Corp.	PEBBLE BEACH 5140	8S003S036W25	40
ADL 566952	Pebble West Claims Corp.	PEBBLE BEACH 5141	8S003S036W25	40
ADL 566953	Pebble West Claims Corp.	PEBBLE BEACH 5238	8S003S036W25	40
ADL 566954	Pebble West Claims Corp.	PEBBLE BEACH 5239	8S003S036W25	40
ADL 566955	Pebble West Claims Corp.	PEBBLE BEACH 5240	8S003S036W25	40
ADL 566956	Pebble West Claims Corp.	PEBBLE BEACH 5241	8S003S036W25	40
ADL 566957	Pebble West Claims Corp.	PEBBLE BEACH 5338	8S003S036W25	40
ADL 566958	Pebble West Claims Corp.	PEBBLE BEACH 5339	8S003S036W25	40
ADL 566959	Pebble West Claims Corp.	PEBBLE BEACH 5340	8S003S036W25	40
ADL 566960	Pebble West Claims Corp.	PEBBLE BEACH 5341	8S003S036W25	40
ADL 566961	Pebble West Claims Corp.	PEBBLE BEACH 5438	8S003S036W24	40
ADL 566962	Pebble West Claims Corp.	PEBBLE BEACH 5439	8S003S036W24	40

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 566963	Pebble West Claims Corp.	PEBBLE BEACH 5440	8S003S036W24	40
ADL 566964	Pebble West Claims Corp.	PEBBLE BEACH 5441	8S003S036W24	40
ADL 566965	Pebble West Claims Corp.	PEBBLE BEACH 5538	8S003S036W24	40
ADL 566966	Pebble West Claims Corp.	PEBBLE BEACH 5539	8S003S036W24	40
ADL 566967	Pebble West Claims Corp.	PEBBLE BEACH 5540	8S003S036W24	40
ADL 566968	Pebble West Claims Corp.	PEBBLE BEACH 5541	8S003S036W24	40
ADL 566969	Pebble West Claims Corp.	PEBBLE BEACH 5638	8S003S036W24	40
ADL 566970	Pebble West Claims Corp.	PEBBLE BEACH 5639	8S003S036W24	40
ADL 566971	Pebble West Claims Corp.	PEBBLE BEACH 5640	8S003S036W24	40
ADL 566972	Pebble West Claims Corp.	PEBBLE BEACH 5641	8S003S036W24	40
ADL 566973	Pebble West Claims Corp.	PEBBLE BEACH 5738	8S003S036W24	40
ADL 566974	Pebble West Claims Corp.	PEBBLE BEACH 5739	8S003S036W24	40
ADL 566975	Pebble West Claims Corp.	PEBBLE BEACH 5740	8S003S036W24	40
ADL 566976	Pebble West Claims Corp.	PEBBLE BEACH 5741	8S003S036W24	40
ADL 566977	Pebble West Claims Corp.	PEBBLE BEACH 5838	8S003S036W13	40
ADL 566978	Pebble West Claims Corp.	PEBBLE BEACH 5839	8S003S036W13	40
ADL 566979	Pebble West Claims Corp.	PEBBLE BEACH 5840	8S003S036W13	40
ADL 566980	Pebble West Claims Corp.	PEBBLE BEACH 5841	8S003S036W13	40
ADL 566981	Pebble West Claims Corp.	PEBBLE BEACH 5938	8S003S036W13	40
ADL 566982	Pebble West Claims Corp.	PEBBLE BEACH 5939	8S003S036W13	40
ADL 566983	Pebble West Claims Corp.	PEBBLE BEACH 5940	8S003S036W13	40
ADL 566984	Pebble West Claims Corp.	PEBBLE BEACH 5941	8S003S036W13	40
ADL 566985	Pebble West Claims Corp.	PEBBLE BEACH 6038	8S003S036W13	40
ADL 566986	Pebble West Claims Corp.	PEBBLE BEACH 6039	8S003S036W13	40
ADL 566987	Pebble West Claims Corp.	PEBBLE BEACH 6040	8S003S036W13	40
ADL 566988	Pebble West Claims Corp.	PEBBLE BEACH 6041	8S003S036W13	40
ADL 566989	Pebble West Claims Corp.	PEBBLE BEACH 6042	8S003S035W18	40
ADL 566990	Pebble West Claims Corp.	PEBBLE BEACH 6043	8S003S035W18	40
ADL 566991	Pebble West Claims Corp.	PEBBLE BEACH 6138	8S003S036W13	40
ADL 566992	Pebble West Claims Corp.	PEBBLE BEACH 6139	8S003S036W13	40
ADL 566993	Pebble West Claims Corp.	PEBBLE BEACH 6140	8S003S036W13	40
ADL 566994	Pebble West Claims Corp.	PEBBLE BEACH 6141	8S003S036W13	40
ADL 566995	Pebble West Claims Corp.	PEBBLE BEACH 6142	8S003S035W18	40
ADL 566996	Pebble West Claims Corp.	PEBBLE BEACH 6143	8S003S035W18	40
ADL 566997	Pebble West Claims Corp.	PEBBLE BEACH 6238	8S003S036W12	40
ADL 566998	Pebble West Claims Corp.	PEBBLE BEACH 6239	8S003S036W12	40
ADL 566999	Pebble West Claims Corp.	PEBBLE BEACH 6240	8S003S036W12	40
ADL 567000	Pebble West Claims Corp.	PEBBLE BEACH 6241	8S003S036W12	40
ADL 567001	Pebble West Claims Corp.	PEBBLE BEACH 6242	8S003S035W07	40
ADL 567002	Pebble West Claims Corp.	PEBBLE BEACH 6243	8S003S035W07	40
ADL 567003	Pebble West Claims Corp.	PEBBLE BEACH 6244	8S003S035W07	40
ADL 567004	Pebble West Claims Corp.	PEBBLE BEACH 6245	8S003S035W07	40
ADL 567005	Pebble West Claims Corp.	PEBBLE BEACH 6246	8S003S035W08	40
ADL 567006	Pebble West Claims Corp.	PEBBLE BEACH 6247	8S003S035W08	40
ADL 567007	Pebble West Claims Corp.	PEBBLE BEACH 6338	8S003S036W12	40
ADL 567008	Pebble West Claims Corp.	PEBBLE BEACH 6339	8S003S036W12	40
ADL 567009	Pebble West Claims Corp.	PEBBLE BEACH 6340	8S003S036W12	40
ADL 567010	Pebble West Claims Corp.	PEBBLE BEACH 6341	8S003S036W12	40
ADL 567011	Pebble West Claims Corp.	PEBBLE BEACH 6342	8S003S035W07	40
ADL 567012	Pebble West Claims Corp.	PEBBLE BEACH 6343	8S003S035W07	40
ADL 567013	Pebble West Claims Corp.	PEBBLE BEACH 6344	8S003S035W07	40
ADL 567014	Pebble West Claims Corp.	PEBBLE BEACH 6345	8S003S035W07	40
ADL 567015	Pebble West Claims Corp.	PEBBLE BEACH 6346	8S003S035W08	40
ADL 567016	Pebble West Claims Corp.	PEBBLE BEACH 6347	8S003S035W08	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 567017	Pebble West Claims Corp.	PEBBLE BEACH 6438	8S003S036W12	40
ADL 567018	Pebble West Claims Corp.	PEBBLE BEACH 6439	8S003S036W12	40
ADL 567019	Pebble West Claims Corp.	PEBBLE BEACH 6440	8S003S036W12	40
ADL 567020	Pebble West Claims Corp.	PEBBLE BEACH 6441	8S003S036W12	40
ADL 567021	Pebble West Claims Corp.	PEBBLE BEACH 6442	8S003S035W07	40
ADL 567022	Pebble West Claims Corp.	PEBBLE BEACH 6443	8S003S035W07	40
ADL 567023	Pebble West Claims Corp.	PEBBLE BEACH 6444	8S003S035W07	40
ADL 567024	Pebble West Claims Corp.	PEBBLE BEACH 6445	8S003S035W07	40
ADL 567025	Pebble West Claims Corp.	PEBBLE BEACH 6446	8S003S035W08	40
ADL 567026	Pebble West Claims Corp.	PEBBLE BEACH 6447	8S003S035W08	40
ADL 567035	Pebble West Claims Corp.	PEBBLE BEACH 6546	8S003S035W08	40
ADL 567036	Pebble West Claims Corp.	PEBBLE BEACH 6547	8S003S035W08	40
ADL 567045	Pebble West Claims Corp.	PEBBLE BEACH 6646	8S003S035W05	40
ADL 567046	Pebble West Claims Corp.	PEBBLE BEACH 6647	8S003S035W05	40
ADL 567047	Pebble West Claims Corp.	PEBBLE BEACH 6648	8S003S035W05	40
ADL 567048	Pebble West Claims Corp.	PEBBLE BEACH 6649	8S003S035W05	40
ADL 567049	Pebble West Claims Corp.	PEBBLE BEACH 6650	8S003S035W04	40
ADL 567050	Pebble West Claims Corp.	PEBBLE BEACH 6651	8S003S035W04	40
ADL 567051	Pebble West Claims Corp.	PEBBLE BEACH 6652	8S003S035W04	40
ADL 567052	Pebble West Claims Corp.	PEBBLE BEACH 6653	8S003S035W04	40
ADL 567053	Pebble West Claims Corp.	PEBBLE BEACH 6654	8S003S035W03	40
ADL 567054	Pebble West Claims Corp.	PEBBLE BEACH 6655	8S003S035W03	40
ADL 567055	Pebble West Claims Corp.	PEBBLE BEACH 6656	8S003S035W03	4
ADL 567064	Pebble West Claims Corp.	PEBBLE BEACH 6746	8S003S035W05	40
ADL 567065	Pebble West Claims Corp.	PEBBLE BEACH 6747	8S003S035W05	40
ADL 567066	Pebble West Claims Corp.	PEBBLE BEACH 6748	8S003S035W05	40
ADL 567067	Pebble West Claims Corp.	PEBBLE BEACH 6749	8S003S035W05	40
ADL 567068	Pebble West Claims Corp.	PEBBLE BEACH 6750	8S003S035W04	40
ADL 567069	Pebble West Claims Corp.	PEBBLE BEACH 6751	8S003S035W04	40
ADL 567083	Pebble West Claims Corp.	PEBBLE BEACH 6846	8S003S035W05	40
ADL 567084	Pebble West Claims Corp.	PEBBLE BEACH 6847	8S003S035W05	40
ADL 567085	Pebble West Claims Corp.	PEBBLE BEACH 6848	8S003S035W05	40
ADL 567086	Pebble West Claims Corp.	PEBBLE BEACH 6849	8S003S035W05	40
ADL 567087	Pebble West Claims Corp.	PEBBLE BEACH 6850	8S003S035W04	40
ADL 567088	Pebble West Claims Corp.	PEBBLE BEACH 6851	8S003S035W04	40
ADL 567102	Pebble West Claims Corp.	PEBBLE BEACH 6946	8S003S035W05	40
ADL 567103	Pebble West Claims Corp.	PEBBLE BEACH 6947	8S003S035W05	40
ADL 567104	Pebble West Claims Corp.	PEBBLE BEACH 6948	8S003S035W05	40
ADL 567105	Pebble West Claims Corp.	PEBBLE BEACH 6949	8S003S035W05	40
ADL 567106	Pebble West Claims Corp.	PEBBLE BEACH 6950	8S003S035W04	40
ADL 567107	Pebble West Claims Corp.	PEBBLE BEACH 6951	8S003S035W04	40
ADL 567841	Pebble West Claims Corp.	SILL 5343	8S004S035W22	40
ADL 567842	Pebble West Claims Corp.	SILL 5344	8S004S035W22	40
ADL 567843	Pebble West Claims Corp.	SILL 5345	8S004S035W23	40
ADL 567844	Pebble West Claims Corp.	SILL 5346	8S004S035W23	40
ADL 567845	Pebble West Claims Corp.	SILL 5347	8S004S035W23	40
ADL 567855	Pebble West Claims Corp.	SILL 5443	8S004S035W22	40
ADL 567856	Pebble West Claims Corp.	SILL 5444	8S004S035W22	40
ADL 567857	Pebble West Claims Corp.	SILL 5445	8S004S035W23	40
ADL 567858	Pebble West Claims Corp.	SILL 5446	8S004S035W23	40
ADL 567859	Pebble West Claims Corp.	SILL 5447	8S004S035W23	40
ADL 567860	Pebble West Claims Corp.	SILL 5448	8S004S035W23	40
ADL 567869	Pebble West Claims Corp.	SILL 5545	8S004S035W14	40
ADL 567870	Pebble West Claims Corp.	SILL 5546	8S004S035W14	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 567871	Pebble West Claims Corp.	SILL 5547	8S004S035W14	40
ADL 567872	Pebble West Claims Corp.	SILL 5548	8S004S035W14	40
ADL 567873	Pebble West Claims Corp.	SILL 5549	8S004S035W13	40
ADL 567881	Pebble West Claims Corp.	SILL 5645	8S004S035W14	40
ADL 567882	Pebble West Claims Corp.	SILL 5646	8S004S035W14	40
ADL 567883	Pebble West Claims Corp.	SILL 5647	8S004S035W14	40
ADL 567884	Pebble West Claims Corp.	SILL 5648	8S004S035W14	40
ADL 567885	Pebble West Claims Corp.	SILL 5649	8S004S035W13	40
ADL 567886	Pebble West Claims Corp.	SILL 5650	8S004S035W13	40
ADL 567893	Pebble West Claims Corp.	SILL 5745	8S004S035W14	40
ADL 567894	Pebble West Claims Corp.	SILL 5746	8S004S035W14	40
ADL 567895	Pebble West Claims Corp.	SILL 5747	8S004S035W14	40
ADL 567896	Pebble West Claims Corp.	SILL 5748	8S004S035W14	40
ADL 567897	Pebble West Claims Corp.	SILL 5749	8S004S035W13	40
ADL 567898	Pebble West Claims Corp.	SILL 5750	8S004S035W13	40
ADL 567905	Pebble West Claims Corp.	SILL 5845	8S004S035W14	40
ADL 567906	Pebble West Claims Corp.	SILL 5846	8S004S035W14	40
ADL 567907	Pebble West Claims Corp.	SILL 5847	8S004S035W14	40
ADL 567908	Pebble West Claims Corp.	SILL 5848	8S004S035W14	40
ADL 567909	Pebble West Claims Corp.	SILL 5849	8S004S035W13	40
ADL 567910	Pebble West Claims Corp.	SILL 5850	8S004S035W13	40
ADL 567911	Pebble West Claims Corp.	SILL 5851	8S004S035W13	40
ADL 567917	Pebble West Claims Corp.	SILL 5945	8S004S035W11	40
ADL 567918	Pebble West Claims Corp.	SILL 5946	8S004S035W11	40
ADL 567919	Pebble West Claims Corp.	SILL 5947	8S004S035W11	40
ADL 567920	Pebble West Claims Corp.	SILL 5948	8S004S035W11	40
ADL 567921	Pebble West Claims Corp.	SILL 5949	8S004S035W12	40
ADL 567922	Pebble West Claims Corp.	SILL 5950	8S004S035W12	40
ADL 567923	Pebble West Claims Corp.	SILL 5953	8S004S034W07	40
ADL 567927	Pebble West Claims Corp.	SILL 6045	8S004S035W11	40
ADL 567928	Pebble West Claims Corp.	SILL 6046	8S004S035W11	40
ADL 567929	Pebble West Claims Corp.	SILL 6047	8S004S035W11	40
ADL 567930	Pebble West Claims Corp.	SILL 6048	8S004S035W11	40
ADL 567931	Pebble West Claims Corp.	SILL 6049	8S004S035W12	40
ADL 567932	Pebble West Claims Corp.	SILL 6050	8S004S035W12	40
ADL 567933	Pebble West Claims Corp.	SILL 6053	8S004S034W07	40
ADL 567937	Pebble West Claims Corp.	SILL 6145	8S004S035W11	40
ADL 567938	Pebble West Claims Corp.	SILL 6146	8S004S035W11	40
ADL 567939	Pebble West Claims Corp.	SILL 6147	8S004S035W11	40
ADL 567940	Pebble West Claims Corp.	SILL 6148	8S004S035W11	40
ADL 567941	Pebble West Claims Corp.	SILL 6149	8S004S035W12	40
ADL 567942	Pebble West Claims Corp.	SILL 6150	8S004S035W12	40
ADL 567943	Pebble West Claims Corp.	SILL 6153	8S004S034W07	40
ADL 567944	Pebble West Claims Corp.	SILL 6154	8S004S034W07	40
ADL 567947	Pebble West Claims Corp.	SILL 6253	8S004S034W07	40
ADL 567948	Pebble West Claims Corp.	SILL 6254	8S004S034W07	40
ADL 567949	Pebble West Claims Corp.	SILL 6255	8S004S034W07	40
ADL 567951	Pebble West Claims Corp.	SILL 6345	8S004S035W02	40
ADL 567952	Pebble West Claims Corp.	SILL 6346	8S004S035W02	40
ADL 567953	Pebble West Claims Corp.	SILL 6347	8S004S035W02	40
ADL 567954	Pebble West Claims Corp.	SILL 6348	8S004S035W02	40
ADL 567955	Pebble West Claims Corp.	SILL 6349	8S004S035W01	40
ADL 567956	Pebble West Claims Corp.	SILL 6350	8S004S035W01	40
ADL 567957	Pebble West Claims Corp.	SILL 6353	8S004S034W06	40

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 567958	Pebble West Claims Corp.	SILL 6354	8S004S034W06	40
ADL 567959	Pebble West Claims Corp.	SILL 6355	8S004S034W06	40
ADL 567960	Pebble West Claims Corp.	SILL 6356	8S004S034W06	40
ADL 567961	Pebble West Claims Corp.	SILL 6445	8S004S035W02	40
ADL 567962	Pebble West Claims Corp.	SILL 6446	8S004S035W02	40
ADL 567963	Pebble West Claims Corp.	SILL 6447	8S004S035W02	40
ADL 567964	Pebble West Claims Corp.	SILL 6448	8S004S035W02	40
ADL 567965	Pebble West Claims Corp.	SILL 6449	8S004S035W01	40
ADL 567966	Pebble West Claims Corp.	SILL 6450	8S004S035W01	40
ADL 567967	Pebble West Claims Corp.	SILL 6453	8S004S034W06	40
ADL 567968	Pebble West Claims Corp.	SILL 6454	8S004S034W06	40
ADL 567969	Pebble West Claims Corp.	SILL 6455	8S004S034W06	40
ADL 567970	Pebble West Claims Corp.	SILL 6456	8S004S034W06	40
ADL 567971	Pebble West Claims Corp.	SILL 6545	8S004S035W02	40
ADL 567972	Pebble West Claims Corp.	SILL 6546	8S004S035W02	40
ADL 567973	Pebble West Claims Corp.	SILL 6547	8S004S035W02	40
ADL 567974	Pebble West Claims Corp.	SILL 6548	8S004S035W02	40
ADL 567975	Pebble West Claims Corp.	SILL 6549	8S004S035W01	40
ADL 567976	Pebble West Claims Corp.	SILL 6550	8S004S035W01	40
ADL 567977	Pebble West Claims Corp.	SILL 6551	8S004S035W01	40
ADL 567978	Pebble West Claims Corp.	SILL 6552	8S004S035W01	40
ADL 567979	Pebble West Claims Corp.	SILL 6553	8S004S034W06	40
ADL 567980	Pebble West Claims Corp.	SILL 6554	8S004S034W06	40
ADL 567981	Pebble West Claims Corp.	SILL 6555	8S004S034W06	40
ADL 567982	Pebble West Claims Corp.	SILL 6556	8S004S034W06	40
ADL 568175	Pebble West Claims Corp.	SILL 8345	8S003S035W11	40
ADL 568176	Pebble West Claims Corp.	SILL 8346	8S003S035W11	40
ADL 568177	Pebble West Claims Corp.	SILL 8347	8S003S035W11	40
ADL 568178	Pebble West Claims Corp.	SILL 8348	8S003S035W11	40
ADL 568255	Pebble West Claims Corp.	SILL 8743	8S003S035W03	40
ADL 568256	Pebble West Claims Corp.	SILL 8744	8S003S035W03	40
ADL 642753	Pebble West Claims Corp.	BC 265	8S003S038W22	160
ADL 642754	Pebble West Claims Corp.	BC 266	8S003S038W23	160
ADL 642755	Pebble West Claims Corp.	BC 267	8S003S038W23	160
ADL 642756	Pebble West Claims Corp.	BC 268	8S003S038W24	160
ADL 642757	Pebble West Claims Corp.	BC 269	8S003S038W24	160
ADL 642758	Pebble West Claims Corp.	BC 270	8S003S037W19	160
ADL 642759	Pebble West Claims Corp.	BC 271	8S003S037W19	160
ADL 642764	Pebble West Claims Corp.	BC 276	8S003S038W22	160
ADL 642765	Pebble West Claims Corp.	BC 277	8S003S038W23	160
ADL 642766	Pebble West Claims Corp.	BC 278	8S003S038W23	160
ADL 642767	Pebble West Claims Corp.	BC 279	8S003S038W24	160
ADL 642768	Pebble West Claims Corp.	BC 280	8S003S038W24	160
ADL 642769	Pebble West Claims Corp.	BC 281	8S003S037W19	160
ADL 642770	Pebble West Claims Corp.	BC 282	8S003S037W19	160
ADL 642775	Pebble West Claims Corp.	BC 287	8S003S038W15	160
ADL 642776	Pebble West Claims Corp.	BC 288	8S003S038W14	160
ADL 642777	Pebble West Claims Corp.	BC 289	8S003S038W14	160
ADL 642778	Pebble West Claims Corp.	BC 290	8S003S038W13	160
ADL 642779	Pebble West Claims Corp.	BC 291	8S003S038W13	160
ADL 642780	Pebble West Claims Corp.	BC 292	8S003S037W18	160
ADL 642781	Pebble West Claims Corp.	BC 293	8S003S037W18	160
ADL 642786	Pebble West Claims Corp.	BC 298	8S003S038W15	160
ADL 642787	Pebble West Claims Corp.	BC 299	8S003S038W14	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642788	Pebble West Claims Corp.	BC 300	8S003S038W14	160
ADL 642789	Pebble West Claims Corp.	BC 301	8S003S038W13	160
ADL 642790	Pebble West Claims Corp.	BC 302	8S003S038W13	160
ADL 642791	Pebble West Claims Corp.	BC 303	8S003S037W18	160
ADL 642792	Pebble West Claims Corp.	BC 304	8S003S037W18	160
ADL 642797	Pebble West Claims Corp.	BC 309	8S003S038W10	160
ADL 642798	Pebble West Claims Corp.	BC 310	8S003S038W11	160
ADL 642799	Pebble West Claims Corp.	BC 311	8S003S038W11	160
ADL 642800	Pebble West Claims Corp.	BC 312	8S003S038W12	160
ADL 642801	Pebble West Claims Corp.	BC 313	8S003S038W12	160
ADL 642802	Pebble West Claims Corp.	BC 314	8S003S037W07	160
ADL 642803	Pebble West Claims Corp.	BC 315	8S003S037W07	160
ADL 642808	Pebble West Claims Corp.	BC 320	8S003S038W10	160
ADL 642809	Pebble West Claims Corp.	BC 321	8S003S038W11	160
ADL 642810	Pebble West Claims Corp.	BC 322	8S003S038W11	160
ADL 642811	Pebble West Claims Corp.	BC 323	8S003S038W12	160
ADL 642812	Pebble West Claims Corp.	BC 324	8S003S038W12	160
ADL 642813	Pebble West Claims Corp.	BC 325	8S003S037W07	160
ADL 642814	Pebble West Claims Corp.	BC 326	8S003S037W07	160
ADL 642819	Pebble West Claims Corp.	BC 331	8S003S038W03	160
ADL 642820	Pebble West Claims Corp.	BC 332	8S003S038W02	160
ADL 642821	Pebble West Claims Corp.	BC 333	8S003S038W02	160
ADL 642822	Pebble West Claims Corp.	BC 334	8S003S038W01	160
ADL 642823	Pebble West Claims Corp.	BC 335	8S003S038W01	160
ADL 642824	Pebble West Claims Corp.	BC 336	8S003S037W06	160
ADL 642825	Pebble West Claims Corp.	BC 337	8S003S037W06	160
ADL 642826	Pebble West Claims Corp.	BC 338	8S003S035W06	160
ADL 642827	Pebble West Claims Corp.	BC 339	8S003S035W06	160
ADL 642832	Pebble West Claims Corp.	BC 344	8S003S038W03	160
ADL 642833	Pebble West Claims Corp.	BC 345	8S003S038W02	160
ADL 642834	Pebble West Claims Corp.	BC 346	8S003S038W02	160
ADL 642835	Pebble West Claims Corp.	BC 347	8S003S038W01	160
ADL 642836	Pebble West Claims Corp.	BC 348	8S003S038W01	160
ADL 642837	Pebble West Claims Corp.	BC 349	8S003S037W06	160
ADL 642838	Pebble West Claims Corp.	BC 350	8S003S037W06	160
ADL 642839	Pebble West Claims Corp.	BC 351	8S003S035W06	160
ADL 642840	Pebble West Claims Corp.	BC 352	8S003S035W06	160
ADL 642841	Pebble West Claims Corp.	BC 353	8S003S035W04	160
ADL 642842	Pebble West Claims Corp.	BC 354	8S003S035W03	160
ADL 642843	Pebble West Claims Corp.	BC 355	8S003S035W03	160
ADL 642848	Pebble West Claims Corp.	BC 360	8S002S038W34	160
ADL 642849	Pebble West Claims Corp.	BC 361	8S002S038W35	160
ADL 642850	Pebble West Claims Corp.	BC 362	8S002S038W35	160
ADL 642851	Pebble West Claims Corp.	BC 363	8S002S038W36	160
ADL 642852	Pebble West Claims Corp.	BC 364	8S002S038W36	160
ADL 642853	Pebble West Claims Corp.	BC 365	8S002S037W31	160
ADL 642854	Pebble West Claims Corp.	BC 366	8S002S037W31	160
ADL 642855	Pebble West Claims Corp.	BC 367	8S002S035W31	160
ADL 642856	Pebble West Claims Corp.	BC 368	8S002S035W31	160
ADL 642857	Pebble West Claims Corp.	BC 369	8S002S035W32	160
ADL 642858	Pebble West Claims Corp.	BC 370	8S002S035W32	160
ADL 642859	Pebble West Claims Corp.	BC 371	8S002S035W33	160
ADL 642860	Pebble West Claims Corp.	BC 372	8S002S035W33	160
ADL 642861	Pebble West Claims Corp.	BC 373	8S002S035W34	160

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Mineral Properties List

Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642862	Pebble West Claims Corp.	BC 374	8S002S035W34	160
ADL 642867	Pebble West Claims Corp.	BC 379	8S002S038W34	160
ADL 642868	Pebble West Claims Corp.	BC 380	8S002S038W35	160
ADL 642869	Pebble West Claims Corp.	BC 381	8S002S038W35	160
ADL 642870	Pebble West Claims Corp.	BC 382	8S002S038W36	160
ADL 642871	Pebble West Claims Corp.	BC 383	8S002S038W36	160
ADL 642872	Pebble West Claims Corp.	BC 384	8S002S037W31	160
ADL 642873	Pebble West Claims Corp.	BC 385	8S002S037W31	160
ADL 642874	Pebble West Claims Corp.	BC 386	8S002S035W31	160
ADL 642875	Pebble West Claims Corp.	BC 387	8S002S035W31	160
ADL 642876	Pebble West Claims Corp.	BC 388	8S002S035W32	160
ADL 642877	Pebble West Claims Corp.	BC 389	8S002S035W32	160
ADL 642878	Pebble West Claims Corp.	BC 390	8S002S035W33	160
ADL 642879	Pebble West Claims Corp.	BC 391	8S002S035W33	160
ADL 642880	Pebble West Claims Corp.	BC 392	8S002S035W34	160
ADL 642881	Pebble West Claims Corp.	BC 393	8S002S035W34	160
ADL 642886	Pebble West Claims Corp.	BC 398	8S002S038W27	160
ADL 642887	Pebble West Claims Corp.	BC 399	8S002S038W26	160
ADL 642888	Pebble West Claims Corp.	BC 400	8S002S038W26	160
ADL 642889	Pebble West Claims Corp.	BC 401	8S002S038W25	160
ADL 642890	Pebble West Claims Corp.	BC 402	8S002S038W25	160
ADL 642891	Pebble West Claims Corp.	BC 403	8S002S037W30	160
ADL 642892	Pebble West Claims Corp.	BC 404	8S002S037W30	160
ADL 642893	Pebble West Claims Corp.	BC 405	8S002S035W30	160
ADL 642894	Pebble West Claims Corp.	BC 406	8S002S035W30	160
ADL 642895	Pebble West Claims Corp.	BC 407	8S002S035W29	160
ADL 642896	Pebble West Claims Corp.	BC 408	8S002S035W29	160
ADL 642897	Pebble West Claims Corp.	BC 409	8S002S035W28	160
ADL 642898	Pebble West Claims Corp.	BC 410	8S002S035W28	160
ADL 642899	Pebble West Claims Corp.	BC 411	8S002S035W27	160
ADL 642900	Pebble West Claims Corp.	BC 412	8S002S035W27	160
ADL 642905	Pebble West Claims Corp.	BC 417	8S002S038W27	160
ADL 642906	Pebble West Claims Corp.	BC 418	8S002S038W26	160
ADL 642907	Pebble West Claims Corp.	BC 419	8S002S038W26	160
ADL 642908	Pebble West Claims Corp.	BC 420	8S002S038W25	160
ADL 642909	Pebble West Claims Corp.	BC 421	8S002S038W25	160
ADL 642910	Pebble West Claims Corp.	BC 422	8S002S037W30	160
ADL 642911	Pebble West Claims Corp.	BC 423	8S002S037W30	160
ADL 642912	Pebble West Claims Corp.	BC 424	8S002S035W30	160
ADL 642913	Pebble West Claims Corp.	BC 425	8S002S035W30	160
ADL 642914	Pebble West Claims Corp.	BC 426	8S002S035W29	160
ADL 642915	Pebble West Claims Corp.	BC 427	8S002S035W29	160
ADL 642916	Pebble West Claims Corp.	BC 428	8S002S035W28	160
ADL 642917	Pebble West Claims Corp.	BC 429	8S002S035W28	160
ADL 642918	Pebble West Claims Corp.	BC 430	8S002S035W27	160
ADL 642919	Pebble West Claims Corp.	BC 431	8S002S035W27	160
ADL 642924	Pebble West Claims Corp.	BC 436	8S002S038W22	160
ADL 642925	Pebble West Claims Corp.	BC 437	8S002S038W23	160
ADL 642926	Pebble West Claims Corp.	BC 438	8S002S038W23	160
ADL 642927	Pebble West Claims Corp.	BC 439	8S002S038W24	160
ADL 642928	Pebble West Claims Corp.	BC 440	8S002S038W24	160
ADL 642929	Pebble West Claims Corp.	BC 441	8S002S037W19	160
ADL 642930	Pebble West Claims Corp.	BC 442	8S002S037W19	160
ADL 642931	Pebble West Claims Corp.	BC 443	8S002S037W20	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642932	Pebble West Claims Corp.	BC 444	8S002S035W19	160
ADL 642933	Pebble West Claims Corp.	BC 445	8S002S035W19	160
ADL 642934	Pebble West Claims Corp.	BC 446	8S002S035W20	160
ADL 642935	Pebble West Claims Corp.	BC 447	8S002S035W20	160
ADL 642936	Pebble West Claims Corp.	BC 448	8S002S035W21	160
ADL 642937	Pebble West Claims Corp.	BC 449	8S002S035W21	160
ADL 642938	Pebble West Claims Corp.	BC 450	8S002S035W22	160
ADL 642939	Pebble West Claims Corp.	BC 451	8S002S035W22	160
ADL 642944	Pebble West Claims Corp.	BC 456	8S002S038W22	160
ADL 642945	Pebble West Claims Corp.	BC 457	8S002S038W23	160
ADL 642946	Pebble West Claims Corp.	BC 458	8S002S038W23	160
ADL 642947	Pebble West Claims Corp.	BC 459	8S002S038W24	160
ADL 642948	Pebble West Claims Corp.	BC 460	8S002S038W24	160
ADL 642949	Pebble West Claims Corp.	BC 461	8S002S037W19	160
ADL 642950	Pebble West Claims Corp.	BC 462	8S002S037W19	160
ADL 642951	Pebble West Claims Corp.	BC 463	8S002S037W20	160
ADL 642952	Pebble West Claims Corp.	BC 464	8S002S037W20	160
ADL 642953	Pebble West Claims Corp.	BC 465	8S002S035W19	160
ADL 642954	Pebble West Claims Corp.	BC 466	8S002S035W19	160
ADL 642955	Pebble West Claims Corp.	BC 467	8S002S035W20	160
ADL 642956	Pebble West Claims Corp.	BC 468	8S002S035W20	160
ADL 642957	Pebble West Claims Corp.	BC 469	8S002S035W21	160
ADL 642958	Pebble West Claims Corp.	BC 470	8S002S035W21	160
ADL 642959	Pebble West Claims Corp.	BC 471	8S002S035W22	160
ADL 642960	Pebble West Claims Corp.	BC 472	8S002S035W22	160
ADL 642964	Pebble West Claims Corp.	BC 476	8S002S038W15	160
ADL 642965	Pebble West Claims Corp.	BC 477	8S002S038W14	160
ADL 642966	Pebble West Claims Corp.	BC 478	8S002S038W14	160
ADL 642967	Pebble West Claims Corp.	BC 479	8S002S038W13	160
ADL 642968	Pebble West Claims Corp.	BC 480	8S002S038W13	160
ADL 642969	Pebble West Claims Corp.	BC 481	8S002S037W18	160
ADL 642970	Pebble West Claims Corp.	BC 482	8S002S037W18	160
ADL 642971	Pebble West Claims Corp.	BC 483	8S002S037W17	160
ADL 642972	Pebble West Claims Corp.	BC 484	8S002S037W17	160
ADL 642973	Pebble West Claims Corp.	BC 485	8S002S037W16	160
ADL 642974	Pebble West Claims Corp.	BC 486	8S002S037W16	160
ADL 642975	Pebble West Claims Corp.	BC 487	8S002S037W15	160
ADL 642976	Pebble West Claims Corp.	BC 488	8S002S035W18	160
ADL 642977	Pebble West Claims Corp.	BC 489	8S002S035W18	160
ADL 642978	Pebble West Claims Corp.	BC 490	8S002S035W17	160
ADL 642979	Pebble West Claims Corp.	BC 491	8S002S035W17	160
ADL 642980	Pebble West Claims Corp.	BC 492	8S002S035W16	160
ADL 642981	Pebble West Claims Corp.	BC 493	8S002S035W16	160
ADL 642982	Pebble West Claims Corp.	BC 494	8S002S035W15	160
ADL 642983	Pebble West Claims Corp.	BC 495	8S002S035W15	160
ADL 642987	Pebble West Claims Corp.	BC 499	8S002S038W15	160
ADL 642988	Pebble West Claims Corp.	BC 500	8S002S038W14	160
ADL 642989	Pebble West Claims Corp.	BC 501	8S002S038W14	160
ADL 642990	Pebble West Claims Corp.	BC 502	8S002S038W13	160
ADL 642991	Pebble West Claims Corp.	BC 503	8S002S038W13	160
ADL 642992	Pebble West Claims Corp.	BC 504	8S002S037W18	160
ADL 642993	Pebble West Claims Corp.	BC 505	8S002S037W18	160
ADL 642994	Pebble West Claims Corp.	BC 506	8S002S037W17	160
ADL 642995	Pebble West Claims Corp.	BC 507	8S002S037W17	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 642996	Pebble West Claims Corp.	BC 508	8S002S037W16	160
ADL 642997	Pebble West Claims Corp.	BC 509	8S002S037W16	160
ADL 642998	Pebble West Claims Corp.	BC 510	8S002S037W15	160
ADL 642999	Pebble West Claims Corp.	BC 511	8S002S035W18	160
ADL 643000	Pebble West Claims Corp.	BC 512	8S002S035W18	160
ADL 643001	Pebble West Claims Corp.	BC 513	8S002S035W17	160
ADL 643002	Pebble West Claims Corp.	BC 514	8S002S035W17	160
ADL 643003	Pebble West Claims Corp.	BC 515	8S002S035W16	160
ADL 643004	Pebble West Claims Corp.	BC 516	8S002S035W16	160
ADL 643005	Pebble West Claims Corp.	BC 517	8S002S035W15	160
ADL 643006	Pebble West Claims Corp.	BC 518	8S002S035W15	160
ADL 643432	Pebble West Claims Corp.	BC 1001	8S003S035W07	40
ADL 643433	Pebble West Claims Corp.	BC 1002	8S003S035W07	40
ADL 643434	Pebble West Claims Corp.	BC 1003	8S003S035W07	40
ADL 643435	Pebble West Claims Corp.	BC 1004	8S003S035W07	40
ADL 643436	Pebble West Claims Corp.	BC 1005	8S003S035W04	40
ADL 643437	Pebble West Claims Corp.	BC 1006	8S003S035W04	40
ADL 643438	Pebble West Claims Corp.	BC 1007	8S003S035W03	40
ADL 643439	Pebble West Claims Corp.	BC 1008	8S003S035W03	40
ADL 643440	Pebble West Claims Corp.	BC 1009	8S003S035W03	40
ADL 643441	Pebble West Claims Corp.	BC 1010	8S003S035W03	40
ADL 644284	Pebble West Claims Corp.	SP 173	8S005S035W09	160
ADL 644285	Pebble West Claims Corp.	SP 174	8S005S035W09	160
ADL 644286	Pebble West Claims Corp.	SP 175	8S005S035W09	160
ADL 644287	Pebble West Claims Corp.	SP 176	8S005S035W09	160
ADL 644288	Pebble West Claims Corp.	SP 177	8S005S035W03	160
ADL 644289	Pebble West Claims Corp.	SP 178	8S005S035W03	160
ADL 644290	Pebble West Claims Corp.	SP 179	8S005S035W04	160
ADL 644291	Pebble West Claims Corp.	SP 180	8S005S035W04	160
ADL 644292	Pebble West Claims Corp.	SP 181	8S005S035W04	160
ADL 644293	Pebble West Claims Corp.	SP 182	8S005S035W04	160
ADL 644294	Pebble West Claims Corp.	SP 183	8S005S035W03	160
ADL 644295	Pebble West Claims Corp.	SP 184	8S005S035W03	160
ADL 644296	Pebble West Claims Corp.	SP 185	8S004S035W36	160
ADL 644297	Pebble West Claims Corp.	SP 186	8S004S035W36	160
ADL 644298	Pebble West Claims Corp.	SP 187	8S004S035W35	160
ADL 644299	Pebble West Claims Corp.	SP 188	8S004S035W35	160
ADL 644300	Pebble West Claims Corp.	SP 189	8S004S035W35	160
ADL 644301	Pebble West Claims Corp.	SP 190	8S004S035W36	160
ADL 644302	Pebble West Claims Corp.	SP 191	8S005S035W07	160
ADL 644303	Pebble West Claims Corp.	SP 192	8S005S035W07	160
ADL 644312	Pebble West Claims Corp.	SP 201	8S005S035W07	160
ADL 644313	Pebble West Claims Corp.	SP 202	8S005S035W07	160
ADL 644314	Pebble West Claims Corp.	SP 203	8S005S035W18	160
ADL 644315	Pebble West Claims Corp.	SP 204	8S005S035W18	160
ADL 644318	Pebble West Claims Corp.	SP 207	8S004S035W36	160
ADL 644319	Pebble West Claims Corp.	SP 208	8S004S035W25	160
ADL 644320	Pebble West Claims Corp.	SP 209	8S004S035W25	160
ADL 644321	Pebble West Claims Corp.	SP 210	8S004S035W25	160
ADL 644322	Pebble West Claims Corp.	SP 216	8S004S035W25	160
ADL 644323	Pebble West Claims Corp.	SP 225	8S004S035W24	160
ADL 644324	Pebble West Claims Corp.	SP 226	8S004S035W24	160
ADL 644325	Pebble West Claims Corp.	SP 227	8S004S034W19	160
ADL 644326	Pebble West Claims Corp.	SP 228	8S004S034W19	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 644327	Pebble West Claims Corp.	SP 229	8S004S034W19	160
ADL 644328	Pebble West Claims Corp.	SP 230	8S004S034W19	160
ADL 644329	Pebble West Claims Corp.	SP 231	8S004S035W24	160
ADL 644330	Pebble West Claims Corp.	SP 232	8S004S035W24	160
ADL 644331	Pebble West Claims Corp.	SP 235	8S004S035W13	160
ADL 644332	Pebble West Claims Corp.	SP 236	8S004S034W18	160
ADL 644333	Pebble West Claims Corp.	SP 237	8S004S034W18	160
ADL 644334	Pebble West Claims Corp.	SP 238	8S004S034W18	160
ADL 644335	Pebble West Claims Corp.	SP 239	8S004S034W18	160
ADL 644336	Pebble West Claims Corp.	SP 245	8S004S034W07	160
ADL 644733	Pebble West Claims Corp.	SOUTH PEBBLE 234	8S004S035W13	40
ADL 644734	Pebble West Claims Corp.	SOUTH PEBBLE 240	8S004S035W13	40
ADL 644735	Pebble West Claims Corp.	SOUTH PEBBLE 241	8S004S035W13	40
ADL 644736	Pebble West Claims Corp.	SOUTH PEBBLE 242	8S004S035W13	40
ADL 644737	Pebble West Claims Corp.	SOUTH PEBBLE 243	8S004S034W07	40
ADL 644738	Pebble West Claims Corp.	SOUTH PEBBLE 244	8S004S034W07	40
ADL 645612	Pebble West Claims Corp.	SP 322	8S004S034W08	160
ADL 645613	Pebble West Claims Corp.	SP 323	8S004S034W08	160
ADL 645614	Pebble West Claims Corp.	SP 324	8S004S034W05	160
ADL 645615	Pebble West Claims Corp.	SP 325	8S004S034W05	160
ADL 645616	Pebble West Claims Corp.	SP 326	8S004S034W05	160
ADL 645617	Pebble West Claims Corp.	SP 327	8S004S034W04	160
ADL 645618	Pebble West Claims Corp.	SP 328	8S004S034W04	160
ADL 645619	Pebble West Claims Corp.	SP 329	8S004S034W03	160
ADL 645620	Pebble West Claims Corp.	SP 330	8S004S034W03	160
ADL 645621	Pebble West Claims Corp.	SP 331	8S003S034W35	160
ADL 645622	Pebble West Claims Corp.	SP 332	8S003S034W34	160
ADL 645623	Pebble West Claims Corp.	SP 333	8S003S034W34	160
ADL 645624	Pebble West Claims Corp.	SP 334	8S003S034W34	160
ADL 645625	Pebble West Claims Corp.	SP 335	8S003S034W34	160
ADL 645626	Pebble West Claims Corp.	SP 336	8S003S034W35	160
ADL 645627	Pebble West Claims Corp.	SP 337	8S003S034W25	160
ADL 645628	Pebble West Claims Corp.	SP 338	8S003S034W25	160
ADL 645629	Pebble West Claims Corp.	SP 339	8S003S034W26	160
ADL 645630	Pebble West Claims Corp.	SP 340	8S003S034W26	160
ADL 645631	Pebble West Claims Corp.	SP 341	8S003S034W27	160
ADL 645632	Pebble West Claims Corp.	SP 342	8S003S034W27	160
ADL 645633	Pebble West Claims Corp.	SP 343	8S003S034W27	160
ADL 645634	Pebble West Claims Corp.	SP 344	8S003S034W27	160
ADL 645635	Pebble West Claims Corp.	SP 345	8S003S034W26	160
ADL 645636	Pebble West Claims Corp.	SP 346	8S003S034W26	160
ADL 645637	Pebble West Claims Corp.	SP 347	8S003S034W25	160
ADL 645638	Pebble West Claims Corp.	SP 348	8S003S034W25	160
ADL 645639	Pebble West Claims Corp.	SP 349	8S003S034W24	160
ADL 645640	Pebble West Claims Corp.	SP 350	8S003S034W24	160
ADL 645641	Pebble West Claims Corp.	SP 351	8S003S034W23	160
ADL 645642	Pebble West Claims Corp.	SP 352	8S003S034W23	160
ADL 645643	Pebble West Claims Corp.	SP 353	8S003S034W22	160
ADL 645644	Pebble West Claims Corp.	SP 354	8S003S034W22	160
ADL 645645	Pebble West Claims Corp.	SP 355	8S003S034W22	160
ADL 645646	Pebble West Claims Corp.	SP 356	8S003S034W22	160
ADL 645647	Pebble West Claims Corp.	SP 357	8S003S034W23	160
ADL 645648	Pebble West Claims Corp.	SP 358	8S003S034W23	160
ADL 645649	Pebble West Claims Corp.	SP 359	8S003S034W24	160

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Case ID	Customer Name	Claim Name	MTRSC	Acres
ADL 645650	Pebble West Claims Corp.	SP 360	8S003S034W24	160
ADL 645651	Pebble West Claims Corp.	SP 361	8S003S034W13	160
ADL 645652	Pebble West Claims Corp.	SP 362	8S003S034W13	160
ADL 645653	Pebble West Claims Corp.	SP 363	8S003S034W14	160
ADL 645654	Pebble West Claims Corp.	SP 364	8S003S034W14	160
ADL 645655	Pebble West Claims Corp.	SP 365	8S003S034W15	160
ADL 645656	Pebble West Claims Corp.	SP 366	8S003S034W15	160
ADL 645657	Pebble West Claims Corp.	SP 367	8S003S034W15	160
ADL 645658	Pebble West Claims Corp.	SP 368	8S003S034W15	160
ADL 645659	Pebble West Claims Corp.	SP 369	8S003S034W14	160
ADL 645660	Pebble West Claims Corp.	SP 370	8S003S034W14	160
ADL 645661	Pebble West Claims Corp.	SP 371	8S003S034W13	160
ADL 645662	Pebble West Claims Corp.	SP 372	8S003S034W13	160
ADL 649923	Pebble West Claims Corp.	BC 1171	8S002S037W15	160
ADL 649924	Pebble West Claims Corp.	BC 1172	8S002S037W14	160
ADL 649925	Pebble West Claims Corp.	BC 1173	8S002S037W14	160
ADL 649926	Pebble West Claims Corp.	BC 1174	8S002S037W13	160
ADL 649927	Pebble West Claims Corp.	BC 1175	8S002S037W13	160
ADL 649928	Pebble West Claims Corp.	BC 1176	8S002S037W15	160
ADL 649929	Pebble West Claims Corp.	BC 1177	8S002S037W14	160
ADL 649930	Pebble West Claims Corp.	BC 1178	8S002S037W14	160
ADL 649931	Pebble West Claims Corp.	BC1179	8S002S037W13	160
ADL 649932	Pebble West Claims Corp.	BC1180	8S002S037W13	160
ADL 649939	Pebble West Claims Corp.	BC1187	8S002S037W24	160
ADL 649940	Pebble West Claims Corp.	BC1188	8S002S037W24	160
ADL 649948	Pebble West Claims Corp.	BC1196	8S002S037W24	160
ADL 649949	Pebble West Claims Corp.	BC1197	8S002S037W24	160